Handbook of Research on

Multidisciplinary Approaches to Entrepreneurship, Innovation, and ICTs

Luísa Cagica Carvalho, Leonilde Reis, Alcina Prata, and Raquel Pereira

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The underlying concept of business continuity is that an organization must have the strategic and tactical capability to plan and respond to business incidents and interruptions, in order to continue business operations at an acceptable predefined level. This chapter proposed an approach to business continuity management in an organization through the definition and implementation of a set of four related phases. The authors integrate the main guidelines, based on the literature review and on good practices and concerns, referred to in the ISO standards and on ITIL, CMMI, and COBIT frameworks. This approach will allow organizations to address the most relevant activities for the development of a business continuity management program. By implementing each of the phase activities, the organization will have a systematic overview of the steps required for an optimized planning and response to business incidents and disruptions, supported by the strategy defined framed within their needs.

Chapter 11

Crossmedia systems are becoming the trend due to technological advances, better interfaces design, and changes in user habits. Due to the use of different devices as part of the same crossmedia system, which allow supporting a multiplicity of contexts of use, useful when considering learning scenarios, new research opportunities and challenges have arisen in the design of these systems. This chapter addresses the effective design of crossmedia systems and interfaces with a particular emphasis on iTV, PC, and mobile devices, through the eiTV application, designed and developed to illustrate and explore this paradigm, based on cognitive and affective aspects that influence user experience. The eiTV application is capable to create, access, and share personalized informal learning environments (created as additional information to the video being watched), via iTV, PC, and mobile devices (the preferred or most adequate device in each context of use).

Chapter 12

The purpose of the chapter is to address the importance of building the project team in order to contribute to maximize the number of project success histories in an international context. The design science research methodology allowed, based on the literature review on the thematic domain, to elaborate a reference framework in order to obtain the scientific validation of the work. The main conclusions focus on presenting the added value of the team building in the implementation and adaptation of software products. The need to define strategies when setting up the teams is emphasized, so that specialists are incorporated in the various domains, taking into account the specificity of the country in which the project will take place. Thus, the definition of team formation policies is considered a differentiating factor, in order to include the knowledge in the domains of the culture of the country, organizational culture and current legal and fiscal frameworks as well as the interpersonal relations component.

Preface

Over the last years we have witnessed the importance of the ICT to the business and organizations in general. New business models, new marketing channels and new markets are reached using ICT. ICTs are a daily support and, many times, a way to develop creativity and innovation.

Currently, most of the organizations are dependent on IS/ICT, in order to support their business strategies. IS/ICT can promote the implementation of strategies and enhancers of optimization of the various aspects of the business. Not only in market enterprises, but also in social organizations, digital economy and ICTs are important tools that can empower social entrepreneurship initiatives to develop, fund and implement new and innovative solutions to social, cultural and environmental problems. Digitalization is more than a trend and ICTs are common and influence the wellbeing of millions of people virtually everywhere.

There is currently an extensive literature addressing the main topics on ICTs, entrepreneurship and innovation in an organizational context. However, the extant research is too focused regarding these topics separately. This edtied book allows an integrated approach about these set of global and actual topics. Thus, students, teachers, potential entrepreneurs and even private and public organizations are mainly directed to the mainstream entrepreneurship, innovation or ICTs what means, ultimately, to underestimate a multidisciplinary approach that mix and complement these topics and contributes to the organizations.

The purpose of this book is to describe research work in an organizational context in order to optimize the practices established in the most diverse domains of knowledge. This book to present a global and multidisciplinary approach that could contribute to a better understanding of the relationship and mutual influence of digital, entrepreneurship and innovation scientific areas. The diversity of the chapters included in the book allows an exploitation of the entrepreneurship, innovation and ICTs, in a global approach, to draw attention to multidisciplinary view of these contexts and their influence in the modern organizations. The book is divided in two main sections:

Section 1 - Digitalization in Business: New Trends

Provide interesting insights about digitalization in the context of businessess and other organizations and propose some trends and clues to new studies about this research.

Section 2 - An Innovative and Sustainable Perspective About ICTs and Technology

This part include chapters more focused on ICT, tecnologies and innovation, and allows a perspective that privilege sustainability as a trend in modern society.

A brief summary of each chapter is given.

SECTION 1: DIGITALIZATION IN BUSINESS – NEW TRENDS

Chapter 1: Business Models for Digital Economy – Good Practices and Success Stories

The first chapter aims to determine the importance of the ever-changing digital economy, analyze its opportunities and exhibit the different types of business models originated by the digital economy. It also aims to attract attention to the possibilities of platform-based businesses. In fact, successful digital business strategies combine the internet capabilities with aspects of the company's finances, requirements, and priorities and may not be appropriate in the rapidly changing digital environment with the demands of the consumers in the past.

Chapter 2: Digital Economy and Cloud – Trends and Challenges for Healthcare Organizations

This chapter presents the trends and challenges that healthcare organizations will face as a result of the digital revolution. In particular, the health sector needs to seek a new strategic focus, acquiring new specialties and establishing new ways of working, defined in new business models in which cloud computing technology will be increasingly present. What is cloud computing and the challenges and trends ahead? Security and privacy of the cloud, cloud adoption and trends in the healthcare industry are also items analysed, as well as cloud applied on the combat to COVID19 pandemic.

Chapter 3: HRM in Tourism Industry – Inferences From Research

This chapter aims to analyse the research from the last twenty years on Human Resources Management in the Tourism industry. The research question is: What are the contributions of the international publications on human resources management and tourism in the Web of Science and Scopus databases in the last two decades? In order to accomplish this goal, the research methodology will be a literature survey using the Scopus and WoS databases.

Chapter 4: Entrepreneurship Embedding Social Network Capability as Best Practice for Small Firms – Some Evidence From a Small Sportswear Retailer in Italy

This chapter examines a small Italian sportswear retailer operating locally and discuss this case attending to the strategy of this retailer in the use of the social networks. The research collected information from consumers in order to highlight the marketing instruments and activities that give rise to adequate customer satisfaction. And allows to suggest a set of best practices for small businesses.

Chapter 5: Leveraging Entrepreneurial Ambition Through Innovative Technologies and Knowledge Transfer Within a National Defense Technological and Industrial Base

This research raises the discussion on how governments', as active agents of an entrepreneurial By linking the development of these capabilities, through an innovative National Technological Industrial Base (DTIB), to new business formation, the notion that entrepreneurship is far from being rooted in a commercially competitive market setting alone is equally reinforced in the context of the chapter.

Chapter 6: Agile Business Analysis for Digital Transformation

This chapter provides an overview of the state-of-the-art Agile Business Analysis (BA) in scope of digital transformation. In accordance with the well-known frameworks, general principles and promising techniques of Agile Business Analysis (BA) are highlighted and discussed. The regarding agile practices provide valuable guidelines for researchers and practitioners and how they can assist continuous feedback, continuous learning, continuous improvement and continuous integration capabilities of organizations; and also how to maximize value to the stakeholders in agile project lifecycles and agile business transformations.

Chapter 7: The Influence of Transformational Leadership, Cultural Orientation, and Emotional Conflict on Innovation in Multicultural Teams

This chapter addresses the question of how transformational leadership, cultural orientation and affective conflict impact on multicultural teams focused on innovation. Additionally, the moderating effect of perceived organizational support on relationship between transformational leadership and team innovation is also analysed. The analysis followed and the achieved results are also described.

Chapter 8: Legalistic Entrepreneurship in the Digital World

This chapter presents today's digital world in which entrepreneurship is developed with an approach that is positively explained, focused on its outcomes and ignores legal barriers. This study aims to reveal and clarify the type of legalistic entrepreneurship that transforms compliance with the law behavior to an entrepreneurial act. The starting point of the study was to answer the question of how the information and communication which is brought by the digital world can be turned into an opportunity against legal obstacles.

SECTION 2: AN INNOVATIVE AND SUSTAINABLE PERSPECTIVE ABOUT ICTS AND TECHNOLOGY

Chapter 9: Concept of Approach to Optimize ICT Management Practices – State of the Art

This chapter describes a multidisciplinary and integrative approach to the changes in business processes cause by the rapid evolution of ICT, namely in public services and local administration, considering the specificity of the Portuguese local administration. Within the scope of integrated and sustained governance, based on the alignment of ICT with business, the main contributions of the proposed approach are the optimization of practices established in the domains of sustainability, human capital, increased productivity, optimization of information security practices and improvement of environmental quality, promoting alignment with Green IT.

Chapter 10: Methodological Approach to Systematization of Business Continuity in Organizations

This chapter proposes an approach to Business Continuity Management in an organization, through the definition and implementation of a set of four related phases. They integrate the main guidelines, based on the literature review and on good practices and concerns, referred to in the ISO standards and on ITIL, CMMI and COBIT frameworks. This approach will allow organizations to address the most relevant activities for the development of a Business Continuity Management Program.

Chapter 11: Interactive TV as Part of Crossmedia Systems in Order to Enhance Informal Learning – The eiTV Case Study

This chapter addresses the effective design of crossmedia systems and interfaces with a particular emphasis on iTV, PC and mobile devices, through the eiTV application, designed and developed to illustrate and explore this paradigm, based on cognitive and affective aspects that influence user experience. The eiTV application described in this chapter is capable to create, access and share Personalized Informal Learning Environments (created as additional information to the video being watched), via iTV, PC and mobile devices (the preferred or most adequate device in each context of use).

Chapter 12: Successful Practices in ICT Team Building in International Projects

This chapter focuses on the need and relevance in systematizing knowledge in the International Projects Team Building. Describes the professional experience in managing teams in international ICT projects and considers that the establishment of the teams is fundamental to the success of the projects. Furthermore, it is presented successful practices when setting up teams to participate in international projects in the context of parameterization /customization of generic software products, in order to maximize the teams' success.

Chapter 13: Comparative WebGIS Software Study – How to Support Users Decisions on the Best Solution to Their Organizations

This chapter discusses the advantages and disadvantages involved in the use of Geographic Information Systems (GIS), with a main focus on WebGIS or geoportals. A detailed comparative study in what concers to the main WebGIS software solutions in terms of characteristics and functionalities is also presented. The main goal of the chapter was to provide users with a list of important recommendations that could help them in the process of choosing a WebGIS software, both in terms of free and proprietary solutions.

Chapter 14: Designing DMO Communication Strategies Through the Use of a Step-by-Step Model

This chapter presents a model which aims to enhance the use of social media by the DMO and in a simple way enable it to manage their presence in social media platforms, without resorting to external service providers and according to their reality as to competences and needs. The use of social media will never replace the tourists' experience itself but it will enable the DMO to try and promote its evaluation and thus making it more enriching, flexible, dynamic and closer to concerns which weren't previously considered.

Chapter 15: Accessibility Solutions for Visually Impaired Persons – A Digital Platform Conceptualization

This chapter addresses a study in which it is intended to conceptualize, develop and evaluate an aggregation platform of accessible solutions target to Portuguese people with visual impairment. The platform contents will be available through an Interactive Television (iTV) application and a web/mobile application accessible to visually impaired users. A survey and an analysis were made in order to understand what features and functionalities the proposed platform can integrate and how it can become a powerful solution for people with visual impairment. The system architecture is also presented.

Chapter 16: Sustainability Design Applied to the Digital Signature of Documents

This chapter proves as ICT can be an added value in order to provide integrated services to customers, namely in the use of electronic documents and digital signatures. The chapter describes a case study in which an Android mobile application, SoftDigital, was developed for document flow management in a hospital environment, meeting the principles of Sustainability Design for the development of software systems, allowing healthcare professionals and patients (or their legal representative) to integrate their digital signature into documents for approval of treatments electronically.

Chapter 17: Sustainability in Information and Communication Technologies

One more exemple of how ICT can provide added value in an organizational context, in order to enhance the definition of business support strategies. This chapter focuses on the contribution of ICT to implement a sustainability policy in the organizations, in the context of the Sustainable Development Goals to improve cooperation and promote development, apllying the principles of the Karlskrona Manifesto. This final chapter analyse the impact of established practices in organizations to design and develop sustainable software systems, which will improve management practices, reducing the quantity of material to be recycled, and aligning organizational strategies with Green IT.

Section 1

Digitalization in Business: New Trends

Chapter 1
Business Models for Digital Economy:
Good Practices and Success Stories

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ABSTRACT

This chapter aims to provide a better understanding about how digitalization affects the business models and business strategies. To answer this question, this chapter presents a literature review complemented by case studies. From a business perspective, this study emphasizes the need to take into account the impact of the ever-changing digital environment on how it influences business strategy, and it categorizes the new business models with a special focus on platform businesses and displays some examples from the practice. The results also suggest that with the internet and the digitalization there were new, innovative business models created which attract new segments and create value in ways unimaginable in the past.

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INTRODUCTION

In today's era of volatility, there is no other way but to re-invent. The only sustainable advantage you can have over others is agility, that's it. Because nothing else is sustainable, everything else you create, somebody else will replicate. - Jeff Bezos, Founder, Amazon

The integration of so-called SMAC innovations – social, mobile, analytics, and cloud computing – has culminated in an ongoing digitalization surge that is now driving the business and society. As digitalization has reached all facets of our personal and professional lives, it has become a priority for executives and policy makers, making it to the headlines for publications, journals, and seminars of professionals (Legner et al., 2017).

The rise of technology and the Internet also required attention from the business sector. Companies need to develop the privacy issues of their consumers who put their data into the hands of these companies. Today, personal data is disseminated, shared and collected more than ever before (OECD, 2015).

When companies respond to the challenges of the digital world and draw on the hard-won experiences of online business leaders, they need to consider how traditional business strategies and execution models are affected by the web and to recognize why the new business elements made possible by the internet is becoming increasingly important.

Successful digital business strategies combine the internet capabilities with aspects of the company's finances, requirements and priorities and may not be appropriate in the rapidly changing digital environment with the demands of the consumers in the past.

This chapter aims to determine the importance of the ever-changing digital economy, analyze its opportunities and showcase the different types of business models the digital economy has created. Its objective is also to attract attention to the possibilities of platform-based businesses.

Our research is divided into four main parts: the first part is dedicated to the digital economy - the digital marketplace and the digitalization of the business - the second part talks about the digital entrepreneurship, third part explains impact of digitalization on the business, based on case studies and the last, the fourth part is devoted to business models of the digital economy, their typologies and it speaks in depth about the platform business models.

LITERATURE REVIEW

Digital Economy

The definition of digital economy, synonymous of digitalization is wide and still difficult to find a synthetic definition and since related with information society (Webster, 1995; Hill, 1999).

The digital economy remains to evolve at quick speed, driven by the ability to collect, use and analyse massive amounts of machine-readable information (digital data) about practically everything. These digital data result from from the digital footprints of personal, social and business activities taking place on various digital platforms (UNCTAD, 2019). According to the same source Global Internet Protocol (IP) traffic, a proxy for data flows, grew from about 100 gigabytes (GB) per day in 1992 to more than 45,000 GB per second in 2017. And yet the world is only in the early days of the data-driven economy;

by 2022 global IP traffic is projected to reach 150,700 GB per second, fuelled by more and more people coming online for the first time and by the expansion of the Internet of Things (IoT).

Additionnaly platformization is a driver of this evolution. Digital platforms provide the emergence of new data driven business models. According to Kenney and Zysman (2016) platform economy enables a socio-technical infrastructure that facilitates new forms of online intermediation between buyers and external sellers. Some outstanding and successful examples of such digital infrastructures are presented as part of the so-called 'sharing economy'. The key to understanding the social structures of sharing economy platforms is to analyze them as digital markets created and served by market organizers. Companies such as Amazon, Facebook, Google, Salesforce and Uber are creating online structures that enable a wide range of human activities. This opens the way for radical changes in creating value in the economy.

Digital platforms are diverse in function and structure. Google and Facebook Are offering search and social media, but they also provide an infrastructure on which other platforms are built. Amazon is a marketplace, like Etsy and eBay. Airbnb and Uber use these newly available cloud tools to force deep changes in a variety of incumbent businesses. Together they are provoking reorganization of a wide variety of markets, work arrangements, and ultimately value creation and capture (Kenney and Zysman, 2016).

Digital Marketplace

Digital markets are developing today thanks to advances in artificial intelligence (AI), machine learning, real-time personalization, and the scale and speed of the latest generation of cloud platforms, including the Google Cloud Platform. Today's digital markets use these technologies to create trusted virtual trading platforms and environments in which buyers and sellers perform a wide range of tasks every day.

When talking about the digitalization of the business and the platforms we can often hear the word "matchmaker". Similarly, to its traditional meaning, matchmakers gather together clients offering services with people needing them. The matchmaker model brings together buyers and sellers, but it doesn't own what is bought and sold (Mullins, n.d.). Uber brings together people needing to be transported with people owning cars and having free time without owning any vehicles. Airbnb connects travelers with homeowners without owning any properties. And how do these companies make a profit? They collect fees, percentages or shares from the services provided.

The Digitalization of the Business

Technological development has created new markets, which entails an unprecedented number of opportunities, but also threats, especially for companies operating in sectors where the old model is rapidly changing, or a parallel system appears combining the traditional model with the digital model. This is not about using electronic sales channels, but completely new concepts for the implementation of standard services using innovational technological solutions. Today, it is no longer enough to offer the best products and services. In the new digital era, the most important are companies that can effectively predict what the customer expects and meet these expectations (Tabrizi, Lam & Irvin, 2019).

By the term digital transformation, we mean the changes that occur through the introduction of digital technology in any part of human society. Digital market transition happens when significant changes in corporate procedures, structures, and technologies are introduced to increase organizational efficiency by increasing the use of digital technology (Chaffey, Edmundson-Bird & Hemphill, 2019).

The process of digitizing an enterprise should not stop only on the product. To fully exploit the potential in the digital field, companies must analyze their strategy and decide on this basis what their operating model should look like and how to reorganize their structures and processes.

A digital company is a firm, which enables and mediates almost all of its activities related to its employees, customers, suppliers digitally. In these companies, all information is easily available through the channels (Christensen, 2015).

Successful online business strategies combine internet capabilities with the facets of the finances, requirements, and priorities of an organization, as well as the desires and aspirations of the consumers. Because the Internet is a complex, rapidly changing business environment, it is often hard to know which tactics are likely to be effective, and when, and why (Coupey, 2016).

Nowadays we are entering the era of industry 4.0 which means more process automation and a new definition of resource management because resources are changing. In industry 4.0, among the digitization processes we can distinguish:

- **Cloud Computing and Big Data:** Systems for storing and processing large amounts of data located on external servers. They often enable the use of additional advanced analytics and machine learning services;
- **IT Systems Integration:** Automatic information flow and data between production and business systems;
- **Industrial Internet of Things (IIoT):** Combination of intelligent sensors and mobile devices into one network allowing for automatic communication between devices in real-time;
- **Cybersecurity:** IT systems and dedicated devices ensuring data security at the level of business (IT) and production (OT) networks;
- **Augmented and Virtual Reality:** The use of virtual or augmented reality goggles when designing new products or for computer-aided image analysis of the observed machine;
- **Simulations (Digital Twin):** The use of modeling and simulation tools at the stage of preparing new products. The use of computer simulation techniques to create a digital model of factories and processes for the training of operators.

In order for technologies to bring benefits, the systems should be integrated with each other and add a security policy (cybersecurity) should be built for them along with appropriate tools to protect against cyber-attacks. The key to making business decisions is already data (of good quality) and teams that know how to work with this data and how to use it to improve business. (Gracel and Rodak, 2019).

Digital Entrepreneurship

The term entrepreneurship appeared to describe the bearing of the risk of buying at a certain price and selling at uncertain prices. Over time, though, understanding of entrepreneurship developed more broadly to include the risk-taking behaviors of individuals who pursue perceived opportunities. Stevenson (1985) defined entrepreneurship as the pursuit of opportunity beyond the resources currently controlled, and Venkatraman delineated the scholarly field of entrepreneurship as the examination of how, by whom, and with what effects opportunities are discovered, evaluated, and exploited to create future goods and services.

The concept of entrepreneurship has evolved many times until we came to the concept of technological entrepreneurship. One of the most important definitions of technological entrepreneurship was created by Tony Bialetti, who emphasized that technological entrepreneurship is "*an investment in a project that assembles and deploys specialized individuals and heterogeneous assets that are intricately related to advances in scientific and technological knowledge for the purpose of creating and capturing value for a firm*" (Bailetti, 2012, p.9). To understand how digitization has changed technology entrepreneurship, we need to focus on three different aspects:

- Technological possibilities
- Entrepreneurship processes
- Acquiring resources

These interconnected perspectives allow us to find and describe examples of entrepreneurship in which we can observe how digitization has penetrated into technological entrepreneurship. Figure 1 present alternative forms of technology and digital entrepreneurship. This figure shows the various forms that technological entrepreneurship can take. Focusing on digital entrepreneurship, we can see that it is related to concepts such as recombinant innovation (an innovation as a process through which new ideas emerge as the combination of existing ideas) or demand-driven approaches to technological innovation in the understanding of market-pull.

Figure 1. Alternative forms of technology and digital entrepreneurship
Source: Brem and Giones, 2017

Typology	Technology Behind the Opportunity	Key Activities In the Process	Access to Resources and Funding
Technology Entrepreneurship	New products based on breakthroughs in research; science-based advances through specific knowledge in an academic field Example: Graphene	Technology proof of concept; first customer validation; activate a global but niche market (Clarysse et al. 2011)	Public research grants and other soft money sources Venture capital attracted by promising intellectual property (Audretsch et al., 2012; Giones & Miralles, 2015
Digital Technology Entrepreneurship	New products based on ICT technologies only; making smart devices using the possibilities of Internet of Things Example: Smartphone	Use of existing technologies; market validation, traction, and growth, scalability	Business angels; seed and venture capital; stock market Crowdfunding reward and equity (Gedda et al., 2016)
Digital Entrepreneushiip	New products and services based on the Internet. Services running only in the cloud; using big data or artificial intelligence Example: Snapchat	Technology as an input factor: high growth ambitions (Wallin et al., 2016) stay ahead of competitors; be the dominant player in the category	Business angels; seed and venture capital; stock market Equity crowdfunding (Tomczak& Brem, 2013)

From a research point of view, digital technology is much closer to the objects, networks, and data infrastructure principles in information systems. Many digital entrepreneurs don't really know about the specific technology behind their business idea, they just concentrate on the service based on it. Technology is therefore only an input variable here (Brem and Giones, 2017). Entrepreneurship in digital technology refers to innovation: the services are technical. The Figure 2 provides three examples of successful digital entrepreneurship models.

Figure 2. The example of digital entrepreneurship
Source: Brem & Giones, 2017

Digital Entrepreneurship	AirBnb (www.airbnb.com)	What started as an idea to make a bit of money by renting space in an apartment, quickly became a popular site foe people to share and find accommodation. After failing to attract business angels, it was only after being part of an acceleration program in 2009 that it started to gain traction as an accommodation-sharing platform.
	Just Eat (www.just-eat.com)	An attempt to make takeaway ordering an option for all types of restaurants in 2001 was the birth of one of the largest networks of international restaurants that offers online ordering in an increasing number of countries around the world.
	Dropbox (www.dropbox.com)	The idea of having a user's files synchronize in the loud was behind the digital storage company that has successfully competed with the largest software firms. Since 2009, when the competitive threat of the iCloud arose, they have managed to keep growing what was once a feature into a full product line for consumers and business.

Digital entrepreneurship encompasses all that's new and different in digital entrepreneurship, including innovative ways to find buyers for business ventures:

- New ways to model and offer products and services;
- New ways to generate revenue and lower costs;
- New opportunities to collaborate with networks and affiliates;
- New opportunities, threats, and solutions.

On a practical level, digital entrepreneurship opens new opportunities for anyone who wants to become an entrepreneur. These basic skills (Allen, n.d.) include finding new customers online, prototyping new business ideas, and improving business ideas based on data.

Digital Business Models

Business Models

Business Models support start-ups to find a way to create value. In general, try to answer to the fundamental questions, such as: *"Who is the customer? And what does the cus-tomer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?"* (Margaretta, 2002).

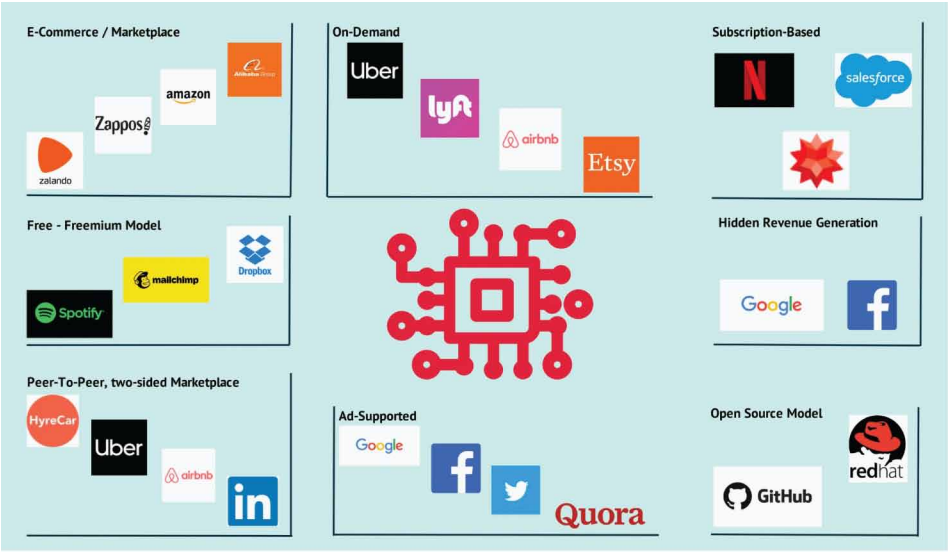
The advent of mobile and Internet technology has provided opportunities to create new forms of organization. Through moving corporate structure away from selling goods to promoting financial transactions between two or more (related) user groups, organizations such as Alibaba and Uber have adopted new methods of structuring business and market borders. These multi-sided networks mediate customer

experiences and thus vary from companies that control a linear sequence of operations as well as from distribution systems that orchestrate a distributor network to create a community of related products. In comparison, relative to intermediaries outside of the digital economy (e.g., insurance brokers, some department stores), these multi-sided channels can introduce new payment processes quicker and at a much lower cost (Zhao, von Delft, Morgan-Thomas and Buck, 2019).

Typologies of Digital Business Models

A digital business model could be described as a system that leverages emerging technology to improve an organization's various aspects. From how clients communicate, how the value proposition is generated, or how it tends to be monetized. They all like to speak in their own terms about modern business models as creative. Innovation, however, happens in many situations by merging elements of existing business systems to create a unique formula. In the following steps we will name and describe some of the most important and popular digital business models (Cuofano, 2019). The figure 3 below illustrates the various types of business models.

Figure 3. Digital business models map
Source: https://fourweekmba.com/digital-business-models/



Digital Business Models could be grouped according to the categories:

1. **Open source Business Model:** The open-source model allows unrestricted access to software and generally gives a developer community the ability to contribute to it. But because it is free, it is not easy to make money out of it. Therefore, these companies usually offer premium services to generate profit. Open-source companies are e.g. Mozilla, Adobe, IBM or Intel;
2. **Free Model:** Companies using this model create new products or services released them for free with the hope that once enough people would get used to them, monetization would not be an issue.

A good example of using this method are Google and Facebook. Both companies have created a free service on the market for a growing number of users, they attracted angel investors than venture capitalists they had to then quickly turn to the advertising model to monetize their users, to avoid being left without cash and investors;

3. **Freemium Model:** Customers receive parts of the digital service (e.g. limited functions of software or service with advertisements) free of charge. This serves to manage the onboarding process with as little sales effort as possible. The offers which can persuade users to upgrade to the premium services can be more volume, no advertising or more data. Freemium model companies are Spotify or DropBox;
4. **E-Commerce Model:** By e-commerce, we mean selling goods through the internet, so when commerce meets the web. Typical e-commerce companies are Amazon or Alibaba;
5. **Subscription-Based Model:** Each month, season or year, the customer signs up to buy or lease a product or service with an electronic payment process. On completion of the first subscription fee, the user will either receive access to a library of goods or services to be used at the time of his or her choosing and receive a specified good or service chosen for regular delivery (Gregory, 2019). Subscription-based business models use Netflix, HBO Go, etc.;
6. **On-Demand Model:** This model has a huge advantage over mass media such as television, radio and the Internet. On-demand consumption gives users access to content at a place and time of their choice. An example of a platform using this model is Netflix. Users can easily watch TV series and movies at their chosen time in online or offline mode, which is connected with each other by the smart download function;
7. **Marketplace Model:** Marketplaces make it possible for external suppliers to sell products in one shared online marketplace. The entire marketplace is working in the same software space due to all sellers can distribute their distinct goods under the umbrella of one website. eBay and Amazon are examples of companies that use this model and are thriving platforms.

Platform Business Models

While the key to rule the 20th-century economy was to own the significance of production, the secret of our own times is to create the means of connection. Platform businesses like Apple Alibaba, Uber or Google rule the market. And what they do? Simply connect consumers and producers and facilitate the exchange of goods and services between them (Thornhill, 2016). *"A platform thinking approach to building a business involves figuring out ways by which an external ecosystem of developers and users can be leveraged to create value."* (Choudary, n.d.)

Unlike traditional businesses, platform businesses don't buy inputs, make goods, and sell them. Instead, they gather participants and then sell these participants access to the other group of participants. According to Evans and Schmalensee (2016) the "participants" are the "inputs" that they use to produce the intermediation service they provide.

In the digital age, platforms can be a serious source of competitive advantage. But it is not so easy to transform a traditional business into a platform one. Goods generate a single revenue stream, while platforms — which are identified as intermediaries that link two or more separate user groups and allow direct interaction between them — can generate several. Furr (2016) explains this transition in a few steps, all from different points of view:

- **Demand-Side Evolution:** When transforming a new platform out of our own products, it starts with attracting a big number of users. But as research shows, the growth of the user basis doesn't come linearly. Rather than that, it occurs in stages:
  - **Structuring an External Product "Love Group":** This phase can happen through a series of projects, conferences, events and various workshops that build and events that built momentum for the product;
  - Transforming the love group into early platform adopters - In this phase, the business owner gives the love group a free hand - they can share ideas to which the company replies and uses them, hence creating a community;
  - Leveraging early adopters to accelerate platform adoption;
- **Supply-Side Evolution:** As firms move from product to platform, the company also evolves through several stages:
  - **Internal Product R&D + External Complementors:** In the first phase, the company's development team focuses on creating momentum for a new, better product through continuous improvement of the original, core product. This inspires customer adoption and enthusiasm. Companies also often open up to external complementors in this phase;
  - **Internal Platform R&D + Blended Complementors + Community Management:** In this stage, companies usually have to expend a greater amount of internal R&D effort to create the platform itself from the initial ideas from complementors. But not all this effort is solely internally focused. In this process, product project leaders frequently find themselves gradually overseeing two main groups: complementors outside the organization and moving to new positions within the company and a growing community that can benefit from an internal position within the business that is committed to supporting and running it;
  - **Hybrid Business Model Management:** In the final stage, businesses follow a hybrid business model and reallocate revenue streams at the cost of the other to maximize and achieve total value production rather than concentrate on one — the service or platform.

The three main transformative technologies which pushed platform drive are cloud, social, and mobile. The cloud makes it easy for anyone to create content for a wide, global audience. Social networks connect people from all over the world and sustain their online identity. Mobile enables connection to this global infrastructure anytime, anywhere. According to Bonchek and Choudary (2013) the result is a globally accessible network of entrepreneurs, workers, and consumers who are available to create businesses, contribute content, and purchase goods and services.

While the concept of network companies may be easy, the consequences are monumental for traditional businesses. Nonetheless, it is doubtful whether the classic company of the 20th century, whose competitive advantage and chief duties are to minimize transaction costs and arbitrate shortcomings in data, will survive. Platforms, as they claim, deliver faster growth, better return on capital, and larger profit margins.'

We may remember, for example, Nokia, the Finnish mobile phone company, or Research in Motion, BlackBerry's Canadian maker, who bestrode the corporate world ten years ago. All firms are intelligent, wealthy, state-of-the-art engineering firms marketing extremely popular goods. Nevertheless, both Apple's iOS operating system and Google's Android have killed them. Nokia and BlackBerry have produced better hardware than Apple's iPhone, there is little doubt. But the traditional mobile phone market was

updated by the App Store, which included 1.5 m apps and accounted for 100bn downloads by the end of 2015 (Thornhill, 2016).

Impact of Digitalization on Strategy

Everyone needs a strategy to act effectively: military commanders, team leaders, athletes or politicians. The same happens in an organization whose goal is to survive in today's environment by building a continuous competitive advantage. This is what a properly formulated strategy allows.

Particularly noteworthy is the aspect related to the digitization of economies. They often create a different world of values and sources of these values for the organization. To meet this, organizations and entire sectors are often forced to take action called digital transformation. Digitization is becoming a major factor in innovation and change in most sectors. Internet of things, cloud-based applications, big data, automation, and multi-channel distribution models are key drivers for the digital economy (Pieriegud, 2016).

Thanks to the development of information and information technologies, enterprises are able to collect and analyze information on customer behavior, analyze current sales in real-time, build models of current trends based on Big Data and forecast inventory. This makes an increasing number of people online 24 hours a day, seven days a week, using online communication channels and social media almost all of the time which means a completely new view on business strategies in running a business (Bajdak, 2016).

Digitalization impacts industries in different sectors. The effect is unique in each situation, which makes it important for businesses to have a good understanding and understanding of what they are facing and how digitization can affect their business: what resources can be exploited and what challenges must be faced (Dawson, Hirt & Scanlan, 2016).

The digitalization (i.e. the method of transforming analog data into digital data sets) is defined as the utilization of electronic resources. Digital transformation is then described as the mechanism used for system-level reconstruction of economies, organizations, and society (Brennen & Kreiss, 2016). This massive change in the market presented both huge risks but also opportunities - some companies failed while others succeeded.

In the following, we introduce two companies, which faced the challenges of this digital era very well and achieved outstanding results because of their change of strategy. These two companies are a shoe retailer CCC and a pizza delivery company, Domino's.

METHODOLOGY

In our research, we chose two companies that took the challenges of the digitalization and turned them against their favor. These companies are the shoe retailer CCC and the pizza delivery Domino's. Both of these companies were already established and fairly successful even before the era of digitalization but were facing enormous obstacles because of these changes. Additionally, this chapter also present good practices - success stories of platform business models and present two cases Airnb and Uber.

When one thinks about the digital markets or the transformations which digitalization brings no one usually thinks about basic companies that sell simple products. Most of the people imagine high-tech companies working with VR, AI and other abstract concepts and advanced technologies which are hard to imagine not even to understand. This was one of the reasons why we chose these companies - we

wanted to show that simple things like shoes and pizza can be sold differently when adapting to the market's needs. And what does the market need? Everything to be on their arms-reach, as fast as possible. Convenience and impatience are the keys to modern customers.

The aim of our chapter is to analyze and describe in-depth how the chosen companies changed their business based on the needs of the digital market and how they became leaders in innovations.

We use qualitative approaches when writing this chapter. We collected information about the companies from various sources - online journals, databases, publications, financial data of the companies, etc. -, processed them, analyzed and compared them not just to each other but to our theoretical framework as well.

CASE STUDIES

CCC Case Study

Background

CCC is currently the largest retail footwear company in Central Europe and the largest footwear manufacturer in Europe. Its structure includes 1219 showrooms in 23 countries: own and based on the franchise. 90% of the total sales value comes from footwear, while the remaining 10% are handbags and other accessories. Main the company's market is the Polish market on which the organization has 439 stores, generating 35% of the entire Capital Group's sales (CCC.eu, 2019).

Evolution and Remarks

The footwear market in Poland is increasing. The market reached the value of PLN 10.4 billion in 2016, in which CCC S.A. takes the first position with a 15.4% share. It owes it an advantage built through investment in advertising and intensive development of the sales network that uses it the same opinion of the brand offering good quality footwear at an affordable price. It is an attractive alternative to the more expensive western ones and domestic brands. Group is also a significant beneficiary of the "Family 500 Plus" program introduced by the Polish government. Thanks to subsidies, demand increased, including for groceries, household appliances, clothing, and footwear. For example, the company in 2016 in Poland recorded a 17.46% increase in revenues in Poland with the year 2015 (Borkowski 2017).

The beginnings of the CCC S.A. group's operations date back to the first half of the 1990s. The first significant digitization was the construction of a fully computerized, modern warehouse base, digitization of the company's management activities in the new headquarters, and creating an establishment CCC Factory, which built and launched footwear production in the neighboring area in 2001. Thanks to this, the company was able to transfer part of the process production inside the organization, reducing costs (by not paying the margin imposed by an external supplier), maintaining technological secrecy, maximizing reliability and continuity of deliveries, and minimizing the costs associated with the transport of finished products. One of the most important advantages was the ability to increase the global potential of the company by fully computerizing distribution processes.

CCC' Digitalization Strategy

In the years 2004–2006 the company was invested more in digitalization. This enabled the development of the sales planning process. CCC was able to prepare statements and reports on the stocking and profitability of individual departments, via an IT system that allows data collection, e.g. revenue, number of transactions, number of store entries, indicators (number of items per receipt, an average value of receipt), margin. Thanks to the data, the management was able to analyze the situation of the company on an ongoing basis, including individual showrooms. The developed IT system also supported forecasting and undoubtedly constituted a strong point of the Capital Group (CCC quarter reports).

An example of forecasting is the sales planning process for a showroom. Shops receive the amount of plans (budgets) to perform for a given month. They are created based on the adopted algorithm. The amount of the plan the store receives is divided into individual days of the month according to the schedule from the previous year (seasonality, holidays, etc.). Thanks to the historical and current analysis of all sales revenues, CCC is able to better understand the needs and preferences of its clients.

In the following years, the company's development in Poland and the opening of new stores every year meant that the Polish market became saturated, which caused the CCC group's pace of development to slow down. Therefore, the company decided to expand to foreign markets. In December 2011, the largest investment in the company's history was completed - the Logistics Center located in Polkowice. This modern and fully automated computerized warehouse was the largest of its kind in Central Europe. This investment with a modern sorting system, combined with further investment in modern IT systems has contributed to the development of key logistics competences (CCC financial report 2011).

In 2014, the logistics center in Polkowice was expanded. Thanks to the investments made, the Group was able to send up to one million pairs of footwear per day to stores located in 15 countries, eliminating the cost of storage, which it would have to do using external warehouses. It also made the company a global enterprise, which brought further strategic challenges.

Changing trends on the retail market, lifestyle changes, technological progress, and development of the e-commerce market have changed the needs and behavior of customers. Over the past few years, CCC has used the Internet as a source of contact with its clients by sending newsletters to the email of interested persons. The group actively built its presence in social media, where it informed about new promotions and marketing campaigns. The Facebook CCC Shoes & Bags fan page reached 645,000 likes (as of 11.11.2019). The preferences regarding the form of shopping have also changed, which made the electronic distribution channel more important. This was the reason why in 2015 the CCC Group decided to buy shares in ebouwie.pl - a company operating on the Polish market for over 20 years, being one of the largest stores in Poland specializing in the sale of footwear and accessories using electronic channels. At the same time, it eliminated potential competition. By achieving, among other things, an advantage derived from economies of scale, CCC has successfully raised entry barriers, minimizing the threat from potential new competitors. Thanks to this, CCC has become a Polish leader in online footwear sales (report on the operations of CCC group, 2016).

DOMINO'S CASE STUDY

Background, Evolution and Remarks

Domino's is the biggest pizza company in the world based on global retail sales, with more than 15,900 stores in over 85 markets around the world. Founded in 1960 in Ypsilanti, Michigan, their origins are in easy pizza delivery, while a significant amount of the revenues do come from carryout customers. In 1965 they became "Domino's Pizza" and in 1967 they opened their first franchise store in the U.S. Internationalization has begun in 1983 when the first stores were open outside of the U.S. in Canada and Australia. While Domino's Pizza is a highly recognized global brand, through its large global network of franchise owners and (390 in the U.S.), they also concentrate on servicing the local neighborhoods. On average, over 3 million pizzas are delivered every day by the company and its franchisees in our global system (Domino's Pizza, 2019).

Domino's Pizza Digitalization Strategy

When one is thinking about digital innovations and innovations in general, pizza is for sure not the first thing that comes to their minds. But you don't need to be an IT programmer or leading a high-tech company to make a change. Domino's Pizza is the best example of that.

Even though looking at Domino's annual reports and numbers we see that they are successful, they hit rock bottom in the mid 00's. They were perceived as a low-quality fast food restaurant and their sales numbers reflected the people's opinions. They realized that they need to rebrand the company so they made some changes, starting with the operations - inventing a new recipe, improved the quality of the ingredients and the service (Wong, 2016). But they didn't stop with the basic methods, they didn't just want to be back in the game, they wanted to beat the competitors. They became a digital transformation that has to lead them to become more successful than ever.

Firstly, they needed to realize the business they were doing. It was not only making pizzas but also delivering them. And because of that, they needed to implement some technological changes. Now, almost half of the company's employees in its headquarters work on software and analytics. All that technology has changed how customers order (they have various options, they can use the Domino's app, their website or directly via twitter, or even by texting an emoji); how they monitor the status of their order; and how Domino's manages its operations (Taylor, 2016).

Going online was the first step in the process. Domino's sold its first pizza online in 1999. It launched an iPhone app in 2010, and a year later also for Android and iPad and then a Windows app in 2012 (Google, n.d.). By building a successful, strong iOS mobile client base, with a powerfully responsive experience, the company's business model fundamentally shifted. Mobile orders took over those traditional ones and contributed to half of their digital sales, with digital sales monopolizing the majority of sales (Wong, 2016).

The next important phase of the digitalization process was "surprise and delight". After the success of the mobile apps, the company implemented a strategy of allowing customers to order on their favorite devices, anyway they want, anywhere, at any time. This was the start of their innovative ordering platform called Domino's AnyWare. Now, customers can order through Apple TV, Google Home, Amazon Echo, Ford Sync, SMS, Samsung Smart TVs, smartwatches, an in-app voice assistant, and other emerging platforms, as well as via Tweets, Slack, and Facebook messenger. The company also created an app

called Domino's Zero Click, where customers simply open the app and, after a 10-second countdown, their Easy Order (an order previously set up on their profiles) will automatically be placed. Zero clicks needed (Domino's, 2019). Domino's Anyware has been nominated for the 8th Shorty Award in the category of the best integrated campaign and was widely recognized and appreciated by Forbes, The Washington Post, Entrepreneur's Magazine, CNN, USA Today and many others.

The company introduced a tracker in 2008, with what the customers could follow the process of their orders. Notifications are sent out when there is progress made and this makes the simple task of ordering pizza a fun experience. By the end of 2019, Domino's will add GPS tracking to their portfolio, starting in the U.S. market (Lucas, 2019).

The diversity of its platform solution also enabled the company to attract top talent to work on product development. The other side of the phase involved implementing a loyalty program in place to reward the best customers and therefore keep them away from the competition (Wong, 2016).

Results of the Innovation Process

Digital ordering now makes up 60% of Domino's business. They are harnessing ordering data from 14,000 stores to improve the customer experience (Cisco, 2017). In 2018, the company's global retail sales represented 13,5 mil. USD, which, in comparison to 2008's 5,5 mil. USD a huge jump (Peltz, 2017). The price of one Domino's share is currently at 280,76 USD (as to the 11th of November, 2019), a huge increase compared to it's all-time low of 3,03 USD in 2008 (Domino's Pizza Group Plc (DOM), 2019). Based on all this information we can state that Domino's identified the problem they were having and took the risk of redesigning their business models - all very successfully.

Similarities and Differences Between the Two Case Studies

These case studies brings some remarks about digitalization in business. There are some similarities and differences between the two companies, which we will describe in the following paragraphs.

Talking about similarities, we can see that both companies used digitalization to analyze and plan their next steps in the future. Both companies can understand what is driving bottom-line results and sales. CCC used this to improve the sales planning process, prepare statements and report on the stocking and profitability of individual departments. Additionally, the developed IT system supported forecasting and undoubtedly constituted a strong point of the Capital group. For Dominos, this digital treatment had a different meaning. They were supported by an outstanding analytic team and were able to employ A/B testing against every new tool and process they implement. Digital products, especially based on order, provide them with massive amounts of data. They can offset costs and proved value. Due to the fact that they can get more budget and finding to scale the areas that were working.

In the other hand, for CCC digitalization means to improve their production, offices, and stores. Due to, digitalization of the company has a new fully computerized, modern warehouse base, digitalised company management in the new headquarters and an establishment CCC factory. That means that the company was able to transfer part of the process production inside the organization, reducing costs, maximizing reliability and continuity of delivery, minimizing the costs associated with the transport of finished products. Talking about Dominos, digitalization means more focusing on clients and their convenience. What is more, this point includes a whole process of ordering and delivery. The company decided to be more mobile and create many opportunities to finalised customers order process. They

offer various options to order dominos app, website, twitter orders and new technology connected with pizza emoji. As we can see, it's a different reason to a digitalized company than for CCC, where the main point is production. The most important thing for this company was not only to produce pizza but also to focus on customers' orders and delivery.

Table 1. Benefits of digitalization

Digital Economy Innovation	Effects on the Management	Influence on Company's Strategy
Development of the technology	IT systems supporting the basic functions of the enterprise (CCC)	Building a competitive advantage on the domestic and foreign market based on own resources and know-how (CCC)
	IT and digitalization changing the core of the company's structure (Domino's)	Thinking about the company as an e-commerce business, adapting to the new trends and adjusting the services offered according to them (Domino's)
Big Data	Data collection, analysis and correct conclusions due to previously designed IT systems (CCC)	Expansion of the competence and resource as a base for future intensive foreign expansion (CCC)
	Gaining and analysing data mainly from the company's newly created website and app, their loyalty program (Domino's)	Gaining a bigger picture, discovering the problems and critical areas, targeting marketing and product placement more efficiently using the customer's data (Domino')
Process automation	Minimization of human work in the production and distribution process; moving away from manual processes towards mixed or fully automated processes, where the role of man is limited to control activities (CCC)	Building a competitive advantage based on economies of scale and striving to become a cost leader (CCC)
	Automatization and digitalization of the operational processes (Domino's)	Speeding up the processes, being more efficient and effective (Domino's)
Customer preferences changes	Online sales channel support (CCC)	Development of a new online sales channel in order to increase the share on the domestic market (CCC)
	From telecommunications migrating to online platforms (Domino's)	Creating a user-friendly website and app, making the process of ordering the product as easy as it can be with various tools added constantly (Domino's)
Popularization of internet usage	Creating new channels of communication with the client and brand promotion (CCC)	A new model of brand communication using the Internet, including social media (CCC)
	New channels of communication, focus on the online world, massive social media usage (Domino's)	New opportunities, new brand promotion model introduced, the company is available and reachable on most of the social media and other internet-based platforms available, opportunity to get competitive advantage and beat the competitors by being up-to-date, user-friendly and very convenient (Domino's)

During the years both companies had to face with entering to next generations of the industry. Nowadays we are entering the era 4.0 (Gracel and Rodak, 2019). The table 1 below shows how CCC and Domino's managed digital innovations and how these companies involved them in their strategies. It also summarizes our work and gives a framework of how the chosen companies benefited from the opportunities of digitalization.

Good Practices - Success Stories of Platform Business Models

As we described in the previous sections, the platform phenomenon is undeniable. But there are some exceptional companies, which rise higher than their competitors and are often mentioned in researches or publications. These businesses are Airbnb and Uber – both extremely successful platform businesses.

Airbnb

Airnb which logged its 500 millionth customer booking in March 2019 - serves as an example of how today's networked platforms, without appearing to do so, compete with traditional industry behemoths. Platforms connect producers and consumers – in the case of Airbnb hosts and travelers – and facilitate interaction and exchange between them. Without the overheads for property and hotel staff, Airbnb has expanded rapidly into related services, making it more difficult for incumbents to survive. It started off with some people offering a spare room, but quickly erupted and became the for that we now know it. Airbnb has no assets of a typical hotel chain. The business can go into new aspects of the consumer value chain without putting a lot of money in front of it by the design of its product. And that's why it's being parallel facilities too soon. Following the first years' success, it is now possible to book not just stays, but experiences as well, widening the portfolio of the platform even more. Through introducing amenities, even in your own area, Airbnb is really aiming to interact with customers more often. So, you might use Airbnb instead of traveling to line up weekend activities by matching up with a host in that area. They allow like-minded people to come together (Kost, 2019).

Uber

Another great example of a successful platform business is Uber. The way we think of personal transportation has created a change. It is present in over 600 cities, has 1 million rides on average a day, over 50 million users, 7 million registered drivers, and a business value of over $70 billion (2017). The key to their success is in their exceptional business model. They solve the problems of many. Traveling from point A to point B without having a vehicle is a global "job to be done". In addition to that, with the changing way of life, people are more comfortable, they want everything to be done quickly and easily - Uber helps to overcome the hassle of ordering taxi transportation. The communication barriers (foreign language), the lack of information, troubles with payments, trust issues are just a few problems to be mentioned that often occur in a traditional taxi service. Uber offered an alternative, easy and transparent service which was much needed, and therefore it became so successful so quickly. And riders are just one segment of their customers. They connect two segments as they are a multi-sided platform. They also solve the other segment's problems, car owners who want driving to make extra money. Uber makes it easy to do that. The other important point to mention is the technical side of the business. It is easy to duplicate the Uber app and the technical platform behind it to new (geographic) markets. For Uber, most of the time, no, or very little changes are required (in some countries, as in India, you can also pay cash). Combine this information-based service with a global digital network, the IOS and Android app stores, and you have a simple way to unlock the product. Uber is also creating a fan community. There are two important reasons why this helps them to create a business model that is exponential. One, because they are a love brand and people are very enthusiastic about the service, they get free marketing because of the positive word of mouth. They need to invest a little-to-none to marketing, because of their position

people naturally talk about them and spread the word, generating new customers. Two, by giving feedback and reviews, consumers (riders and drivers) are significant contributors to the platform's performance and output. Uber is ' outsourcing ' to its customers the platform's important element. It's very scalable, it's also available (Mensing, 2019).

CONCLUDING REMARKS

The digital economy is a rapidly growing field of business. Companies operating in this space consciously or unconsciously create new concepts and business models that develop the digital market. For now, the most popular concepts of digital business models are Free, Freemium, E-commerce, Subscription-based, On-demand, Marketplace.

The developed digital economy is beneficial for already operating companies on the market. It gives many new possibilities to enlarge the range of operation and opens new channels of reaching suppliers, invoices and customers. It is also very important for companies entering the market, it gives the opportunity for an easier start and faster development. Also, the digital economy is giving opportunities to create entirely new companies with unique digital products or services, for instance, data housewares, chatbot suppliers etc. On the other hand, the digital economy forces several entrepreneurs as CCC and Domino's to digitalize whole or some parts of their business to stay top-notch for customers. This brings many changes in the management of the company, team, and competencies that are required from employees. And it forces many managers to dynamically adapt strategies to rapidly changing market changes which are a very big challenge.

The digital economy is also an important element for customers. As a result, they have easier access to a wide range of products and services that they can use whenever they need it. When a customer needs transportation from the airport to his apartment he is ordering Uber, when he/she want to book an apartment for vacation he/she is using Airbnb or Booking.com, when some groceries are missing in the fridge he/she is talking to Amazon Alexa and ordering food online just by using voice. It shows how many classic markets have been replaced by their digital equivalents. The key is to be open to the rapid changes and adapt in the best possible way - either if we already have a functioning business or planning to start one otherwise the company can collapse faster than we think.

REFERENCES

Allen, J. (2019). *Account Suspended*. Retrieved 22 October 2019, from https://www.learndigitalentrepreneurship.com/2019/02/16/what-is-digital-entrepreneurship/

Bajdak, A. (2013). Automatyzacja komunikacji marketingowej w Internecie. *Handel Wewnętrzny, 3*, 31-32.

Bonchek, M., & Choudary, S. (2013). *Three Elements of a Successful Platform Strategy*. Retrieved 19 October 2019, from https://hbr.org/2013/01/three-elements-of-a-successful-platform

Borkowski, K. (2017). *Współczesne determinanty zarządzania operacyjnego w kontekście kształtowania strategii przedsiębiorstwa*. Academic Press.

Brem, A., & Giones, F. (2017). Digital Technology Entrepreneurship: A Definition and Research Agenda. *Technology Innovation Management Review*, *7*(5), 44–51. doi:10.22215/timreview/1076

Brennen, J. S., & Kreiss, D. (2016). Digitalization. In K. B. Jensen, E. W. Rothenbuhler, J. D. Pooley, & R. T. Craig (Eds.), *The International Encyclopedia of Communication Theory and Philosophy* (pp. 556–566). Wiley-Blackwell. doi:10.1002/9781118766804.wbiect111

CCC Financial Report 201. (n.d.). Retrieved 11 November 2019, from https://firma.ccc.eu/pl/22,raporty.html

CCC Group Operations Report. (n.d.). Retrieved 11 November 2019, from https://firma.ccc.eu/pl/22,raporty.html

CCC Quarter Reports Years 2004 – 2006. (n.d.). Retrieved 11 November 2019, from https://firma.ccc.eu/pl/27,prezentacje.html

Chaffey, D., Edmundson-Bird, D., & Hemphill, T. (2019). *Digital business and e-commerce management* (7th ed.). Pearson.

Choudary, S. (n.d.a). *A Platform Thinking approach to building a business.* Retrieved 19 October 2019, from http://platformed.info/a-platform-thinking-approach-business-engine-scale/

Choudary, S. (n.d.b). *The Lepore-Christensen Debate: A repeatable pattern for Platforms and Disruptive Innovation*. Retrieved 19 October 2019, from http://platformed.info/lepore-christensen-disruptive-innovation-airbnb/

Christensen, J. (2015). *Digital business in the digital age*. Books on Demand.

Cisco. (2017). *Domino's Delivers Explosive Growth with Cisco-Driven Digital Transformation*. Retrieved 11 November 2019, from https://www.cisco.com/c/dam/en_us/about/case-studies-customer-success-stories/dominos-case-study.pdf

Coupey, E. (2016). *Digital business*. Routledge. doi:10.4324/9781315506418

Cuofano, G. (2019). *Digital Business Models Map: The Most Popular Digital Business Model Types - FourWeekMBA*. Retrieved 21 October 2019, from https://fourweekmba.com/digital-business-models/

Dawson, A., Hirt, M., & Scanlan, J. (2016). *The economic essentials of digital strategy*. Retrieved 12 November 2019, from https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-economic-essentials-of-digital-strategy

Domino's. (2019). *Domino's Anyware*. Retrieved 11 November 2019, from https://anyware.dominos.com/

Domino's Pizza. (2019). *2018 Annual report*. Retrieved from http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_DPZ_2018.pdf

Domino's Pizza Group (DOM). (2019). *Ordinary shares. Google finance*. Retrieved 11 November 2019 from https://www.hl.co.uk/shares/shares-search-results/d/dominos-pizza-group-plc-ordinary

Evans, D., & Schmalensee, R. (2016). *What Platforms Do Differently than Traditional Businesses.* Retrieved 19 October 2019, from https://hbr.org/2016/05/what-platforms-do-differently-than-traditional-businesses

Furr, N. (2016). *Transitioning Your Company from Product to Platform*. Retrieved 19 October 2019, from https://hbr.org/2016/04/transitioning-your-company-from-product-to-platform

Giones, F., & Brem, A. (2017). Digital Technology Entrepreneurship: A Definition and Research Agenda. *Technology Innovation Management Review*, *7*(5), 44–51. doi:10.22215/timreview/1076

Gracel, J., & Rodak, A. (n.d.). *Transformacja do przemysłu 4.0.* Retrieved 21 October 2019, from https://www.hbrp.pl/b/transformacja-do-przemyslu-40/PiYIsMRNo?NO_COOKIES=1

Gregory, A. (2019). *Subscription Business Model Explained*. Retrieved 21 October 2019, from https://www.thebalancesmb.com/how-a-subscription-business-model-works-4159768

Hill, M. W. (1999). *The Impact of Information on Society*. Gower.

Kost, D. (2019). *Why Airbnb Isn't Your Typical Technology Successful Story*. Retrieved 19 October 2019, from https://www.forbes.com/sites/hbsworkingknowledge/2019/08/05/why-airbnb-isnt-your-typical-technology-successful-story/#4ed249085638

Legner, C., Eymann, T., Hess, T., Matt, C., Böhmann, T., Drews, P., Mädche, A., Urbach, N., & Ahlemann, F. (2017). Digitalization: Opportunity and Challenge for the Business and Information Systems Engineering Community. *Business & Information Systems Engineering*, *59*(4), 301–308. doi:10.100712599-017-0484-2

Lorenz, T. (2015). *Soon you can order a pizza by tweeting the pizza emoji at Domino's*. Retrieved 11 November 2019, from https://www.businessinsider.com/dominos-emoji-pizza-order-2015-5

Lucas, A. (2019). *Domino's will launch GPS tracking for delivery orders by end of 2019.* Retrieved 11 November 2019, from https://www.cnbc.com/2019/07/16/dominos-will-launch-gps-tracking-for-delivery-orders-by-end-of-2019.html?__source=twitter%7Cmain

Margaretta, J. (2002). Why Business Models Matter. *Harvard Business Review*, *80*(5), 86–92. PMID:12024761

Mensing, G. (2019). *Uber - Business Models Inc*. Retrieved 20 October 2019, from https://www.businessmodelsinc.com/exponential-business-model/uber/

Mullins, J. (n.d.). *How Companies Like Airbnb Use Matchmaker Model to Grow Their Business*. Retrieved 19 October 2019, from https://blog.growthinstitute.com/funding/matchmaker-models

O'Brien, C. (n.d.). *What are the Benefits of Digital Transformation?* Retrieved 20 October 2019, from https://digitalmarketinginstitute.com/en-eu/blog/13-03-18-what-are-the-benefits-of-digital-transformation

OECD. (2015). *OECD Digital Economy Outlook 2015*. doi:10.1787/9789264232440-en

Peltz, J. (2017). *Domino's Pizza stock is up 5,000% since 2008. Here's why*. Retrieved 11 November 2019, from https://www.latimes.com/business/la-fi-agenda-dominos-20170515-story.html

Pieriegud, J. (2016). Cyfryzacja gospodarki i społeczeństwa – wymiar globalny, europejski i krajowy. In *Cyfryzacja Gospodarki i Społeczeństwa. Szanse i wyzwania dla sektorów infrastrukturalnych*. Publikacja Europejskiego Kongresu Finansowego.

Richter, C., Kraus, S., Brem, A., Durst, S., & Giselbrecht, C. (2017). Digital entrepreneurship: Innovative business models for the sharing economy. *Creativity and Innovation Management*, *26*(3), 300–310. doi:10.1111/caim.12227

Tabrizi, B., Lam, E., & Irvin, V. (2019). *Digital Transformation Is Not About Technology*. Retrieved 22 October 2019, from https://hbr.org/2019/03/digital-transformation-is-not-about-technology

Taylor, B. (2016). *How Domino's Pizza Reinvented Itself.* Retrieved 11 November 2019, from https://hbr.org/2016/11/how-dominos-pizza-reinvented-itself

Thornhill, J. (2016). *Platform businesses may wipe out classic 20th century companies | Financial Times.* Retrieved 19 October 2019, from https://www.ft.com/content/67705108-580c-11e6-8d05-4eaa66292c32

UNCTAD. (2019). *Digital Economy Report 2019*. United Nations. Available on: https://unctad.org/en/PublicationsLibrary/der2019_overview_en.pdf

Webster, F. (1995). *Theories of the Information Society*. Routledge. doi:10.4324/9780203991367

Wong, K. (2016). *How Domino's Transformed Into An E-commerce Powerhouse Whose Product Is Pizza*. Retrieved 11 November 2019, from https://www.forbes.com/sites/kylewong/2018/01/26/how-dominos-transformed-into-an-ecommerce-powerhouse-whose-product-is-pizza/#748173507f76

Zhao, Y., von Delft, S., Morgan-Thomas, A., & Buck, T. (2019). The evolution of platform business models: Exploring competitive battles in the world of platforms. *Long Range Planning*, 101892. Advance online publication. doi:10.1016/j.lrp.2019.101892

ADDITIONAL READING

Carvalho, L. (2017). *Handbook of Research On Entrepreneurial Development and Innovation within Smart Cities*. IGI Global. doi:10.4018/978-1-5225-1978-2

Carvalho, L., Galina, S., & Sánchez-Hérnandez, M. I. (2019). An international perspective of the business incubators' perception about business model Canvas for start-ups. *Thunderbird International Business Review*, tie.22112. Advance online publication. doi:10.1002/tie.22112

Carvalho, L., & Isaías, P. (2018). *Handbook of Research on Entrepreneurship and Marketing for Global Reach in the Digital Economy*. IGI Global.

Isaías, P., & Carvalho, L. (2018). *User Innovation and the Phenomenon in the Digital Economy*. IGI Global.

KEY TERMS AND DEFINITIONS

Business Model: Explains how an organization creates, delivers, and captures value, in economic, social, cultural, or other contexts.

Digital Business Model: Use digitalization to create or develop new business models.

Digital Entrepreneurship: Describes how entrepreneurship will change in line with digital technology and digitalization.

Digitalization: Concerning to the use of digital technologies to change a business model and provide new revenue and value-producing opportunities.

Innovative Business Models: Use innovation based on new or improved products, process, marketing strategies or organizational approaches to create or develop a new business model.

Platform Business Model: Is a business model that creates value by facilitating exchanges between two or more interdependent groups, usually consumers and producers.

Technology: Is the creation, usage and knowledge of tools, techniques, crafts, systems, or methods of organization, to solve a problem or serve some purpose or end.

Chapter 2
Digital Economy and Cloud: Trends and Challenges for Healthcare Organizations

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ABSTRACT

This chapter aims to present the trends and challenges healthcare organizations will face as a result of the digital revolution. In particular, the healthcare industry needs to look for a new strategic focus, acquiring new specialties, and establishing new ways of working, defined in new business models in which cloud computing technology will be increasingly present. Understanding what cloud computing is is the first step to better understand the challenges and trends ahead.

INTRODUCTION

Many healthcare organizations, not only at the level of services, but also at the level of specialized suppliers in the sector, are not prepared for the technological challenges that are coming. The strategic vision of these organizations should be, firstly, to realize that adapting to the Digital Economy is important for the success of their business models and secondly, that it is imperative to innovate in the approach to the market and innovate in the diversification of products and services to offer, as well as in management processes, even if it means leaving the comfort zone. In order for these organizations to create new offers and better responses to services, it is necessary to put aside the idea of "we've always done it this way and that's how we got here".

In the book Hit Refresh, the CEO of Microsoft describes very well how his organization had to change the business focus in order to continue to be one of the main players in the market: "we needed to build deeper empathy for our customers and their unarticulated and unmet needs. It was time to hit refresh." (Nadella, 2017, pp. 29). In a very recent past, Microsoft had the need to create a deeper empathy with

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its customers, to be closer to their problems and to better understand them. A few years earlier, Drucker (1994) wrote about business models and stated that what had paralyzed IBM in the 1970s and 1980s was the (wrong) assumption by its managers that the industry was driven by hardware. In Drucker's opinion, an organization that wanted to be innovative and well succeed, could not be too focused on selling its "hardware" (that is, its traditional products and services) but should, instead, try to understand its customers in order to provide alternative solutions, more diversified and integrated with its customers' needs. And, if we add the opinion of Nadella (2017) to this thought, in which empathy generates innovation, all of this leads us to the conclusion that a company should be as close as possible to its customers, feeling their needs, problems, "pains" and ambitions, so you can execute an innovative and successful business model.

Understand the true path of a business, creating more and better relationships with its customers, is one of the main steps towards innovation. Organizations that are too focused on their traditional business models, can hardly change and focus on innovation. In an increasingly global and digital world, it is important for organizations to perform a "hit refresh" to their business models.

In this chapter, the authors will address, from a management perspective, not only the trends, but also the challenges related to cloud computing technology and its adoption by the entire ecosystem of organizations and companies operating in the healthcare sector. A qualitative methodology is used based on the documental analysis of healthcare reporting and information collected from several sources and is an important topic for entrepreneurs and other stakeholders concerned with these issues.

In this chapter the authors address the following subjects:

- **What is cloud computing?** What kind of novelty brings this emerging technology?
- **Service and Deployment Models for the Cloud:** Organizations in all business areas, including healthcare, that are willing to adopt cloud computing as part of their business model should understand the types of services and deployment models that most cloud providers supply;
- **Level of Cloud Adoption by Organizations:** Cloud computing is new for most organizations but there are some of them that are already investing in this type of infrastructures. Is it a trendy technology?
- **Challenges of Cloud Computing:** So that cloud computing could be a present technology in business, organizations need to understand the multiple challenges involving the use of cloud as a service;
- **Cloud Security and Privacy:** Of all challenges, security and privacy are fundamental to the healthcare sector;
- **Cloud Adoption and Trends in the Healthcare Industry:** Overloaded systems require higher availability of clinical diagnostics and the huge amount of data generated continues to increase exponentially. How will healthcare organizations manage those challenges? And how are they implementing proper cloud strategies?
- **The Cloud applied on the combat to COVID19 Pandemic:** The importance of cloud computing and technological industry helping healthcare organizations in the facing of COVID19 pandemic.

WHAT IS CLOUD COMPUTING?

Understanding what is cloud computing is the first step to better understand the challenges and trends ahead.

The most formal definition of cloud computing,, is described by the National Institute of Standards & Technology (NIST), a United States Government entity, where it defines that "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance, 2011, pp.2). The NIST definition for cloud computing remains, until today, the main reference for the service models and implementation of this particular technology.

Sosinsky (2011), in a more abstract way, refers that cloud computing is associated with a set of applications and services that run on a distributed network using virtualized resources and accessed by common Internet protocols and network standards.

In a simpler way, and according to Briggs and Kassner (2017), the "cloud" physically consists of millions of servers distributed by several data centers very large and strategically located around the world.

The proliferation of this technology in recent years has led many companies to include cloud computing in their business model. It is, therefore, clear to say that cloud computing represents a huge opportunity for organizations and their businesses and activities. In the view of IBM, described by Anderson (IBM Corporation, 2015b), with the use of cloud computing any company, or department, can focus on its main competencies, instead of worrying about the operation of some technologies.

Smaller organizations now have the opportunity to access technologies and services in the cloud that, until recently, were only available to large companies, since only these had the investment capacity and the knowledge in this technology. The pay-for-use or pay-as-you-go payment model, which is quite standardized in the digital economy, contributed to the growing adhesion of cloud computing. A payment based on consumption, similar to what already exists in energy or water services, allowed a more rational – and scalable – management of technology costs by organizations and reduce the total cost of ownership.

According to Gartner Inc. (2019) - a world leader in information technology (IT) research and consultancy - cloud computing is a disruptive phenomenon, with the potential to make organizations more competitive than ever. Nevertheless, and in the view of this consulting firm, although this technology is already a platform widely adopted by digitally based businesses, there are still many companies that are unaware of this technology, or do not yet have a fully defined and documented strategy in this subject. In Gartner's estimates, about less than a third of companies worldwide implement this strategy. In the topics ahead, the status of cloud computing adoption in organizations will be analysed more in detail.

SERVICE AND DEPLOYMENT MODELS FOR THE CLOUD

In the definition of cloud computing, from the National Institute of Standards & Technology (Mell & Grance, 2011), it is possible to find a unifying vision of the five essential characteristics of cloud services:

- **On-Demand Self-Service:** A consumer can unilaterally use computing resources, such as server time and network storage, as needed automatically without requiring human interaction with their service providers;
- **Broad Network Access:** The resources are available on the network and are accessed through standard mechanisms that promote the use of heterogeneous thin or thick client platforms, such as mobile phones, tablets, notebooks and workstations;
- **Resource Pooling:** The supplier's computing resources are grouped to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to the consumer's needs. Examples of resources include storage, processing, memory and network bandwidth;
- **Rapid Elasticity:** Resources can be provisioned and made available in an elastic manner, in some cases automatically, for rapid scalability, according to demand. For the consumer, the resources available for provisioning generally seem unlimited and can be appropriated in any quantity and at any time;
- **Measured Service:** Cloud systems automatically control and optimize the use of resources by taking advantage of a measurement resource at some level of abstraction appropriate to the type of service (for example, storage, processing, bandwidth and active user accounts).

Mell & Grance (2011) identified three service models available to consumers and which, even today, are a global standard for cloud computing:

- **Infrastructure-as-a-Service (IaaS):** In this model, the capacity that is offered to the consumer is processing, storage, networks and other fundamental computing resources, in which the consumer is able to implement and run any type of software, from operating systems to software applications. The consumer does not manage, or control, the underlying cloud infrastructure, but has control over operating systems, storage, deployed applications and, possibly, limited control over selected network components, such as firewalls, for example;
- **Platform-as-a-Service (PaaS):** In this model, the resource provided to the consumer is the implementation of applications created or purchased by the consumer in the cloud infrastructure created, using programming languages and tools supported by the supplier. The consumer does not manage, or control, the underlying cloud infrastructure, including network, servers, operating systems or storage, but has control over the applications deployed and possibly over the settings of the application hosting environment;
- **Software-as-a-Service (SaaS):** The capability that is offered to the consumer in this model is to use the vendor's applications running on a cloud infrastructure. Applications are accessed from multiple client devices through a thin client interface, such as an internet browser (for example, a webmail application). The consumer does not manage, or control, the underlying cloud infrastructure, including network, servers, operating systems, storage or even individual application resources, with the possible exception of limited and specific application user configurations.

In addition to the service models described, four deployment models for cloud computing technology can be categorized, as the assumptions defined by the National Institute of Standards & Technology (Mell & Grance, 2011), such as:

- **Public Cloud:** The cloud infrastructure is provisioned for open use by the general public;
- **Private Cloud:** The cloud infrastructure is provisioned for the exclusive use and needs of a single organization that includes multiple consumers;
- **Community Cloud:** The cloud infrastructure is provisioned for the exclusive use of a specific consumer community of organizations that share concerns;
- **Hybrid Cloud:** The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community or public).

In a private cloud model, the infrastructure can be owned, managed and operated by the organization, by third parties or by some combination between them, and can still exist inside or outside the facilities. Some healthcare systems, banking and financial services are usually hosted on private clouds. The community cloud model is also identical in this sense, where one or more organizations can own and managed within the community this type of cloud infrastructure. Some examples can be found in universities or research institutions. In the public cloud model, organizations that consume this type of cloud, host their technological infrastructures outside their facilities. In the case of the hybrid cloud model, the entities involved remain as exclusive, but united by proprietary technology, allowing the portability of data and applications.

Leading cloud computing service providers, such as Microsoft Azure, Amazon AWS, IBM Cloud or Google, combine several service models with deployment models, thereby making multiple ways of providing cloud computing to organizations.

LEVEL OF CLOUD ADOPTION BY ORGANIZATIONS

In recent years, the evolution of cloud computing in terms technology, as well as the improvements in the transparency of commercial service models, has allowed a significant increase in the proliferation of this technology. According to the Forbes Technology Council (Forbes, 2017), the adoption of the cloud by the organizations is growing, as they become more and more aware of the benefits that this technology can bring, not only in terms of efficiency, but also in terms of profitability and reduction of operational costs.

A survey held by IDG (2018) concluded that in 2019, nine out of ten companies in the United States of America will have some part of their technological infrastructure, or applications, in the cloud. The same study also predicts that by 2021, the other companies will also have already migrated some of their technological resources to the cloud. IDG (2018) also estimates that, during 2020, the 52% of non-cloud technological environments, currently existing in the United States of America, will increase to 31%, with the Software-as-a-Service (SaaS) service model to become the preferred and most adopted by American companies. If this data is analysed as a growing trend worldwide, it is easily understood that in Europe the scenario is also of growth in the adoption of cloud-based technologies, although this growth is a little slower in most European countries than in the United States of America.

In 2012, the European Union, aware of this problem, published the document European Cloud Strategy, where it established a set of clear strategic lines for the adoption of cloud computing by private and public organizations. According to the European Commission, these cloud computing initiatives are based on the strategy revealed by the Commission in 2012 to unlock the potential of cloud computing in Europe.

Also, according to this document, "the strategy outlined actions to deliver a net gain of 2.5 million new European jobs, and an annual boost of €160 billion to the European Union GDP (around 1%), by 2020".

For a more effective implementation of this strategy, three key actions were established with the purpose to speed up cloud adoption by companies and also to help cloud providers to improve their technology and services. The three key actions are:

1. Safe and fair contract terms and conditions, adopting the best practices regarding the contractual conditions of cloud services;
2. Technical standards simplification, in order to simplify and speed up the interoperability, portability and reversibility of cloud services;
3. Establishing a European cloud partnership, bringing private and public sector organizations to work together on purchasing requirements for cloud computing services, in a more open and transparent way.

From the point of view of the European Commission, these three key actions will increase the confidence of potential customers for cloud services – speed up their acceptance and adoption - as well as improving regulations that cloud providers must implement and follow. This matter has taken on such importance in the majority of the European Union members that, in 2014, the European Commission reinforced these same strategic lines, defining several follow-up and support actions and including them as a priority area for research, development and innovation in the first Horizon 2020 program. According to data from Eurostat (2018), 26% of the organizations, within the European Union, used cloud computing services, mostly for embedded email services and electronic document storage, of which 55% used advanced cloud services, such as financial, accounting or CRM applications. This study also concluded that, in 2018, the use of public clouds was slightly higher than the use of private clouds, 18% and 11%, respectively.

Figure 1 illustrates the use of cloud computing services in European Union companies, comparing the years 2014 and 2018.

CHALLENGES OF CLOUD COMPUTING

As much as cloud computing technology has evolved in recent years, due to the technology evolution or due to the improvement and simplification of service models by providers, there are still many challenges that prevent this technology from being adopted quickly or be easily understood by organizations as a fundamental part of their business strategies. If, on the one hand, it appears that cloud service providers "promise" agility, flexibility, scalability, innovation, security and economic advantages for organizations, on the other hand, it turns out that there are still many challenges for this technology to overcome, including cultural barriers, lack of control of infrastructure, reliability or dependence on the Internet, security and privacy, just to list those that are most relevant for cloud computing adoption strategies by organizations.

According to Mather, Kumaraswamy and Latif (2009), although the benefits of cloud computing are easy to understand, the more difficult and critical will be the perception of customers of the existing technological architectures in organizations at the level of cloud deployment. On the other hand, Sharmila

et al. (2020) listed the main limitations of cloud computing that are the *"cost of the massive amount of data storage, control over the distributed environment, security, privacy, and transfer"*.

Figure 1. Use of cloud computing services in EU companies
Source: Eurostat (2018a)

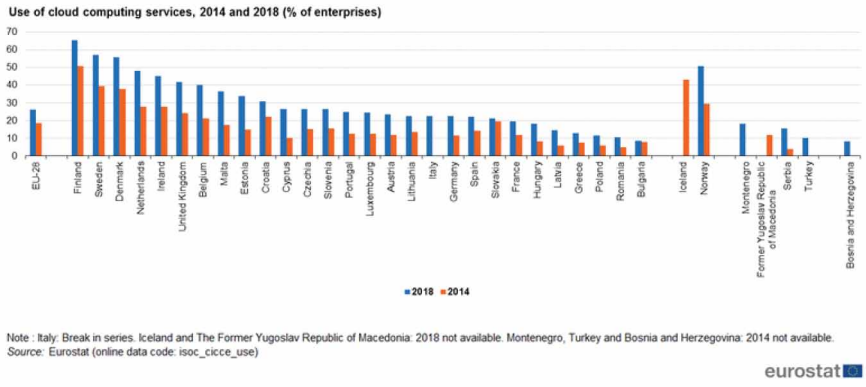


Table 1 shows how these authors relate traditional technological infrastructures with cloud infrastructures.

Table 1. Traditional technological infrastructures versus cloud infrastructures

Dedicated/Traditional IT Infrastructures	Cloud Infrastructures
High upfront IT investments.	Low upfront IT investments, pay-for-use model.
High cost of reliable IT infrastructure.	Reliability built into the cloud architecture.
High complexity of the IT environment.	Modular IT architecture environments.
Complex IT infrastrutures.	Non-existent IT infrastructures.

Source: Adapted from Mather, Kumaraswamy & Latif (2009)

In the opinion of Plummer, Vice President of Gartner and Gartner Fellow, taken from the document Cloud Strategy Leadership (Gartner Inc., 2017, pp. 7), "cloud computing represents one of the most misunderstood, yet valuable, innovations in current IT and business strategies". In the perspective of the consulting firm, for each scenario in cloud technologies implementation, it is important to evaluate the potential benefits, such as speed of implementation, cost reduction or the resolution of internal infrastructure capacity problems.

It is also important that potential risks and challenges are taken into account when adopting these technologies, such as, for example, the identification of dangers in the use of cloud services - such as security and data protection - or the potential difficulties that may be experienced in the migration/ integration of cloud services in the organizations' environment.

From the perspective of the Forbes Technology Council (Forbes, 2017), there are still some relevant challenges for organizations, with regard to the change from their local technological infrastructures to infrastructures in the cloud, namely:

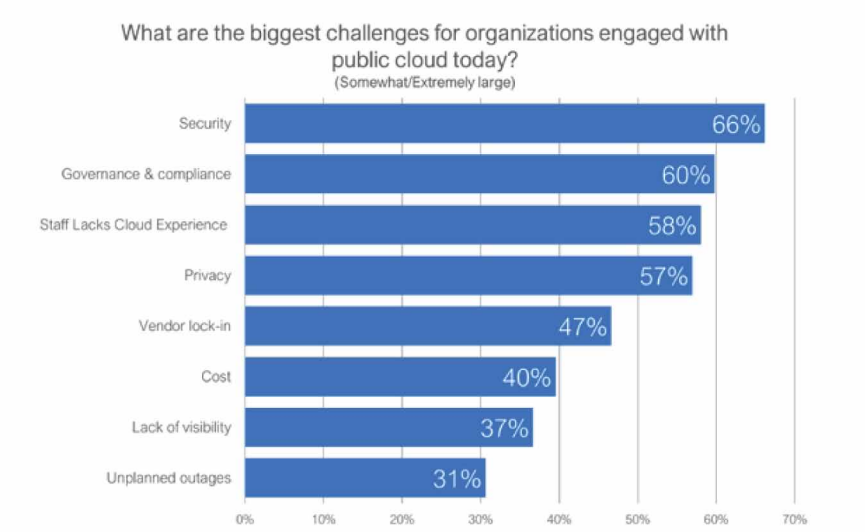
1. **Getting it Right:** Due to the lack of experience of organizations or the complex service models offered by most providers;
2. **People and Processes:** Within an organization, the biggest challenges in implementing any change (technological or not) are the people and the adoption of new processes. In this logic, larger and older companies will find it more difficult to adopt the cloud technology, whereas smaller and younger companies will more easily embrace this transition;
3. **Having a Defined Strategy and Business Objectives:** Each organization should have a well-defined cloud strategy, in line with its business goals;
4. **Getting over the Psychological Barriers:** These barriers inevitably occur whenever there is a comparison between architectures, infrastructures or internal technological platforms and what is offered by cloud systems;
5. **Time, Cost and Security:** These are, perhaps, the most common and difficult challenges to overcome in adopting a cloud strategy. Not only data migration issues – which consume time and resources for organizations – but also issues concerning data security and privacy. Namely, because, at times, it is difficult for organizations to separate the "physical" from the "virtual" and trust the data that were once stored in proprietary systems and with the adoption of this new technology the same data is stored in the "cloud", outside organizations' premises;
6. **Not getting Caught up in the Hype:** Proper planning for data – or infrastructure – migration to the cloud should be one major strategy to be taken into account, so that there is no overhead for the organization, that may be difficult and complicated to manage;
7. **Changing Management:** Any major change in IT within an organization, always involves changes in terms of management;
8. **Dependable Technological Infrastructure:** As business becomes more dependent on cloud computing, the level of adaptability of its internal technological infrastructure is extremely important;
9. **Accurately Estimating the Costs:** Many of the organizations that migrate part, or all, of their IT infrastructures to the cloud, and that do not do an assertive job on estimating costs associated with this migration, end up having problems ahead;
10. **Modifying the Architecture of Cloud Services:** It is wrong to re-architect the entire internal IT structure to fit perfectly with the cloud services to be adopted;
11. **Translating Security Posture to the Cloud Environment:** One of the biggest challenges on adopting cloud computing is security, and even greater challenge is full translating an organizations' security framework to the cloud environment. It is important that the service provider is also reliable in terms of security and privacy systems for the data to be migrated;
12. **Determining Whether to Lease or Own:** Used to the IT infrastructure traditional purchase model, organizations see the pay-as-you-go service model of cloud platforms as a challenge and novelty;
13. **Connecting Legacy Systems with Cloud Applications:** Sometimes, in organizations, most of the IT infrastructures – consisting of software, servers and others – are not cloud-ready, i.e. are not prepared for a full migration to the cloud. In this way, the connection between these legacy systems and the cloud can be challenging.

CLOUD SECURITY AND PRIVACY

In this field, research conducted by large private global technological organizations is extremely important because, being close to their customers, they are able to better measure the state of evolution in the adoption of the cloud and the challenges that their customers face.

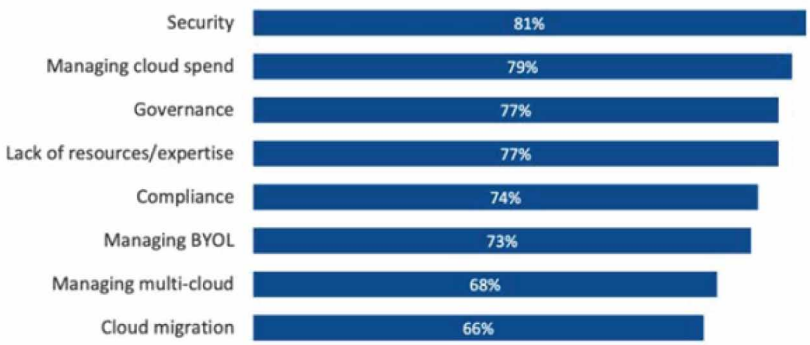
In a survey of industry influencers carried on by LogicMonitor (2017), in the United States of America, organizations presented security (66%) and privacy (57%) as major challenges to the integration of public clouds in their business models (see Figure 2).

Figure 2. Main issues reported by companies in the USA in 2017 regarding public Clouds
Source: LogicMonitor (2017)



A more recent survey, conducted by Flexera (2020), in its annual "2020 State of the Cloud Report", in the top four of cloud challenges identified by global top companies and decision-makers, security is the primary concern, followed by managing cloud spend, governance and lack of technology resources (see *Figure 3*).

Figure 3. The top cloud challenges in 2020 for organizations
Source: Flexera State of the Cloud Report (2020)



It is therefore legitimate that any organization with the intention to adopt (or has already adopted) cloud technologies, has serious security and privacy concerns.

As mentioned by Mather, Kumaraswamy and Latif (2009), the concept of privacy is quite diverse, depending on the country, culture or jurisdiction, and is usually formed by legal interpretations and people's expectations. Although it is easily understood that a clear, precise and universal definition is not possible on the one hand, on the other hand it is widely agreed that when it comes to privacy, especially in the cloud context, we are considering the issues related to personal data and the collection, storage and use of that data.

According to the Organization for Economic Co-operation and Development (OECD), "Personal data means any information relating to an identified or identifiable individual (data subject)" (OECD, 2013, pp. 13). More recently, published in the Official Journal of the European Union (European Union, 2016), the European Parliament approved the General Data Protection Regulation (GDPR), "on the protection of natural persons with regard to the processing of personal data and on the free movement of such data", having entered into force on May 25, 2018. In this Regulation, in article 4, it is possible to read, regarding the definition of "personal data", the following:

For the purposes of this Regulation, "personal data" means any information relating to an identified or identifiable natural person ("data subject"); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.

Through this Regulation, all European Union Member States, as well as all organizations (public or private) in the European Union space, are obliged to comply with the standards that are defined in relation to the protection of personal data, more specifically in relation to nature, collection and data processing, as well as the information and consent of the data subjects. In the United States of America, regulation is more complex, combining federal privacy laws with state laws and other laws and regulations.

In summary, what is observed, both at the global level and at a more regional level, in the context of European Union Member States, is that the existing set of regulations demonstrates not only the growing concern of different Governments in protecting the privacy of their citizens, but also an important

privacy challenge in cloud computing environments, which can generate significant impacts both in the adoption, as in the execution, of business processes based on this technology.

The different existing regulations raise, however, concerns for cloud service providers, since the adoption of this technology, as well as its proliferation is (and will be) generating more and more data. That is why companies like Microsoft, Amazon or IBM present approaches to data lifecycle management, which are guides to good practices, often automated on cloud platforms, and which enable organizations to an adequate management of their cloud resources, both in terms of protection and security, as well as in terms of performance, availability and costs.

Regarding the definition of the data life cycle and its phases, what is known is that there are several approaches, varying between academic ones, those contained in data protection regulations and laws and those adopted by the data cloud services providers. It is certain that all private and personal data must be managed as part of the data used by the organization. According to Mather, Kumaraswamy and Latif (2009), data must be managed and controlled from the moment the information is conceived until its elimination. In the perspective of the Cloud Security Alliance (Mogull et al, 2017), the phases of a data cycle are referred to: creation, storage, use, sharing, archiving and destruction (see Figure 4).

Figure 4. Data lifecycle management
Source: Mogull et al. (2017)

Therefore, it is easy to understand what are the main privacy concerns in the cloud. Based on what was previously analysed, it can be said that the concerns and threats are found in any of the phases of the data life cycle. According to Mather, Kumaraswamy and Latif (2009), key concerns generally involve security and privacy and this is where the existing regulation focus the most:

- **Data Access:** Any individual has the right to know what part of his personal information is stored and it should be possible, at any time, to stop the process of collecting (or storing the data) and request that they be deleted;

- **Compliance:** Since the different "clouds" can cross multiple jurisdictions and regulations, it is important that the security and privacy requirements of any cloud are easily accessed and understood by the users of the services, and that those same services are in compliance with existing laws and regulations;
- **Data Storage:** The location where personal and private information is stored, as well as the existence or not of data transfer, are users' key concerns;
- **Retention:** To know how long data can be retained and by whom;
- **Data destruction:** How is information destroyed? If requested by the user, this process must be immediate, complete, clean and transparent;
- **Audit and Monitoring:** It is essential that organizations and individuals frequently monitor the entire data lifecycle process, and that they assure to the most relevant stakeholders that privacy and security measures are being implemented correctly;
- **Privacy Breaches:** This is a very relevant issue and, perhaps, the one that concerns users and organizations the most when it comes to cloud services, since privacy breach and data leakage can have a huge impact on organizations' business, at financial level, or at image level, with the loss of confidence from customers or users of the service.

Many of these concerns are not specific to personal data, but also to all types of information that runs throughout the "cloud".

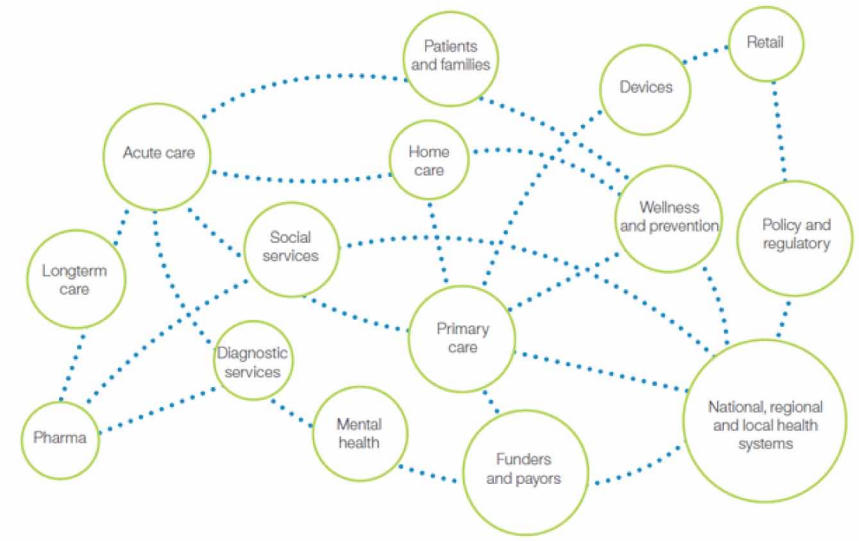
In summary, despite the numerous laws and regulations for cloud and data protection services, there are still legitimate concerns on the part of organizations and individuals and that neither existing laws and regulations nor cloud service providers have yet managed to mitigate. There are interesting challenges that cloud computing technology faces.

CLOUD ADOPTION AND TRENDS IN THE HEALTHCARE INDUSTRY

In a dynamic market that is constantly changing and full of innovation such as the healthcare, cloud computing technologies have brought, over the past decade, possibilities for renewing existing business models, as well as creating new ones. An analysis of the North American healthcare sector, carried out by Porter (2006) warned to the healthcare paradox, referring to the growing and high costs in the sector and, among other aspects, the high resistance to innovation, suggesting that the goal should be in the sense of focusing more and more on the patient and adding value to them. This is not only a problem in healthcare services in the United States of America, but also throughout the world, especially in Europe. According to Porter and Lee (2013), the business paradigm of the healthcare market is outdated. At the global level, healthcare systems are experiencing problems, related to rising costs and in the other hand related with their quality. In Least Developed Countries (LDC), the poor healthcare systems and the weak (or almost nonexistent) public investments contribute to this problem. At more developed countries, is the gradual ageing of the population and the problem of subsidizing national health systems that contributes to the problem. In Portugal, for example, according to data from the National Statistics Institute (INE, 2017) and EUROSTAT (2018b), the population has suffered a significant drop since 2010 and, in 2017, that was responsible for about 21% of people aged 65. When compared to the European Union member countries, Portugal is classified as the 4th country with the most senior population and the 5th country

with the highest aging index. This presents enormous challenges in terms of health services responses, but also in terms of monitorization of patients.

Figure 5. Examples of application cases of cloud technology in healthcare
Source: Bowser J., Saxena, S., Fraser, H. & Marshall, A. (2017)



Overloaded systems require higher availability of clinical diagnostics, for example, in follow-up level and monitorization of patients, particularly the senior population and/or with chronic diseases. According to IBM (2015a), it is these historical changes that drive transformation in the healthcare sector, through technological, regulatory, legislative and even cultural changes. As mentioned before, the huge amount of data generated in healthcare continues to increase exponentially, not only as a result of clinical records, but also from image scanning level and data generated by the personal healthcare devices. The report of the EMC Digital Universe & IDC (2014), states that the healthcare sector is one of the fastest growing segments in the digital universe, growing 48% per year, compared to 40% in other sectors.

Fagan (2014) claimed that, social, mobile and cloud technologies are becoming essential tools in strengthening the link between healthcare providers and users of these services, moving services from a fragmented approach to an approach centered on the patient/user. This perspective reinforces the idea of Porter and Lee (2013), which suggests that healthcare service providers may be increasingly focused on patients/users. Raza (2017) suggested that this transition is being driven mainly by two forces: the need of organizations to cut costs and the continuous improvement of quality attendance. In other words, service providers are under increasing pressure to reduce operating expenses and infrastructure costs. On the other hand, they are also pressured by the fact that service users want to access healthcare information and diagnoses that are increasingly more immediate and with more quality.

Bowser, Saxena, Fraser and Marshall (2017) published the result of a study, conducted in 2016 by IBM, about 83 leading global companies in the health market, where 54% of respondents stated that traditional value chains in the healthcare industry are be replaced by new business models, supported by

emerging technologies such as artificial intelligence, cognitive computing, Internet of Things (IoT) and the growing evolution of cloud computing. The development of such new technologies, in the opinion of these authors, "*are converging to change not only how, where and with what precision healthcare is delivered, but also the very definition of healthcare.*" (page 1, of the "A Healthy Outlook study - Digital Reinvention in Healthcare"). For Bowser et al. (2017), it is well known that a number of healthcare activities, which were fragmented until then, are evolving into increasingly integrated ecosystems of researchers, suppliers, consumers and regulators, thus being able to interact with patients, caregivers and others on a more individualized way. Figure 5 shows us some examples of use cases in the healthcare industry related to the use of cloud technology, where we can observe the integrated ecosystems that de following authors referred.

As mentioned by Kumari, Tanwar & Kumar (2018), the acceptance of the Internet of Things (IoT) devices by organizations in the healthcare industry is growing at a rapid pace. The Industry 4.0 requirements are being interpreted and applied in this economic sector as Healthcare 4.0, and the increasingly number of smart healthcare devices is also currently producing a large amount of data on a regular basis, or Big Data. This huge quantity of data, produced by the latest and most advanced medical devices, such as ECG or temperature monitors, or Medical Internet of Things (mIoT) has enormous potential to change the health sector (Sharmila et al., 2020). These new technologies, based on cloud computing, has shifted Healthcare 4.0 to a more patient centric care model, which benefits more the patients and their needs (Kumari, Tanwar & Kumar, 2018). In the opinion of Sharmila et al. (2020), the combination of these smart medical devices with mobile apps – and all the potential it can bring – turns IoT into mIoT, powerful medical and diagnostic tools, which is the genesis of industry 4.0 and Healthcare 4.0.

In the view of IBM and according to Ferkoun (2014), the healthcare sector can benefit from cloud computing technologies in the following areas:

- **Data Analytics:** The adoption of the cloud, the growing amount of data stored, and the increase in the computing capacity of the systems, gives organizations a huge opportunity to apply analytical methods (statistical, predictive and quantitative models), in order to provide a better understanding of the information and, thus, generate better results;
- **Security:** Thanks to the multiple existing regulations and the requirements of compliance demanded from the industry, the adoption of cloud technologies is growing. Regarding security, cloud service providers are increasingly integrating resources into their systems, in order to relieve organizations of complex security structures;
- **Mobility:** Cloud services, by providing mobility capabilities, are enabling key information to be accessed by medical and health personnel, anywhere and on any device;
- **Collaboration:** Cloud technology enables collaboration between doctors, nurses and other healthcare professionals, in a faster and more embracing way. Likewise, it facilitates the collaboration and exchange of information between these professionals and patients/users, reducing the time of diagnosis and allowing access to critical historical data, making it possible to elaborate more accurate diagnoses, based on informed decisions.

As in any other industry, the healthcare industry faces the same challenges in the adoption of cloud computing, sharing the advantages and disadvantages of any other organization, as already discussed, but with a greater concern: the security of healthcare patient's data stored is highly critical and requires specific care from service providers. For example, in the United States of America, the Health Insurance

Portability and Accountability Act (HIPAA) regulation was created in 1996 to modernize the flow of health data information and regulate patients' personal information, both held by health agencies and data maintained by insurance companies, mainly to prevent fraud and information theft.

In the European Union, more recently, the General Data Protection Regulation (GDPR) came to apply regulations to the privacy of personal data and the use of it by healthcare service providers. Both the GDPR and the HIPAA make it mandatory for healthcare providers to follow strict internal safety protocols and ensure compliance with the regulations concerned.

Healthcare organizations that are currently implementing new digital technologies are creating added value, not only for themselves and their customers, but also for the industry they operate. Bowser et al. (2017) refer to "digital reinvention" as the process by which these organizations go beyond the simple digitization of systems or processes, involving all their stakeholders, from patients, health professionals, caregivers, suppliers, support institutions and others, with the help of new technologies. In order to achieve a total digital revolution, the healthcare sector needs to seek a new strategic focus, acquiring new specialties, and establishing new ways of working and cloud computing technology will be increasingly present in this strategy.

THE CLOUD APPLIED ON THE COMBAT TO COVID19 PANDEMIC

In 2020, physical world was replaced by the virtual as a consequence of COVID -19 pandemic and technology became a critical tool to help, for example, assisting hospital systems with tracking the pandemic and providing telehealth and remote-patient monitoring solutions. Cloud computing makes available services such as IBM Cloud, Amazon Web Services (AWS), Microsoft Azure or Google Cloud, that make possible the connectivity, on a global scale, between people, businesses, healthcare organizations and government support authorities.

The Coronavirus pandemic is the biggest challenge facing healthcare systems worldwide, highlighting their strengths and weaknesses. According to Wittbold et al. (2020), the spread of COVID -19 is stretching digital transformation and the use of operational systems based in cloud technology in healthcare and beyond. National health system around the world cannot keep up with this kind of explosive demand (growing in an exponential rate) without the rapid and large-scale adoption of digital operating models.

The IBM Research, like so many research departments of other organizations in the IT field, has recently developed new cloud and AI-based technologies that can be quite useful in dealing with this global challenge that scourge and plagued the world in 2020. The strategy is to work together and manage the outbreak of COVID-19 using the available technology, applying data, knowledge, computing power and insights to solve this problem. According to Dario Gil – Director of IBM Research – technology and scientific knowledge are tools that can help in the global battle against the disease (IBM, 2020). This could be carried out with the support of several new IBM resources that were made available free of charge to help health researchers, doctors and scientists from all over the world accelerate the discovery of drugs for COVID-19, from the collection and application of information, passing by the latest genetic data about viruses and the identification of possible targets for treatments. Another example, presented by Laurence (2020), is Salesforce company that launched its first Salesforce Care solution for healthcare systems, designed specifically for healthcare providers who are experiencing a flow of requests due to COVID-19. They further expanded Salesforce Care with additional free solutions to help companies in any industry stay connected to stakeholders, even when everyone is working remotely. Salesforce Care

solutions are available immediately and can be set up very quickly. Sayegh (2020) refers that the most fantastic thing about cloud technologies is the flexible options they provide, even more so now in this time of crisis, when companies need solutions they can implement and test quickly.

Summarizing, the massive increase in demand for cloud computing allows healthcare and research institutions worldwide to use cloud computing systems on a large scale in order to carry out simulations and calculations in bioinformatics and epidemiology fields in the shortest time, which could take several months with the use of conventional computer systems. Wittbold et al. (2020), suggest that world response to COVID-19 has accelerated the adoption and scaling of virtual and artificial intelligence (AI) tools. From the AI bots deployed by Providence and Partners HealthCare to the Smart Field Hospital in Wuhan, rapid digital transformation is being employed to tackle the exponentially growing of THE COVID-19 threat. It is to be expected and anticipated that, after COVID-19 settles, the way in which medical care will be provided in the future will be transformed.

FUTURE RESEARCH DIRECTIONS

Many current challenges have not been addressed. This chapter gives numerous challenges and its future research directions of cloud computing applications to healthcare services. As much as the cloud is becoming a fundamental tool in supporting the complex management healthcare industry, there are still some challenges that the authors, in their perspective, agree should be the subject of future research, such as: security, privacy and intelligent devices. These subjects should be studied not only in the context of the existing systems, but also in the context of new healthcare business models.

The emergence of new startups in the health sector, with value propositions and disruptive services is, in the authors' perspective, a huge challenge for the industry itself, for the users of the services and for legal regulation.

The cloud and related service models have enabled "democratization" in accessing cloud technology in the healthcare industry. The authors leave some questions that may serve as a basis for future new insights for research in this field: How intelligent devices can be used as remote patient monitoring tools and how this will change health as a service? How can the industry manage the exponential amount of data produced by more intelligent and connected health systems? How will security and privacy be handled by the healthcare industry in crisis situations, such as the COVID-19 pandemic?

The authors saw some limitations regarding to the availability of more current data which, in some of the cases mentioned in this chapter, will be updated in an upcoming research. Also future research in these areas could help organizations in the healthcare industry to better understand these challenges and be better prepared to adopt the cloud in their business models.

CONCLUSION

It is hard, or even impossible, to imagine a world without cloud technology. Whether on complex business systems or the simplest mobile phone application.

The authors intended to demonstrate that cloud computing, both in terms of technology and business processes, goes a long way towards its adoption by organizations and by many business sectors, as it

guarantees not only scalability of solutions but also the simplicity and flexibility in cost structures, so important for the balance and sustainability of its business models.

Security and privacy, as they are extremely critical issues for most organizations and, in particular, for healthcare organizations, remain the biggest concern and biggest obstacle in cloud adoption. The healthcare industry needs to handle confidential patient data and information and is often unwilling to rely on external technology, such as cloud computing. But all over the world, especially in developed countries, laws and regulations are being put in place to protect citizens and organizations with regard to their security and privacy.

In the healthcare industry, the cloud is proving to be an essential tool to help tracking and diagnosing diseases and in the integration of complex and multiple systems, providing better and faster responses. Tools like AI, for example, are easier to use and implement, thanks to the evolution of cloud computing in recent years and health organizations are adopting it and using it at a faster pace.

In the near future, the health ecosystem will see enormous challenges such as:

- Population aging in developed and industrialized countries, increased life expectancy and the emergence of chronic diseases associated with this phenomenon;
- Growth in diseases - such as cancer - that will need an increasing search for effective treatments;
- Emergence of new diseases - such as the example of the COVID-19 pandemic - which could be a serious problem for national health systems;
- Exponential and mass production of information (big data) by the different health services that will lead to problems of storage and adequate data treatment.

Taking into account these predictions, cloud computing may be one of the tools that will help the health sector to be better prepared for these and other challenges in the near future.

REFERENCES

Bowser, J., Saxena, S., Fraser, H., & Marshall, A. (2017). *A Healthy Outlook: Digital Reinvention in Healthcare. IBM Institute for Business Value*. IBM Corporation. Retrieved from: https://www.ibm.com/thought-leadership/institute-business-value/report/drhealthcare

Briggs, B., & Kassner, E. (2017). *Enterprise Cloud Strategy* (2nd ed.). Microsoft Press.

Drucker, P. (1994, Sept.). *The Theory of the Business. Harvard Business Review*.

EMC Digital Universe & IDC. (2014). *Driving Data Growth in Healthcare: Challenges & Opportunities for IT*. Retrieved 2019, January 12, from https://www.emc.com/analyst-report/digital-universe-healthcare-vertical-report-ar.pdf

European Union. (2016). *Official Journal of the European Union, L, 119*. Retrieved January 9, 2019, from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&qid=1587293345463&from=EN

EUROSTAT. (2018a). *Cloud Computing - Statistics on The Use by Enterprises.* Retrieved in 2019, January 9, from https://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises

EUROSTAT. (2018b). *Proportion of population aged 65 and over*. Retrieved in 2019, January 13, from https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tps00028&plugin=1

Fagan, L. (2014), *Salesforce. How Cloud-Based Technology is Transforming the Healthcare Industry*. Retrieved in 2019, January 11, from https://www.salesforce.com/blog/2014/06/cloud-technology-healthcare.html

Ferkoun, M. (2014), *Five Ways the Healthcare Industry Benefits from Cloud Computing*. IBM Corporation. Retrieved in 2019, January 13, from https://www.ibm.com/blogs/cloud-computing/2014/05/16/five-ways-the-healthcare-industry-benefits-from-cloud-computing/

Flexera. (2020). *Flexera 2020 State of the Cloud Report*. Retrieved in 2020, March 20, from https://resources.flexera.com/web/pdf/report-state-of-the-cloud-2020.pdf?elqTrackId=8e710f56b1c44fe39130b0d6168944ed&elqaid=5770&elqat=2

Forbes. (2017). Forbes Technology Council. *13 Biggest Challenges When Moving Your Business to The Cloud*. Retrieved in 2019, January 9, from https://www.forbes.com/sites/forbestechcouncil/2017/06/05/13-biggest-challenges-when-moving-your-business-to-the-cloud/#7ef07cd19b0e

Gartner, Inc. (2017). *Cloud Strategy Leadership - Gartner Insights on How and Why Leaders Must Implement Cloud Computing*. Retrieved in 2019, January 8, from: https://www.gartner.com/en/publications/cloud-leadership

Gartner, Inc. (2019), *Advance Cloud Computing Capabilities - Create a cloud strategy to maximize the benefits of cloud computing*. Retrieved 2019, January 8, from https://www.gartner.com/en/information-technology/insights/cloud-strategy

IBM. (2020). *IBM Releases Novel AI-Powered Technologies to Help Health and Research Community Accelerate the Discovery of Medical Insights and Treatments for COVID-19*. Retrieved 2020, April 3, from https://www.ibm.com/blogs/research/2020/04/ai-powered-technologies-accelerate-discovery-covid-19/

IBM Corporation. (2015a). *A Growth Engine for Healthcare: How Cloud Computing Can Help the Industry Navigate Change*. Retrieved 2019, January 11, from https://www.ibm.com/industries/healthcare/Growth_Engine_for_Healthcare/index.html

IBM Corporation. (2015b). *Cloud Computing Simplified: The Thoughts on Cloud Way. IBM RedBlook publication*. Retrieved 2019, January 11, from http://www.redbooks.ibm.com/abstracts/redp5179.html?Open

IDG. (2018). Cloud Computing Survey – Executive Summary. Framingham, MA: IDG.

INE – Instituto Nacional de Estatística. (2017). *Projeções de População Residente 2015-2080*. Retrieved in 2019, January 13, from https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaques&DESTAQUESdest_boui=277695619&DESTAQUESmodo=2&xlang=pt

Kumari, A., Tanwar, S., Tyagi, S., & Kumar, N. (2018). Fog computing for healthcare 4.0 environment: Opportunities and challenges. *Computers & Electrical Engineering*, *72*, 1–13. doi:10.1016/j.compeleceng.2018.08.015

Lawrence, C. (2020). *Is Cloud Computing the Superhero of Covid-19?* Retrieved in 2020, March 30, from https://www.codemotion.com/magazine/dev-hub/cloud-manager/cloud-computing-covid-19/

LogicMonitor. (2017). *Cloud Vision 2020: The Future of the Cloud. A Survey of Industry Influencers*. Retrieved in 2019, January 9, from https://www.logicmonitor.com/resource/cloud-vision-2020-future-cloud-study

Mather, T., Kumaraswamy, S., & Latif, S. (2009). *Cloud Security and Privacy*. O'Reilly.

Mell, P., & Grance, T. (2011). *The NIST Definition of Cloud Computing*. NIST – Recommendations of the National Institute of Standards and Techonology – U.S. Department of Commerce - Special Publication 800-145. Retrieved in 2018, November 18, from https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf

Mogull, R., Arlen, J., Gilbert, F., Lane, A., Mortman, D., Peterson, G., & Rothman, M. (2017). *Security Guidance for Critical Areas of Focus in Cloud Computing v4.0.* CSA - Cloud Security Alliance. Retrieved in 2019, January 11, from https://cloudsecurityalliance.org/artifacts/security-guidance-v4/

Nadella, S. (2017). *Hit Refresh - The Quest to Rediscover Microsoft's Soul and Imagine a Better Future for Everyone*. Harper Collins Publishers.

OECD. (2013). *The OECD Privacy Framework.* Retrieved in 2019, January 9, from http://www.oecd.org/internet/ieconomy/privacy-guidelines.htm

Porter, M. (2006). Redefining Health Care: Creating Value-Based Competition on Results. Harvard Business Review.

Porter, M., & Lee, T. (2013). The Strategy That Will Fix Health Care. *Harvard Business Review*.

Raza, K. (2017). *How the Cloud Is Transforming Healthcare*. Forbes Technology Council. Retrieved in 2019, January 11, from https://www.forbes.com/sites/forbestechcouncil/2017/06/13/how-the-cloud-is-transforming-healthcare/#748702351fd7

Sayegh, E. (2020). *As COVID-19 Pushes Businesses To Their Limit, The Cloud Rises Above*. Forbes. Retrieved 2020, March 26, from https://www.forbes.com/sites/emilsayegh/2020/03/26/as-covid-19-pushes-businesses-to-their-limit-the-cloud-rises-above/#3c6e162b7851

Sharma, S., Chen, K., & Sheth, A. (2018, March/April). Toward Practical Privacy-Preserving Analytics for IoT and Cloud-Based Healthcare Systems. *IEEE Internet Computing*, *22*(2), 42–51. doi:10.1109/MIC.2018.112102519

Sharmila, R., Kumar, D., Kumar, P., & Ashok, A. (2020). Introduction to Multimedia Big Data Computing for IoT. In S. Tanwar, S. Tyagi & N. Kumar (Eds.), Multimedia Big Data Computing for IoT Applications - Concepts, Paradigms and Solutions (pp. 3-36). Springer Nature Singapore. doi:10.1007/978-981-13-8759-3_1

Sosinsky, B. (2011). *Cloud Computing Bible*. Wiley Publishing, Inc.

Wittbold, K. A., Carroll, C., Iansiti, M., Zhang, H. M., & Landman, A. B. (2020). How Hospitals Are Using AI to Battle Covid-19. *Harvard Business Review.* Retrieved in 2020, April 3, from https://hbr.org/2020/04/how-hospitals-are-using-ai-to-battle-covid-19

Chapter 3
HRM in the Tourism Industry:
Inferences From Research

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ABSTRACT

This chapter aims to analyze the research from the last 20 years about human resources management in the tourism industry. The research question is: What are the contributions of the international publications on human resources management and tourism in the Web of Science and Scopus databases in the last two decades? In order to accomplish this goal, the research methodology will be a literature survey using the Scopus and WoS databases. To develop this research, first, it will be performed a literature review on HRM as strategic value, and also on the multiple perspectives of the concept of tourism. Moreover, it will be made state of the art on human resources management in the tourism industry. Furthermore, the results of the literature survey are presented. The main findings show that there is still a need for more production about human resources management in the tourism industry, which was based on the importance of one segment to the other, as well as the infinite possibilities of incremental actions that allow a mutual benefit between these two fields.

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INTRODUCTION

Global competitiveness has been a point of concern to both tourism market managers and researchers (Gannon & Johnson, 1995). Companies are increasingly looking forward to develop a motivational and learning environment, due to global competitiveness, to achieve acceptable results. (Marinho et al., 2014).

From this perspective, studies on human resources management in tourism are critical such as public, private, visitors, and community sectors, i.e., all stakeholders involved, benefit from this integration (Baum et al., 1997).

According to Barney (1991) and Baum (2006), human resources, with knowledge, skills, and features provided that competitors are not able to copy, are essential in the companies, with refection on the competitive advantage which they need to respond to the encountered challenges. Also, Neves (2007) states that of all the resources present in a company, the most determinant in organizational effectiveness are human resources, as the most significant responsibility in creating a competitive advantage is theirs. Apart from human resources, factors regarding the organizational process are essential, once the company's employees (Evans et al., 2003) elaborate strategies and arrange for its implementation. Covey et al. (2012) mention that companies need to find strategies involving and commit their employees to organizational performance in order to make them stronger, competitive, sustainable, and more capable of differentiation, corroborate this.

In this perspective, human resources management is becoming more strategic, competitive and sustainable, in a constantly changing environment as a source of value and result for the company and its stakeholders (Freitas, 2012). From the same point of view, human capital is crucial for the competitiveness of companies, and especially for tourism, as well as for the sector's development.

In this global village, business managers need to be mindful of the present, innovate, and implement strategies that signal best people management practices, so that companies are more competitive and responsive to challenges.

According to Rego et al. (2012) and Kusluvan et al. (2010), companies should strike a balance when it comes to developing entrepreneurship and human resources strategies as the implementation of business strategies implicates in human resource management.

Based on these inferences and knowing the importance of human resources management and tourism, the research problem was elaborated: "What are the contributions of the international publications on human resources management and tourism in the Web of Science and Scopus databases in the last two decades? Thus, this study has a general objective: To analyse the characteristics of publications related to the themes of human resources management and tourism in the last two decades, in the referred databases.

The article is organized into five sections. After a brief introduction, theoretical contribution will be described, explaining the state of the art of the themes, the theoretical and methodological procedures of the research, and, in the following section, the principal results found. To conclude the study, the final considerations of the study are carried out, as well as its limitations and future lines of investigation.

HUMAN RESOURCE MANAGEMENT A STRATEGIC DRIVER FOR TOURISM

The Strategic Value of Human Resources Management

With the competitiveness of the markets, organizations have been developing strategies, practices, and management policies, enabling them to differentiate themselves positively in their competitive relationships. Thus, effective organizations need to manage scarce or valuable resources and may develop a competitive advantage, resulting in high performance concerning the competition (Mahoney & Pandian, 1992).

Human resource management is one of the resources that may act as one of the competitive differentiators of organizations. Thus, in order to make decisions in the area of human resources management (HRM), implies modification of specific processes, realities, structures and is associated with a set of actions enabling to cover remuneration, evaluation, training, and the development of work environment. (Dessler, 2003).

Being the centre of competitiveness of organizations, HRM can be understood as a critical element in the process of development and creation of the workforce (Lepak et al., 2006). It is observed that a well-structured human resources management, promotes training, motivation, an environment conducive to employee contribution (Jiang et al., 2012), to produce favourable conditions for the development of capacities and resources creating value for organizations (Barney & Wright, 1998).

According to Ansoff (1977), an organization needs people to reach the goals and complete the objectives; it is essential to develop skills in each employee. HR management becomes an agent of change in companies, and employees have at their disposal management tools to help the achievement of effective results, leading to the growth and development of the organization (Marchioli et al., 2018).

According to Chiavenato (2003), Human resources (HR) is an area dealing directly with human beings, that is, elements with different personalities, who are looking for a professional in the area of human resources to experience in different areas. The HRM has a vital role in explaining business strategies through more elaborate practices and policies to retain and develop talents (Fleury, 2002).

HR management is associated with sustained competitive organizational advantages and high market performance (Pickles et al., 1999). In this context, we verify a close relationship between HRM and increased productivity (Fox et al., 1999). It is assumed that HR management is where knowledge and innovation are developed, and their activities tend to cause greater flexibility for companies in a competitive scenario (Motta, 1991).

For Friedman et al. (2000), all organizations have the habit of saying that people are their greatest asset, but few of them speak what they preach. Human resources management provides companies with solutions so that their employees can perform their work in the best possible way to meet personal wishes and the social environment within the organization (Marchioli et al., 2018). Therefore, for better development of the HRM area, it is necessary to include programs for quality of life at work, financial suggestions, and well-being.

Another function of human resource management is to organize policies and actions in such a way that people can perform their work with the highest efficiency and effectiveness (Marchioli et al., 2018). According to Silva (2002), the main merit of management is to induce employees to achieve goals within the organization efficiently and effectively. As far as this is concerned, the role of the human resources manager is fundamental, as he is the one who develops and motivates employees.

Therefore, the HRM involves the preparation and planning of the organization, and proper planning leads the organization to operational efficiency and the effectiveness of its business (Girardi, 2008).

Thus, human resources management reveals the power of HR tactics to influence both individual and company's performance, offering possible strategies capable of producing adequate results from production to the boardroom (Ulrich, 2000).

Multiple Perspectives on Tourism

Tourism studies have grown over the past decade. Several researchers have been studying the theme of tourism, relating to the most different areas of knowledge. In this sense, tourism has solidified itself in one of the fundamental aspects of the world economy, being part of the gross domestic product (GDP) of several countries (Costa et al., 2014). Besides, Netto (2017), emphasizes that the 20th century was classified as the "tourism century."

In this context, Rodrigues (2000) defines tourism as:

A complex activity that comprises both production and consumption, both secondary activities (space production) and tertiary activities (services) that collaborate by appropriating 'exotic places,' 'natural landscapes,' 'historical landscapes,' transforming them into locations that should be observed from which cultural and historical knowledge will be obtained, providing relaxation, and various other symbolic or real reasons. (Rodrigues, 2000, p. 48)

Following this, some types of tourism have been classified according to the focus on local specificities, directed to the production on an artisanal scale, searching for a different development involving the most diverse social strata.

Among the classifications, the World Tourism Organization- UNWTO (2017) defines tourism as the places that can be visited frequently, reflecting on impacts for the place.

Another terminology is the community-based tourism (CBT), which is defined as a cluster of factors that have community involvement in order to reduce conflicts and impacts on the environment (Curcija et al., 2019).

Sustainable tourism seeks to apply the tripod of long-term sustainability, allowing the maintenance of biodiversity and cultural goods worldwide, as well as reducing low-income levels (Pawson et al., 2017).

A concept that has been currently studied a lot and earned the right to be highlighted is "Tourist-phobia or Tourism-phobia," which is a response to tourism in some places (Milano, 2018).

After the explanation of the different spheres of tourism in the next topic, state of the art on the themes as the object of this study will be addressed: human resource management and tourism.

State of the Art on Human Resources Management in the Tourism Industry

The study by Kusluvan et al. (2010), addressed to state of the art on human resource management (HRM) in the tourism and hospitality sector. Based on these data, the research presented an evaluation of the emerging issues of HRM and a synthesis of what was recommended in the literature to manage employee performance.

Baum (2007), analysed the main factors that influence the role and management of human resources in tourism for the last 20 years, seeking to evaluate the evidence of significant changes in the sector, such as the practice of human resource management in contemporary tourism, ICTs in tourism, etc.

The conclusions indicate that the changes occurred in the tourism work environment during the review period were short-lived.

It is known that quality in services provision is fundamental to remain competitive in world tourism. Go & Govers (2000) analysed eight case studies of recommended practices from different destinations in four European countries, intending to determine whether selected European destinations apply integrated quality management as a means of increasing their competitiveness. The results indicated that the search for quality tourist destinations is applied. In general, destinations have as a policy and strategy or human resources management, instead of showing a balanced and integrated approach to quality management.

In another study, Tsaur & Lin (2004) mention the relationship between human resource management practices, behaviour, and quality of service in tourist hotels in Taiwan. As a result, they highlighted that human resource management practices partially had a direct effect on customers 'perceptions of service quality and an indirect effect on employees' behaviour. Highlighting also that the service's behaviour mediates, only partially, the relationship between human resource management practices and service quality.

Chou (2014), studied the existing gap in the concept of "green organizational climate" and used personal belief variables to explore the contextual and individual variation in the environmental behaviour of hotel employees. The results showed that factors at both individual and group levels are significantly associated with employees' environmental beliefs and behaviours.

In Baum (2015), knowing that some factors in the HRM remain global tourism challenges, he sought to identify significant changes by providing an assessment of the current status of the problems that Baum identified in 2007 as well as the identification of a series of emerging concerns that continue to shape the working environment of tourism.

Among the challenges Boselie, et al. (2003) studied the relationship between human resource management (HRM) and performance in the USA that can be applied in other countries and different cultures. The study was applied in the Netherlands, using the theory of control versus commitment in combination with New Institutionalism. The data showed that the effect of human resource management is less significant in highly institutionalized sectors (hospitals and local government) than in not so institutionalized sector, such as hotels.

Baum et al. (2016) reflect the narrative of sustainable tourism, and its primary goal is to approach negligence in that field highlighting all references to the workforce in the United Nations 2030 Agenda for Sustainable Development. The discussion follows the emergent field of human resources sustainable management and its contribution to meet with UN's Goals for Sustainable Development and to improve the recognition of workforce and employment issues in the tourism-related debate. The article concludes by gathering the implications and locating them within the fundamental principles of the 2030 Agenda for Sustainable Development.

Boselie et al. (2017) carried out a bibliometric study on strategic human resource management (HRM) from a general administration point of view and hospitality and tourism. The critical, qualitative, and comparative literature review provided insights into emerging research trends and pointed out gaps in the literature. The results of the review showed six research streams of the literature on hospitality and tourism: human capital and company performance, high-performance HRM practices and performance, international/global issues and strategic HRM, individual HRM practices and performance, qualitative analyses of the human resources management literature on hospitality and tourism and country-specific strategic human resource management.

METHODOLOGY

Literature Survey – The Methodologic Approach

The present study is bibliometrics, characterized as the descriptive quantitative approach, aiming to investigate the primary uses of the themes human resources management and tourism in the last two decades, In the databases of Web of Science and Scopus databases.

The method for this study is bibliometrics, defined by Veal (2011, p. 91), as "an academic term that refers to the process of identifying and studying previously published research relevant to the topic of interest." According to the authors, Fonseca (1986), Okubo (1997), and Araújo (2006) bibliometrics is a technique of quantitative and statistical type which allows measuring production and dissemination of scientific knowledge. According to Silva (2004) and Leite Filho (2008), bibliometrics aims to evaluate the technical or scientific activity of a specific area of knowledge through a quantitative study of publications. This article aims to expand the knowledge concerning related publications to the management of human resources and tourism, based on the articles researched on the topic.

Bibliometrics can adopt various methods of analysis and be used for a multitude of purposes and are based on the laws of bibliometrics. Among the first laws of Bibliometrics are Zipf (word frequency), Lotka (author productivity), and the best-known Bradford (journal productivity), all three considered static.

Sample Definition

A quantitative perspective was adopted due to the attempt to quantify some variables related to scientific production on the themes mentioned above. Bibliometrics is defined by Rousseau (2001) and Camps, et al. (2006) as a subject that allows a quantitative study of scientific production, through the analysis of its nature and transfer of science in a specific period.

The universe of the study consists of the Scientifics articles published between the years 2000 and 2019, obtained from the Web of Science and Scopus databases, which were used as study material to compare their development regarding human resources management and tourism.

For the data collection of this research, we used the databases referred to in the previous paragraph. Therefore, two of the largest multidisciplinary databases comprising aspects of national and international abstracts and longitudinal studies were described. In the research fields, the words human resources management and tourism were mentioned, identifying the principal authors who wrote about the theme, among other characteristics, and investigating articles published during this period, in order to show the context in which the term was a reference.

WOS is a multidisciplinary base indexing only the most quoted journals in their respective areas of expertise. According to Capes (2017), through the Web will be possible to create a quotation index that, further to enable identification of received citations, used references and records related, also provides the necessary tools for citations, references, and h-index analysis, allowing bibliometric surveys. (Capes, 2017).

About the Scopus base, its scope stands out in Health Sciences, Physics, and Social Sciences. According to Capes (2017), the database includes academic titles, revised by peers, open access, procedures, the scientific content of webpages. Support functionalities to the analysis of results, such as author identification, and affiliations, publication citations analysis, which are made available to the user.

The research was refined in such a way that only scientific articles and books in both databases included the term Management of Human Resources and Tourism, and were searched in order to broaden the research bases and terms. Thus, in order to compare the production of articles collected from the Web of Science and Scopus, the principal authors who wrote on the topic were identified, the growth of research in terms, during the period under review, the leading journals, main institutions, main countries and languages, areas of knowledge, and even the most cited publications, in order to map the relevance of studies. Excel spreadsheets were created to analyse data, comparison.

Data Collection Steps

This article was divided into two stages. In the first step, the terms Management of Human Resources and Tourism were written in the research field of the WOS database and Scopus, limited to the period between 2000 and 2019. Then, the overall features of the publications were surveyed.

In the second stage, the most cited publications were considered and compared with the authors who published the most in the same period. The steps of the research are shown in Figure 1.

The bibliometric analysis of this study was performed according to the steps described in Figure 1.

Figure 1. Stages of research
Source: Authors' elaboration.

RESULTS

The research results showed the main features of scientific production related to the scope of the expression of the study, in the years 2000 to 2019. When searched "Management of Human Resources and Tourism", 806 scientific articles were found on the Web of Science and 1365 articles on Scopus.

Thus, the following are the general characteristics of publications related to the theme according to the following categories: 1. Research areas 2. Type of documents, 3. Annually published articles, 4. Main authors, 5. Source Title, 6 Main Institutions, 7. Main countries, 8. Main languages 9. Keywords and then, the number of publications per author and the number of citations will be displayed.

CHARACTERISTICS OF THE PUBLICATIONS

Research Areas

Regarding the main Research Areas in Management of Human Resources and Tourism publications, there seems to be a convergence in the two main research areas of most published articles in Web of Science and Scopus: Environmental Sciences and Engineering, as shown in table 1. It is worthy of mentioning that one same article can be classified in multiple thematic areas.

Then the type of document published was analysed (Figure 2), standing out the articles' publication, representing 63,11% of the total documents found in the Scopus database and 36,89% in Web of Science database.

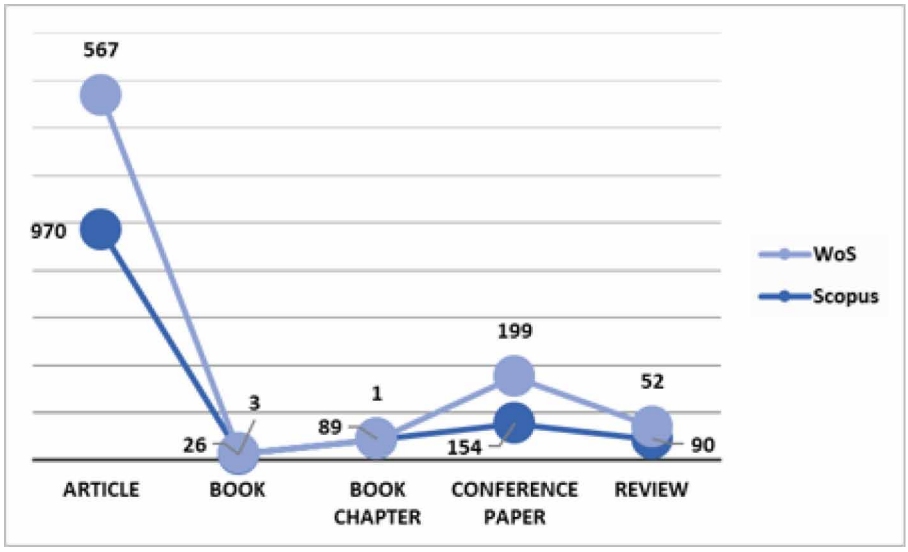
Table 1. Distribution of articles by research areas

Research Area	Scopus	WoS	Total
Agricultural and Biological Sciences	277		277
Biochemistry, Genetics and Molecular Biology	54		54
Biodiversity Conservation		46	46
Business Economics		179	179
Business, Management and Accounting	360		360
Computer Science	72		72
Earth and Planetary Sciences	175		175
Economics, Econometrics and Finance	78		78
Education Educational Research		31	31
Engineering	90	45	135
Environmental Science	610	273	883
Geology		31	31
Medicine	70		70
Oceanography		32	32
Science Technology Other Topics		57	57
Social Sciences	367		367
Social Sciences Other Topics		252	252
Water Resources		49	49
Total	**2153**	**995**	**3148**

Type of Document

There is an index of citations in the Web of Science and in Scopus, where the cited documents by each author and the documents quoted by them are mentioned (Figure 2).

Figure 2. Distribution of articles by type of publication
Source: Authors' elaboration.



ANNUALLY PUBLISHED ARTICLES

According to Figure 3, it is possible to follow the growth of the publications in Scopus and WoS databases; 2018 and 2019 were the years with the highest productivity in both databases.

Figure 3. Publications distributed per year
Source: Authors' elaboration.

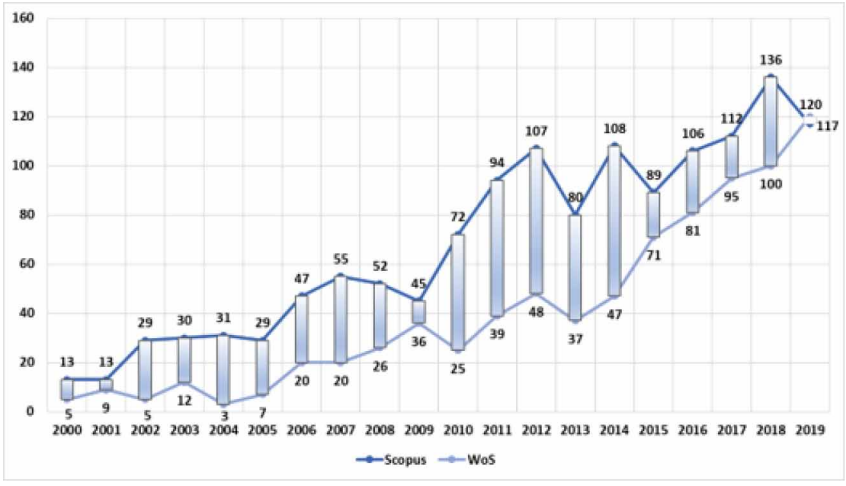


Table 2 presents the main authors who published articles related to the chosen topics in the study for the analysed period. Expecting to find authors with greater relevance, it was found that only Baum, T., stood out as author that published in the two databases.

Baum, T. is also among the most cited authors for the period under analysis. The number of publications in the two databases show a possible gap in the academic field, so when analysing the theme, there is not one researcher standing out significantly.

Table 2. Distribution of articles by authors

Authors	Scopus	WoS	Total
Baum, T.	8	10	18
Begossi, A.		4	4
Cao, Y.		5	5
Ciocarlan-Chitucea, A.		4	4
Crooks, V.A.	6		6
Ditton, R.B.	5		5
Halpern, B.S.	4		4
Hughes, K.A.	5		5
Johnston, R.	5		5
Kong, H.	4		4
Kong, H.Y.		4	4
Lindsey, P.A.	4		4
Liu, Y.		4	4
Marco-Lajara, B.		5	5
Nepal, S.K.	4		4
Ouyang, Z.	4		4
Popescu, D.		5	5
Robinson, R.N.S.		5	5
Ubeda-Garcia, M.		5	5
Total	**49**	**51**	**100**

TYPE OF SOURCES

In Identifying the sources of publication, it was found that among the journals with the highest impact and with most scientific articles published, involving the theme, in both databases Web of Science and Scopus: Environmental Management, International Journal of Contemporary Hospitality Management and Tourism Management, stand out.

MAIN INSTITUTIONS

The main institutions and published works related to the theme Management of Human Resources and Tourism are identified in Table 3.

Institutions' identification to which publication is associated shows that the number of publications is quite similar, though it is not possible to stand out a dominant organization in the group.

Table 3. Distribution of articles by source

Title of Sources	Scopus	WoS	Total
Advances in Social Science Education and Humanities Research		8	8
AEBMR Advances in Economics Business and Management Research		9	9
Environmental Management	79	12	91
Environmental Monitoring and Assessment	17		17
International Journal of Contemporary Hospitality Management	29	20	49
International Journal of Hospitality Management	11	17	28
International Journal of Human Resource Management		6	6
International Journal of Tourism Research		6	6
Journal of Environmental Management	53		53
Journal of Sustainable Tourism	16	18	34
Marine Policy		12	12
Marine Pollution Bulletin	19		19
Ocean and Coastal Management	22	19	41
Plos One	35		35
Science of The Total Environment	16		16
Shengtai Xuebao Acta Ecologica Sinica	20		20
Sustainability		10	10
Tourism Management	28	26	54
Total	**345**	**163**	**508**

Table 4. Distribution of articles by main institutions

Institutions	Scopus	WoS	Total
Chinese Academy of Sciences	23		23
CNRS Centre National de la Recherche Scientifique	12		12
Commonwealth Scientific Ind. Research Organisation Csiro		10	10
Griffith University	15		15
Hong Kong Polytechnic University	16	17	33
James Cook University	19	11	30
School of Hotel and Tourism Management, Hong Kong Polytechnic University	14		14
Simon Fraser University	13		13
State University System of Florida		18	18
Texas A&M University	15		15
Universitat D Alacant		11	11
University of California System		12	12
University of Florida	12	9	21
University of North Carolina		11	11
University of Queensland	16	13	29
University of Strathclyde		10	10
Total	**155**	**122**	**277**

MAIN COUNTRIES

The number of articles distributed by significant countries is shown in Table 5.

It was noted that the countries with most articles published were European countries, United States, Australia, and China. It should be noted that there is an inevitable centralization of articles published in these areas and will, therefore, be an area of interest for research. In continental terms, it can be noted a predominance of Europe as the source of publications.

Table 5. Distribution of articles by country

Turkey	31	20	51
United Kingdom	148	64	212
United States	224	129	353
Total	**1271**	**762**	**2033**

MAIN LANGUAGES

The papers published in the study area are published in English, 773 in the Web of Science, and 1305 in Scopus, as shown in Table 6, corresponding to 95.54% of the works.

Table 6. Distribution of articles by language

Language	Scopus	WoS	Total
Arabic	1		1
Chinese	29	2	31
Croatian	3	1	4
English	1305	773	2078
French	7	2	9
German	3		3
Persian	4		4
Polish		3	3
Portuguese	4	6	10
Russian	5	2	7
Slovenian		1	1
Spanish	8	15	23
Turkish		1	1
Total	**1369**	**806**	**2175**

MOST USED KEYWORDS

In the articles of the study were found 50 keywords in the text related to the theme (Figure 4). The keywords represent a source of access to scientific articles, briefly present the content used in the studies.

The most used keywords were "Human Resource Management, Human Resource, Tourism, and Tourism Management," what is cohesive with the purpose of the research, and strengthens the selection of the Bibliographic Portfolio.

Figure 4. Keywords of the research articles

RELATIONSHIP AMONG THE MOST CITED ARTICLES

Tables 7 and 8 show the references of twenty articles, most cited in each database, resulting from the research carried out for the terms Management of Human Resources and Tourism.

Table 7 (WOS) shows that there are articles published in 2018, such as the work of Radjenovic, Misko that did not reach an expressive number of citations, allowing us to infer that such an article was not highlighted in the academy, and therefore, did not have a significant influence on researchers working on the Management of Human Resources and Tourism issues.

Table 7 (WOS) also highlights four publications (from the years 2009, 2008, 2007, and 2010) that obtained the highest number of citations, which suggests that their content reached greater relevance with researchers in the area.

In the years 2010 and 2007, two publications stand out, obtaining the highest number of citations, as shown in Table 8 (Scopus), showing that researchers in the area found them essential.

The book "Employment Relations in the Hospitality and Tourism Industries," published in 2004, written by Lucas, R., professor at the Manchester Metropolitan University in UK, and the book "Human Resource Management for the Hospitality and Tourism Industries," published in 2007, written by Nickson, D., professor at the University of Strathclyde in UK, were in the ranking of the most cited articles.

The survey in the Table 8 (Scopus) showed the article, The Human Dimension: A review of human resources management issues in the tourism and hospitality industry is ranked in the 1st position with 198 citations.

The article "Human resources in tourism: Still waiting for change" published in the Journal of Tourism Management, written by Baum, T., in the year 2007, was the most cited on both databases with 192 citations in Scopus and 185 citations in WoS. This paper revises key themes impacting on the role and the management of human resources in tourism, considering the status of work within the tourism sector and reflects the impact that critical environmental developments had on the practice of human resource management in contemporary tourism.

FINAL CONSIDERATIONS

The present study knowing the importance of human resources management and tourism, sought to answer the question, "What are the contributions of the international publications on human resources management and tourism in the Web of Science and Scopus databases in the last two decades?" Aiming this, the characteristics of the national and international scientific production that report the theme of "human resources management tourism" were analysed. In order to reach the goal, bibliometric research was carried out in both databases, obtaining 2175 publications, 806 in the Web of Science and 1365 publications in Scopus, related to these themes.

However, the diversity of the research area of the authors and the educational institutions of origin indicates how important are the different views of the sector and their relationship with tourism, which contributes to criticism about Human Resources Management and Tourism, even if not all the works are directly related to the study of tourism. The data reveal that there is a diversification of scientific production on Human Resources Management and Tourism, benefiting directly and indirectly the related sectors, as well as contributing to the quality of tourism-related intellectual production.

Table 7. Articles in number of citations (WOS)

Nr. Citations WoS	Title	Author	Journal	Year
199	Impacts of local human activities on the Antarctic environment	Tin, T.; Fleming, Z.L.; Hughes, K.A.; Ainley, D.G.; Convey, P.; Moreno, C.A.; Pfeiffer, S.; Scott, J.; Snape, I.	*Antarctic Science* 21(1), 3-33	2009
185	Can ecotourism interpretation really lead to pro-conservation knowledge, attitudes and behaviour? Evidence from the Galapagos islands	Powell, R.B.; Ham, S.H.	*Journal of Sustainable Tourism* 16(4), 467-489	2008
185	Human resources in tourism: Still waiting for change	Baum, T.	*Tourism Management* 28(6), 1383-1399	2007
179	The Human Dimension A Review of Human Resources Management Issues in the Tourism and Hospitality Industry	Kusluvan, S.; Kusluvan, Z.; Ilhan, I.; Buyruk, L.i	*Cornell Hospitality Quarterly* 51(2), 171-214	2010
142	Integrated quality management for tourist destinations: a European perspective on achieving competitiveness	Go, FM; Govers, R	*Tourism Management* 21(1), 79-88	2000
135	Health in Southeast Asia 5 Human resources for health in southeast Asia: shortages, distributional challenges, and international trade in health services	Kanchanachitra, C.; Lindelow, M.; Johnston, T.; Hanvoravongchai, P.; Lorenzo, F.M.; Nguyen, L.H.; Wilopo, S.A.; dela Rosa, J.F.	*Lancet* 377(9767), 769-781	2011
84	Hotels' environmental policies and employee personal environmental beliefs: Interactions and outcomes	Chou, C.-J.	*Tourism Management* 40, 436-446	2014
72	Human resources in tourism: Still waiting for change? - A 2015 reprise	Baum, T.	*Tourism Management* 50, 204-212	2015
61	Human resource management, institutionalization and organizational performance: a comparison of hospitals, hotels and local government	Boselie, P; Paauwe, J; Richardson, R	*International Journal of Human Resource Management* 14(8), 1407-1429	2003
40	Hotel development in China: a review of the English language literature	Kong, H.; Cheung, C.	*International Journal of Contemporary Hospitality Management* 21(3), 341-355	2009
39	Implications of the Internet - an analysis of the Aragonese hospitality industry, 2002	Garces, SA; Gorgemans, S; Sanchez, AM; Perez, MP	*Tourism Management* 25(5), 603-613	2004
21	Strategic human resources management research in hospitality and tourism A review of current literature and suggestions for the future	Madera, J.M.; Dawson, M.; Guchait, P.; Belarmino, A.M.	*International Journal of Contemporary Hospitality Management* 29(1), 48-67	2017
17	General self-efficacy's effect on career choice goals via vocational interests and person-job fit: A mediation model	Song, Z.; Chon, K.	*International Journal of Hospitality Management* 31(3), 798-808	2012
12	Responsible tourism that creates shared value among stakeholders	Camilleri, M. A.	*Tourism Planning & Development* 13(2), 219-235	2016
10	How to influence hospitality employee perceptions on hotel brand performance?	Cheung, C.; Kong, H.; Song, H.	*international journal of contemporary hospitality management* 26(8), 1162-1178	2014
8	Influence of Creativity and Social Capital on the Entrepreneurial Intention of Tourism Students	Chia, C.-C.; Liang, C.	*Journal of Entrepreneurship Management and Innovation* 12(2), 151-167	2016
7	Work-family studies in the tourism and hospitality contexts	Zhao, X. (Roy)	*International Journal of Contemporary Hospitality Management* 28(11), 2422-2445	2016
6	The valuation of skill and the configuration of HRM	Riley, M.; Szivas, E.	*Tourism Economics* 15(1), 105-120	2009
3	The quality of human resources in tourism and hospitality industry in Montenegro	Radjenovic, M.	*Transformations In Business & Economics* 17(2), 86-94	2018

Table 8. Main articles in number of citations (Scopus)

Nr. Citations Scopus	Title	Author	Journal	Year
198	The human dimension: A review of human resources management issues in the tourism and hospitality industry	Kusluvan, S., Kusluvan, Z., Ilhan, I., Buyruk, L	*Cornell Hospitality Quarterly* 51 (2), 171-214.	2010
192	Human resources in tourism: Still waiting for change	Baum, T	*Tourism Management* 28 (6), 1383-1399.	2007
154	Integrated quality management for tourist destinations: A European perspective on achieving competitiveness	Go, F.M., Govers, R.	*Tourism Management* 21 (1), 79-88	2000
137	Promoting service quality in tourist hotels: The role of HRM practices and service behavior	Tsaur, S.-H., Lin, Y.-C.	*Tourism Management* 25 (4), 471-481	2004
83	Hotels' environmental policies and employee personal environmental beliefs: Interactions and outcomes	Chou, C.-J	*Tourism Management* 40, 436-446	2014
82	Human resources in tourism: Still waiting for change? - A 2015 reprise	Baum, T.	*Tourism Management* 50, 204-212	2015
71	Human resource management, institutionalization and organizational performance: A comparison of hospitals, hotels and local government	Boselie, P., Paauwe, J., Richardson, R.	*International Journal of Human Resource Management* 14 (8), 1407-1429	2003
65	Human resources issues facing the hotel and travel industry in China	Qiu Zhang, H., wu, E.	*International Journal of Contemporary Hospitality Management* 16 (7), 424-428	2004
62	Employment relations in the hospitality and tourism industries	Lucas, R.	Book 1-306	2004
60	Developing graduate managers for hospitality and tourism	Littlejohn, D., Watson, S.	*International Journal of Contemporary Hospitality Management* 16 (7), 408-414	2004
58	Significant developments and emerging issues in human resource management	Lucas, R., Deery, M.	*International Journal of Hospitality Management* 23 (5), 459-472	2004
54	Testing the stressor-strain-outcome model of customer-related social stressors in predicting emotional exhaustion, customer orientation and service recovery performance	Choi, C.H., Kim, T.T., Lee, G., Lee, S.K.	*International Journal of Hospitality Management* 36, 272-285	2014
54	Seasonality in tourism employment: Human resource challenges	Jolliffe, L., Farnsworth, R.	*International Journal of Contemporary Hospitality Management* 15 (6), 312-316.	2003
51	Work-family conflict, work-family facilitation, and job outcomes in the Korean hotel industry	Choi, H.J., Kim, Y.T.	*International Journal of Contemporary Hospitality Management* 24 (7), 1011-1028	2012
46	Human resource management for the hospitality and tourism industries	Nickson, D.	Book 1-305	2007
45	Human resource management and developing proactive environmental strategies: The influence of environmental training and organizational learning	Vidal-Salazar, M.D., Cordón-Pozo, E., Ferrón-Vilchez, V.	*Human Resource Management* 51 (6), 905-934	2012
45	Migrant networks, language learning and tourism employment	Janta, H., Lugosi, P., Brown, L., Ladkin, A	*Tourism Management* 33 (2), 431-439.	2012
45	Small tourism firms and management practices in New Zealand: The Centre Stage Macro Region	Ateljevic, J.	*Tourism Management* 28 (1), 307-316	2007
45	The effects of nepotism on human resource management: The case of three, four and five star hotels in Northern Cyprus	Arasli, H., Bavik, A., Ekiz, E.H.	*International Journal of Sociology and Social Policy* 26 (7-8), 295-308.	2006
43	Illuminating happy-low and unhappy-high performing frontline service employees	Hsiao, J.P.-H., Jaw, C., Huan, T.-C., Woodside, A.G.	*International Journal of Contemporary Hospitality Management* 27 (4), 608-647	2015

This study understands the need for more production about Human Resources Management and Tourism, which was based on the importance of one segment to the other, as well as the infinite possibilities of incremental actions allowing a mutual benefit between these activities. Thus, seeking to identify the academic links between the management of human resources and tourism, the present study had as its objective in analysing the characteristics of publications related to the themes of human resources management and tourism and how those matters had been approached by the academy, jointly. Bibliometric research sought to combine the themes, management of human resources, and tourism.

It has been noted that from the 20 most cited articles in each database, six articles are shown in both the Web of Science and Scopus. It was also noticed that, from the ten authors that published more on the subject in both databases, one in Scopus and four in the Web of Science, is mentioned in the list of the most cited authors, being Baum, T. the most cited in both databases.

Co-author Hughes, K.A, from the most cited article in the Web of Science, with an impact on local human activities in the Antarctic environment, is among the ten most published authors on the subject during the period of the study. Kusluvan, S., Kusluvan, Z., Ilhan, I., Buyruk, L, wrought the most cited paper in Scopus, "the human dimension": A review of human resources management issues in tourism and hospitality industry, published in journal Cornell Hospitality Quarterly, are not among the ten most published authors on the subject during the period of the study.

It was also verified that, in both databases, the United States lead the ranking of the countries that published the most on the subject, and the English language is predominant in the publications. It is noteworthy that publications on the subject researched from Brazil and Portugal were found in the Web of Science and Scopus, which indicates that this theme has been worked by Brazilian and Portuguese researchers who seek originality in their work.

The present study found the following limitations: 1) the main limitation of this study refers to the fact that only the search term "management of human resources and tourism" was used; 2) the information available is limited to articles selected only on international databases, WOS and Scopus.

The contribution of this article to the studies in Management is due to the resulting indicators regarding the research institutions and the journals that stand out the most in the production of knowledge on the subject at an international level.

Considering that this is an important theme, results suggest that much more is to be produced in order to have a better knowledge of the inner-game of strength between the researched themes. Thus, it is suggested that for future research, it is necessary the elaboration of new analysis, enlarging the number of words, to be lined up with the theme and other that may be appropriately lined up in databases.

Moreover, analysing the literature review lead to several conclusions about the studies already carried out in the field of Human Resources Management in Tourism and hospitality sector, that in line with this research. First of all, Tsaur & Lin (2004) mention the relationship between human resource management practices, behaviour, and quality of service in tourist hotels in Taiwan, and they concluded that human resource management practices partially had a direct effect on customers 'perceptions of service quality and an indirect effect on employees' behaviour. This is related to the survey analysis as this topic is one of the most studied in the past years. For a more specific analysis Baum (2007), analysed the main factors that influence the role and management of human resources in tourism, followed by Kusluvan et al. (2010) research, that studied the employee performance.

In addition, in 2015, Baum concluded that some factors in the HRM remain global tourism challenges, reinforced by his study in 2016, which is focused in human resources sustainable management and its contribution to meet with UN 's Goals for Sustainable Development. More recently Boselie et al. (2017)

made a comparative literature review which provided insights into emerging research trends and pointed out gaps in the literature: human capital and company performance, high-performance HRM practices and performance, international/global issues and strategic HRM, individual HRM practices and performance, qualitative analyses of the human resources management literature on hospitality and tourism and country-specific strategic human resource management, in line with the conclusions of this research.

REFERENCES

Ansoff, H. I. (1977). *Estratégia empresarial* (A. Z. Sanvicente, Trans.). McGraw-Hill.

Araújo, C. A. (2006). Bibliometria: evolução histórica e questões atuais. Em Questão, 12(1), 11-32.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99–120. doi:10.1177/014920639101700108

Barney, J. B., & Arikan, A. M. (2001). The resource-based view: origins and implications. In The Blackwell handbook of strategic management. Oxford: Blackwell Publishers Ltd.

Baum, T. (2006). Human resources issues in the tourism of extreme island destinations. In G. Baldacchino (Ed.), *Extreme tourism: Lessons from the World's Cold-Water Islands*. Elsevier.

Baum, T. (2007). Recursos humanos no turismo: Ainda à espera de mudanças. *Tourism Management*, *28*(6), 1383–1399. doi:10.1016/j.tourman.2007.04.005

Baum, T. (2015). Human resources in tourism: Still waiting for change? - A 2015 reprise. *Tourism Management*, *50*, 204–212. doi:10.1016/j.tourman.2015.02.001

Baum, T., Amoah, V., & Spivack, S. (1997). Policy dimensions of human resource management in the tourism and hospitality industries. *International Journal of Contemporary Hospitality Management, 9*, 221–229.

Baum, T., Cheung, C., Kong, H., Kralj, A., Mooney, S., Thi Thanh, H. N., Ramachandran, S., Ružic, M. D., & Siow, M. L. (2016). Sustainability and the tourism and hospitality workforce: A thematic analysis. *Sustainability*, *8*(8), 809. doi:10.3390u8080809

Boselie, P., Paauwe, J., & Richardson, R. (2003). Human resource management, institutionalization and organizational performance: A comparison of hospitals, hotels and local government. *International Journal of Human Resource Management*, *14*(8), 1407–1429. doi:10.1080/0958519032000145828

Camps, D., Samar, M.E., Ávila, R.E., & Recuero, Y. (2006). Estudio bibliométrico de un volumen de la revista Archivos de Medicina. *Arch Med., 2*(3).

Capes – Coordenação de Aperfeiçoamento de pessoal de Nível Superior. (2017). Acervo.

Chiavenato, I. (2003). *Administração de Recurso Humano: Fundamentos Básicos* (5th ed.). Atlas.

Chou, C. J. (2014). Hotels' environmental policies and employee personal environmental beliefs: Interactions and outcomes. *Tourism Management*, *40*, 436–446. doi:10.1016/j.tourman.2013.08.001

Costa, J., Montenegro, M., & Gomes, J. (2018). What challenges and opportunities will lead to success? *Worldwide Hospitality and Tourism Themes*, *10*(6), 631–634. doi:10.1108/WHATT-08-2018-0053

Covey, S., & Huling, J. (2012). The 4 Disciplines of Execution: Achieving Your Wildly Important Goal*s. New York Times*.

Curcija, M., Breakey, N., & Driml, S. (2019). Development of a conflict management model as a tool for improved Project outcomes in community based tourism. *Tourism Management*, *70*, 341–354. doi:10.1016/j.tourman.2018.08.016

Dessler, G. (2003). *Administração de recursos humanos*. Prentice Hall.

Evans, G. W., Wells, N. M., & Moch, A. (2003). Housing and mental health: A review of the evidence and a methodological and conceptual critique. *The Journal of Social Issues*, *V59*(3), 475–500. doi:10.1111/1540-4560.00074

Fleury, M. T. L. (2002). *As Pessoas na Organização*. Gente.

Fonseca, E. N. (Org.). (1986). Bibliometria: teoria e prática. Cultrix/EDUSP.

Fox, D., Byrne, V., & Rouault, F. (1999). Performance improvement: What to keep in mind. *Training & Development*, *53*, 38–54.

Freitas, J. C. T. (2012). *Estratégia Organizacional: Utilizando a política de Treinamento e Desenvolvimento como Vantagem Competitiva*. IX Seget – Simpósio de Excelência em Gestão Tecnologia.

Gannon, J., & Johnson, K. (1995). The global hotel industry: The emergence of continental hotel companies. *Progress in Tourism and Hospitality Research*, *1*(1), 31–42.

Girardi, D. (2008). *Da seção de pessoal a gestão estratégica de pessoas: consultoria interna de recursos humanos*. Pandion.

Go, F. M., & Govers, R. (2000). Integrated quality management for tourist destinations: A European perspective on achieving competitiveness. *Tourism Management*, *21*(1), 79–88. doi:10.1016/S0261-5177(99)00098-9

Hall, M. (2011). Publish and perish? Bibliometric analysis, journal ranking and assessment of research quality in tourism. *Tourism Management*, *32*(1), 16–27. doi:10.1016/j.tourman.2010.07.001

Jiang, K., Lepak, P. D., Jia Hu, J., & Baer, J. C. (2012). How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. *Academy of Management Journal*, *55*(6), 1264–1294. doi:10.5465/amj.2011.0088

Kusluvan, S., Kusluvan, Z., Ilhan, I., & Buyruk, L. (2010). The Human Dimension: *A Review of Human Resources Management Issues in the Tourism and Hospitality Industry. Cornell Hospitality Quarterly*, *51*(2), 171–214. doi:10.1177/1938965510362871

Leite Filho, G. A. (2008). Padrões de produtividade de autores em periódicos e congressos na área de contabilidade no Brasil: Um estudo bibliométrico. *Revista de Administração Contemporânea, Curitiba*, *12*(2), 533–554. doi:10.1590/S1415-65552008000200011

Lepak, D., Liao, H., Chung, Y., & Harden, E. (2006). A Conceptual Review of Human Resource Management Systems in Strategic Human Resource Management Research. Research in Personnel and Human Resources Management, 25, 217-271. doi:10.1016/S0742-7301(06)25006-0

Mahoney, J., & Pandian, R. (1992). The resource-based view within the conversation of strategic management. *Strategic Management Journal*, *13*(5), 363–380. doi:10.1002mj.4250130505

Marchioli, A., Soligo, K., Silva, L, & Fonseca, B.G. (2018). A gestão de recursos humanos como estratégia nas empresas. *Revista União das Faculdades dos Grandes lagos*, *1*(1).

Marinho, C. R. P., Marinho, R. C. P., Carvalho, C. A. S., & Gutierrez, R. H. (2014). *Competência e Aprendizagem: Perspectivas Estratégicas orientadas à vantagem competitiva sustentável*. X Ceneg – Congresso Nacional de Excelência em Gestão.

Milano, C. (2018). Overtourism, malestar social y turismofobia. Un debate controvertido. Escuela Universitaria de Turismo Ostelea Universidad de Lleida (España). PASOS. *Revista de Turismo y Patrimonio Cultural.*, *16*(3), 551–564. doi:10.25145/j.pasos.2018.16.041

Motta, P. R. (1991). *Gestão contemporânea: a Ciência e a arre de ser dirigente*. Record.

Netto, L. G. P. (2017). *O que é turismo*. Editora Brasileiense.

Neves, J. G. (2007). Human Resources Management: Evolution of the problem in terms of concepts and practices. In Human Resources Management: Contexts, processes and techniques. Lisbon: Editora RH.

Okubo, Y. (1997). *Bibliometric Indicators and Analysis of Research Systems: Methods and Examples*. OECD Science, Technology and Industry Working Papers, 1997/01. OECD Publishing.

Pawson, S., D'Arcy, P., & Richardson, S. (2017). The value of community-based tourism in Banteay Chhmar, Cambodia. *Tourism Geographies*, *19*(3), 378–397. doi:10.1080/14616688.2016.1183143

Pickles, L., Bookbinder, S., & Watts, C. (1999). Building the HR value Chain. *Employment Relations Today*, *25*(1), 21-3.

Rego, A., Sousa, F., Marques, C., & Cunha, P. M. (2012). Authentic leadership promoting employees' psychological capital and creativity *Journal of Business Research, 65*, 429-437.

Rodrigues, A. M. A. (2000). Desenvolvimento sustentável e atividade turística. In C. Serrano (Ed.), *Olhares contemporâneos sobre o turismo* (pp. 171–188). Papirus.

Rousseau, R. (2001). Indicadores bibliométricos y econométricos en la evaluación de instituciones científicas. *Acimed*, *9*, 23–29.

Silva, M. R. (2004). *Análise bibliométrica da produção científica docente do programa de pós-graduação em educação especial/UFSCar.* Dissertação (Mestrado em Educação Especial) - Universidade Federal de São Carlos, São Carlos, Brasil.

Silva, R. O. (2002). *Teorias da Administração*. Pioneira Thomson Learning.

Tsaur, S.-H., & Lin, Y.-C. (2004). Promoting service quality in tourist hotels: The role of HRM practices and service behavior. *Tourism Management*, *25*(4), 471–481. doi:10.1016/S0261-5177(03)00117-1

Ulrich, D. (2000). *Recursos humanos estratégicos: novas perspectivas para os profissionais de RH*. Futura.

Veal, A. J. (2011). Research methodology in leisure and tourism. Sao Paulo: Aleph.

Chapter 4
Entrepreneurship Embedding Social Network Capability as Best Practice for Small Firms: Some Evidence From a Small Sportswear Retailer in Italy

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ABSTRACT

The rapid development of information communication technology (ITC) has opened up potential new marketing channels, and the enterprises must keep abreast of the evolution of the context and start operating with a multichannel approach, that is, with the interaction of various different marketing channels. It is in this perspective that the work examines a small Italian sportswear retailer operating locally. Said retailer has achieved a very significant market position in its sector of expertise thanks to the use of the social networks. For this purpose, information will be acquired from questionnaires filled out by consumers in the aim of highlighting the marketing instruments and activities that give rise to adequate customer satisfaction. The analysis of the results will make it possible to identify the capabilities which, via appropriate integration of the tools made available by the internet, suggest the best practices for small businesses.

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INTRODUCTION

The evolution of the digital world has forced businesses and consumers to face a new and complex challenge (Peretti, 2011).

As far as enterprises are concerned, this development of technologies has brought about a radical change in the paradigm of marketing and communications. In fact, many authors define this phase as the transition from traditional marketing, implemented through such means as television, printed media, radio, cinema, billboards, etc., to a digital type of marketing which has become possible thanks to the use of internet.

On the other hand instead, consumers have drastically changed their behaviour, and as a result, also their purchasing processes (Peretti, 2011).

Organisations now find themselves having to compete in a world where the role of the consumers has changed and where the digital media have taken over. This situation, as affirmed by numerous digital communication experts, has mainly been determined by the following four phenomena (Peretti, 2011):

- The evolution of Internet and its diffusion in terms of penetration;
- The explosion of the social networks;
- The decline in the traditional communication media;
- The changes in consumer behaviour.

As explained by previous authors, the concept of entrepreneurship is the process via which individuals pursue opportunities without considering the resources they are controlling at a given time (Song, 2015). The subjects at the head of an organisation may come up against obstacles when using their own resources which often prove to be insufficient for achieving their goal.

This shortcoming may be overcome, at least partially, by correct exploitation of the social networks. Nowadays, there is the widespread opinion that these digital instruments are largely linked to the success of entrepreneurs who, by making accurate use of the same, can acquire knowledge of relevant information which allows them to gain advantages over the competition while bearing costs that are almost equal to zero. (Olanrewaju, Hossain, Whiteside & Mercieca, 2020). These platforms are used above all by individuals and companies for interacting and maintaining and expanding their professional networks in order to build relationships for the exchange of information and work collaboration (Song, 2015).

The rapid development of Information Communication Technology (ITC) has opened up potential new marketing channels, and the enterprises must keep abreast of the evolution of the context and start operating with a multichannel approach, that is, with the interaction of various different marketing channels (Chen & Lamberti, 2016).

It is in this perspective that the present work examines a small Italian sportswear retailer operating locally. Said retailer has achieved a very significant market position in its sector of expertise thanks to the use of the social networks.

For this purpose, information will be acquired from questionnaires filled out by consumers in the aim of highlighting the marketing instruments and activities that give rise to adequate customer satisfaction.

The analysis of the results will make it possible to identify the capabilities which, via appropriate integration of the tools made available by the Internet, suggest the best practices for small businesses.

Indeed, a factor that has had a great influence in determining the current scenario is the change in the attitude of consumers who have become increasingly more demanding and unpredictable in their choices

since they are now able to avail of greater information when evaluating a given product and therefore make a direct comparison with what the competition is offering (Peretti, 2011).

In this chapter, consumer behaviour regarding the use of social networks and their influence on purchasing decisions is analysed by taking four different constructs into account, namely, the motivation, attitudes, involvement and purchase intentions of consumers (Le Roux & Maree, 2016).

The motivations that encourage a given subject to become a member of a certain brand community on Facebook, or any other social network, may be either hedonistic or utilitarian in nature (Le Roux & Maree, 2016).

Hedonistic motivations refer to the search for entertainment, games, pastimes, exercise, or social commitment, that is, everything that can give pleasure.

On the other hand, utilitarian motivations refer to the efficiency, effectiveness, and realisation of a specific objective, meaning everything that is functional to the consumer (Le Roux & Maree, 2016).

The motivations tend to influence the attitude and involvement of consumers.

When speaking about attitudes we are referring to positive or negative attitudes that develop over time and which can lead to either acceptance or aversion towards a specific brand by consumers. They are usually influenced by having purchased the product or by information received from the media or third parties. It often happens that continuous exposure to stimuli gives rise to a favourable evaluation and positive attitudes towards the brand. The latter will most likely encourage the consumer to make the purchase (Le Roux & Maree, 2016).

Involvement, instead, finds its conceptual basis in the interactive experience and the value of co-creation in traditional marketing. Consumers are often involved in actions such as giving advice and assistance to other consumers, writing reviews, and participating in online forums (Le Roux & Maree, 2016).

In order to achieve the goal, the questionnaire developed investigates consumers also in relation to the retailer's reactivity, online shopping on Facebook, the recommendations provided by other consumers and friends, trust in retailers, and the behaviour and loyalty intentions shown towards them (Nadeem, Andreini, Salo & Laukkanen, 2015).

The questionnaire also concerns the consumers' use of and attitudes towards the social networks.

Online retailers are concerned about how the involvement affects trust and loyalty.

Trust is a key issue for those operating on the market who want to establish long-term relationships with customers by receiving information and answers they can use in the future. Furthermore, this aspect is influenced by the recommendations made by customers. As shown by previous research, people are more likely to trust information provided by other consumers rather than information given by companies (Nadeem et al., 2015); this means that retailers must pay attention to the phenomenon of recommendations expressed by customers through the social media, as well as their attitude towards these platforms, in order to pursue a goal of adequate competitive positioning on the market.

BACKGROUND WITH LITERATURE REVIEW OF RETAILERS AND SOCIAL NETWORKS: MARKETING ACTIVITIES, DIGITALISATION AND ENTREPRENEURSHIP

In this section authors examine contributions made by literature to the three different areas of interest:

1. The first area examines contributions made by literature to the utilization of social networks by retailers and their digital marketing activities;
2. The second area concerns retailer entrepreneurship and the social network development;
3. The third area addresses the role of the customers and the application of social networks for retailers.

DIGITAL MARKETING AND THE SOCIAL NETWORKS

The evolution of the digital world has forced businesses and consumers to face a new and complex challenge (Peretti, 2011).

As far as enterprises are concerned, this development of technologies has brought about a radical change in the paradigm of marketing and communications. In fact, many authors define this phase as the transition from traditional marketing, implemented through such means as television, printed media, radio, cinema, billboards, etc., to a digital type of marketing which has become possible thanks to the use of internet.

On the other hand, instead, consumers have drastically changed their behaviour, and as a result, also their purchasing processes (Peretti, 2011).

Organisations now find themselves having to compete in a world where the role of the consumer has changed and where the digital media has taken over. This situation, as affirmed by numerous digital communication experts, has mainly been determined by the following four phenomena (Peretti, 2011):

- The evolution of Internet and its diffusion in terms of penetration;
- The explosion of the social networks;
- The decline in the traditional communication media;
- The changes in consumer behaviour.

The rapid development of Information Communication Technology (ITC) has opened up potential new marketing channels, and the enterprises must keep abreast of the evolution of this context and start operating via interaction with various different marketing channels (Chen & Lamberti, 2016).

Thanks to the www (World Wide Web), the growth of online networks in terms not only of numbers of computers connected, but also and above all, of their way of being and expressing themselves through the websites, has given rise to multiple use methods which avail of increasingly more user-friendly devices such as smartphones, laptops, tablets, and iPads (Peretti, 2011).

With the penetration of Internet, social networks have also sprung up, digital platforms that allow those registered to share opinions, experiences, information, and ideas in a very simple manner. The largest social network, Facebook, created by Mark Zuckerberg in 2004, is now the most widely used with more than one billion active users (Peretti, 2011). Social media have entered to form part of the daily life of consumers, who also declare to be influenced in their decision-making when purchasing products. Thanks to the social media, a new marketing method has been created that allows enterprises to interact directly with the consumer, improving the products and services offered based on the latter's tastes and needs. (Lin, Wang & Hajli, 2019; Simonova,Popov & Komarova, 2020).

Another factor that has had a huge influence in determining the current scenario is the change in attitude of consumers who are have become increasingly more demanding and unpredictable in their choices as they are now able to evaluate a specific product with more information on hand, as well as

making a direct comparison with what the competition is offering (Willems,Smolders,Brengman,Luyten & Schöning,2017; Peretti, 2011).

Social networks are defined by many experts as web-based services that allow individuals to build their own public profile within a platform which includes all the other subjects who have registered and with whom it is possible to establish a relationship through the sharing of thoughts, knowledge and different types of information, such as photos, videos and audio files (Song, 2015).

Their rapid diffusion has only been possible thanks to the introduction of broadband internet which has made surfing on the web much faster and cheaper.

Initially, social networks were only used for recreational and hedonistic purposes, however, due to their success and strong penetration all over the world, they are used increasingly more by enterprises to make themselves known and advertise their products. (Lin, Wang & Hajli, 2019).

The most interesting and innovative aspect is the possibility of creating forums between consumers and brands, in which there is continuous interaction that allows companies to listen to members' requests, advice, and criticisms, thus establishing a constructive relationship with them (Le Roux & Maree, 2016).

It is extremely simple to join a brand community on Facebook or Instagram: you just need to post a "like" or become a "follower" on the relative page. This allows for taking advantage of all the information posted, such as special offers, new products marketed, and views and opinions of other users which often influence the consumers' decision to purchase. It should be borne in mind however, that in addition to being beneficial for the company, the user-friendliness of social networks in sharing opinions can also constitute an element of risk and in some cases have negative effects. In fact, consumers can freely make negative considerations about the products and the company itself on the social networks, and these observations, which are visible to all visitors to the site, represent a potential negative impact on the company image and the appeal of its services. (Loureiro, & Bilro,2020; Pfeffer, Zorbach & Carley, 2014).

The importance for companies to introduce various marketing channels to reach their customers must in any case be emphasised, and is based on the studies in literature which reveal that through synchronised multichannel marketing firms can simultaneously offer customers products, services, support combinations and related information (Chen & Lamberti, 2016).

In literature three main motivations are identified that drive an organisation to avail of this type of approach and which are not necessarily mutually exclusive: economically driven motivations, customer driven motivations and competition driven motivations (Chen & Lamberti, 2016).

Economically driven motivations are mainly represented by a reduction in costs and the implementation of product lines; savings in the operating process give rise to fewer errors and reduced communication times with the advantages that some channels offer like cheaper advertising on the social networks compared to the traditional systems that include leafletting and use of the mass media, e.g. ratio, TV and printed media (Chen & Lamberti, 2016).

Instead, customer driven motivations are dictated by the fact that via use of the multichannels, companies are convinced they can gain information about the strengths and weaknesses of their various competitors, as well as discovering the tastes and demands of consumers, in this way managing to offer increasingly more differentiated and personalised products with excellent value for money (Chen & Lamberti, 2016).

The use of marketing multichannels, as previously highlighted by researchers (Chen & Lamberti, 2016), can be implemented by availing of various instruments not necessarily used together, and characterised by different functions:

- **Mass Media:** Used mainly to provide practical information about the products and services offered, but capable of carrying out transactional tasks via ordering from catalogues and shopping TVs; not suitable for establishing relationships with customers;
- **Stores:** Their main function is that of carrying out the transactions, but at the same time however, they are effective tools for maintaining customer relations;
- **Call Centres:** They provide technical support and assistance and take care of practical communication;
- **Sector-Specific Initiatives:** They provide platforms for the companies wishing to give visibility to their products;
- **Websites:** Excellent for providing an information service and establishing relationships with customers;
- **Social Networks:** The main channels for creating and maintaining customer relations;
- **Text Messages and Emails:** They are used mainly to provide practical information and promotional messages;
- **Web Applications:** A rapidly developing channel capable of performing multiple functions;
- **Mobile Channels:** Extremely important for carrying out transaction functions.

Through the use of digital media and tools, businesses have developed the capacity to activate Digital Marketing, which in literature leads to the implementation of communication policies, reconnaissance, and customer contact activities, as well as the maintenance and consolidation of marketing relationships through digital channels and digital tools (Kannan, 2017; Beck, & Rygl,2015; Narayana,2018; Karatum,2017; Souiden,Ladhari & Chiadmi, 2018).

In the light of these considerations, it should be noted that a company that manages to correctly use a plurality of marketing channels on a modern, extremely dynamic and demanding market has a greater potential for achieving more competitive advantages compared to other organisations that do not use them (Lindsey-Mullikin & Borin, 2017; Simonova,Popov & Komarova, 2020).

ENTREPRENEURSHIP AND THE SOCIAL NETWORKS

As explained by previous authors, the concept of entrepreneurship is the process via which individuals pursue opportunities without considering the resources they are controlling at a given time (Song, 2015). The subjects at the head of an organisation may come up against obstacles when using their own resources which often prove to be insufficient for achieving their goal.

This shortcoming may be overcome, at least partially, by correct exploitation of the social networks. (Simonova,Popov & Komarova, 2020). Nowadays, there is the widespread opinion that these digital instruments are largely linked to the success of entrepreneurs who, by making accurate use of the same, can acquire knowledge of relevant information which allows them to gain competitive advantages over the competition while bearing costs that are almost equal to zero (Olanrewaju et al., 2020). These platforms are used above all by individuals and companies for interacting and maintaining and expanding their professional networks in order to build relationships for the exchange of information and work collaboration (Song, 2015).

According to some scholars, social networks are tools that can directly improve company performance through the construction of trust-based relationships, (Simonova,Popov & Komarova, 2020), information

transfer, and problem-solving agreements (Song, 2015;Lindsey-Mullikin & Borin, 2017). In addition, they make it possible to create "bridges" among groups of close friends, with decisive advantages, especially in a phase of activity which is already underway, as they allow for benefiting from other user groups surrounding the circle of close friends and therefore also from the resources that the latter can provide. As reported in literature, the extent of these resources varies depending on certain elements such as the frequency of contacts, the emotional intensity of the relationships, the mutual commitment among the actors involved, and the degree of intimacy (Song, 2015; Lindsey-Mullikin & Borin, 2017; (Olanrewaju et al., 2020).

Therefore, being present on social network platforms like Facebook can constitute a distinctive resource for the company, provided the entrepreneur is able to adapt his/her behaviour to the new scenario. (Simonova,Popov & Komarova, 2020). It should be borne in mind however, that in addition to being beneficial for the company, the user-friendliness of social networks in sharing opinions can also constitute an element of risk and in some cases have negative effects. In fact, consumers can freely make negative considerations about the products and the company itself on the social networks, and these observations, which are visible to all visitors to the site, represent a potential negative impact on the company image and the appeal of its services. (Loureiro, & Bilro,2020; Pfeffer, Zorbach & Carley,2014).

In particular, in this situation it is extremely important for the entrepreneur to have the capacity to perceive the opportunity of the social media resources, represented by social interactions (a very high number of contacts, in different and distant geographical areas, in instantaneous terms) that can be activated by the company, in conjunction with the contribution of users via a variety of new sources of online information that are generated, disseminated and used by consumers, with the intention of educating others with regard to the companies' services, products, brands and personalities (Mangold & Faulds, 2009; Lam,Yeung,Lo & Cheng,2019; Olanrewaju et al., 2020). The perception of the opportunities to be turned into the creation of value calls for motivation and the presence of entrepreneurial skills aimed at integrating valid operationalisation of the company's resources. (Lam et al.,2019; Olanrewaju et al., 2020). In fact, adequate capabilities allow the company to activate a marketing intelligence for getting to know the customers' needs and requirements, for acquiring information in order to establish relationships of mutual trust, and for making the promotion and information process efficient and effective (Demil, Lecocq, Ricart & Zott,2015).

CUSTOMERS AND THE SOCIAL NETWORKS

A factor that has had a great influence in determining the current scenario is the change in the attitude of consumers who have become increasingly more demanding and unpredictable in their choices since they are now able to avail of greater information when evaluating a given product and therefore make a direct comparison with what the competition is offering (Peretti, 2011).

In literature, consumer behaviour regarding the use of social networks and their influence on purchasing decisions is analysed by taking four different constructs into account, namely, the motivation, attitudes, involvement and purchase intentions of consumers (Le Roux & Maree, 2016).

The motivations that encourage a given subject to become a member of a certain brand community on Facebook, or any other social network, may be either hedonistic or utilitarian in nature (Le Roux & Maree, 2016; Sigurdsson et al., 2020).

Hedonistic motivations refer to the search for entertainment, games, pastimes, exercise or social commitment, that is, everything that can give pleasure.

On the other hand, utilitarian motivations refer to the efficiency, effectiveness, and realisation of a specific objective, meaning everything that is functional to the consumer (Le Roux & Maree, 2016).

The motivations tend to influence the attitude and involvement of consumers.

When speaking about attitudes we are referring to positive or negative attitudes that develop over time and which can lead to either acceptance or aversion towards a specific brand by consumers. They are usually influenced by having purchased the product or by information received from the media or third parties. Therefore, negative information can also drastically reduce the company's image and the appeal of its services. (Loureiro, & Bilro,2020; Pfeffer, Zorbach & Carley,2014; Casado-Díaz, Beckmann & Miller,2020).

On the other hand, in literature it is highlighted how it often happens that continuous exposure to positive stimuli gives rise to a favourable evaluation and positive attitudes towards the brand. The latter will most likely encourage the consumer to make the purchase (Le Roux & Maree, 2016).

Involvement, instead, finds its conceptual basis in the interactive experience and the value of co-creation in traditional marketing. Consumers are often involved in actions such as giving advice and assistance to other consumers, writing reviews and participating in online forums (Le Roux & Maree,2016; Sigurdsson et al., 2020).

Online retailers are concerned about how the involvement affects trust and loyalty.

Trust is a key issue for those operating on the market who want to establish long-term relationships with customers by receiving information and answers they can use in the future. Furthermore, this aspect is influenced by the recommendations made by customers. As shown by previous research, people are more likely to trust information provided by other consumers rather than information given by companies (Nadeem et al., 2015; Lindsey-Mullikin & Borin, 2017); this means that retailers must pay attention to the phenomenon of recommendations expressed by customers through the social media, as well as their attitude towards these platforms, in order to pursue a goal of adequate competitive positioning on the market.

Loyalty represents a favourable attitude of consumers towards a brand, which results in the purchase of the product or service offered. In addition to positive behaviours, loyalty towards a brand is also built through feelings, which the individual begins to experience every time he/she sees or buys a particular item bearing that brand (Nadeem et al., 2015; Lindsey-Mullikin & Borin, 2017).

The last construct, the purchasing intention, is a predictor of behaviour and refers to the intention that a certain subject has of buying a branded product. It follows that if a consumer is strongly intentioned, he/she will most probably make the purchase.

According to some surveys it is possible to observe a strong relationship between hedonistic motivations and attitude towards the brand, while utilitarian motivations do not present the same situation. In addition, there is a strong link between brand attitude and the intention to purchase (Le Roux & Maree, 2016).

It is also pointed out in literature that trust in the e-tailer is explained by the quality of the website and online shopping via Facebook; the attitude is linked to trust and loyalty intentions towards the retailer (Nadeem et al., 2015). Furthermore, there are no major differences in the approach to online shopping as far as males and females are concerned. In the light of these results it is possible to observe the importance of investing in online marketing activities in order to build solid and lasting relationships with customers.

SOCIAL NETWORKS AND RETAILING: SOME FINDINGS FROM A SMALL SPORTSWEAR RETAILER IN ITALY.

The experimental part of this work consists of a survey targeting customers of the retail enterprise called "Fuorigioco".

This store, located in Camaiore (LU), Italy, can boast one of the richest assortments of sporting goods in Versilia.

Opened in the summer of 2011 thanks to the initiative of Marco Dini, former amateur soccer player and well-known personality in this area, "Fuorigioco" was successful right from the start due to the high quality of the products offered and the presence of the owner, always on hand to advise customers.

It stocks more than 150 models of soccer boots, as well as other accessories for playing Italy's best-loved sport (goalies' gloves, shin guards, shorts, thermal outfits, tracksuits, and much more).

Due to the considerable specialisation in this sector, the owner can count on privileged supply relationships, as he deals directly with big manufacturers like Nike, Adidas, Asics, etc. ..., to which he sends orders online, receiving the deliveries by courier a few days later.

On interviewing the owner, it is evident that the preferred marketing tools for advertising the store and its products are the social networks since they are much cheaper than traditional channels and also more persuasive and penetrating among the target customers he intends to satisfy.

"Fuorigioco" has a Facebook page, with approximately 10 thousand "likes" (quite a lot considering that the store is found in a town with about 35 thousand inhabitants) and an Instagram profile, currently the two social platforms with the most subscribers.

In addition, it also has a very well-structured website which offers an online sales service with free shipping of items worth more than € 29.00.

This gave rise to the idea, thanks also to the owner's availability and collaboration, of creating a questionnaire focussing on the use of the social networks for promoting and selling the products. More specifically, customers were asked several questions.

Out of a total of 119 individuals who took part, only 111 finished the survey, 84.7% males (n= 94) and 15.3% females (n=17), the majority of whom (approximately 52%) were aged between 20 and 30 years, while 30% were over 30, and the under-20's represented the rest of the respondents, about 20 subjects (figure 1).

Figure 1. Age of respondents
Source: Own presentation of authors.

First Survey			
Age	tot answer	111	%
under 15 years old		3	2,70%
between 15 and 20		17	15,32%
between 20 and 30		57	51,35%
over 30 years old		34	30,63%

From a comparison with the results of previous studies (Nadeem et al., 2015; Le Roux & Maree, 2016); it was observed that the average age emerging from our survey was similar to that of the articles in literature.

Returning to the questionnaire, it can be noted in the personal information section, that the sport played the most by customers of the store is soccer, approximately 80%, while the remaining 20% is divided among sports like tennis, swimming, athletics, etc.

They were also asked to indicate their municipality of residence in order to better understand the "range of action" of Fuorigioco. It was found that 64% live in Camaiore, 12% in Viareggio and rest are divided among the neighbouring municipalities of Pietrasanta, Forte dei Marmi, Massarosa, Massa and Lucca.

Most of the respondents, approx. 70%, have known about the store ever since it opened, that is, since August 2011, while 30% have known about it for less than two years.

Almost all respondents said they had purchased from Fuorigioco at least once; the majority shop there once every 6 months (47.5%), 22% once a year, while the remaining 30% shop there at shorter intervals (every three months and even several times a month).

A careful analysis of the data shows a relationship between purchase frequency and average expenditure. In fact, the more frequent customers tend to spend smaller amounts, on average always under € 50, while for the others the average expenditure is a little higher, generally between € 50 and € 100.

As regards visits to the Facebook and Instagram fan pages, it can be observed how about 92%, therefore almost all the respondents, have visited the Fuorigioco Facebook profile at least once, while that of Instagram is followed a little less, involving only 65.5% of the respondents.

Analysing the second construct, the use of social networks. Most respondents said they connected to social platforms (Figure 2) several times every day (72.6%), spending less than 30 minutes on average each time. Only 11% said they use it once a day, while others visit their profiles more sporadically, weekly, or even monthly.

Figure 2. Average time spent on social networks
Source: Own presentation of authors.

First Survey		
Avarage time spent on Social networks	**117**	**%**
< 10 minutes	52	46,85%
between 10 and 30 minutes	45	40,54%
between 30 minutes and 1 hour	8	7,21%
between 1 and 2 hours	4	3,60%
> 2 hours	8	7,21%

The sample analysed in the study spends less time on social platforms than the respondents of previous surveys in literature (Nadeem et al., 2015).

From the results obtained in the survey, the social network used most frequently turns out to be Facebook, with 94 out of 111 regularly active users, after which we find Instagram with 73 active users, followed by LinkedIn and Twitter, which do not receive the same engagement however (6 and 10 daily users respectively).

Respondents were asked to indicate which function was performed most on the social networks and it emerged that around 70% use them mainly to share thoughts, photos, and videos, as well as to find out what others are doing.

Nevertheless, consumers did not seem to be very interested in exploiting Facebook and other social networks to make online purchases or receive advice from other users, since, with reference to the questions relating to this construct where they were asked to answer with a score ranging from 1 to 7 (1=very little; 7=a great deal), the average value observed was 4.34. It should be noted however, that this result

is higher than the average value found in the answers published in previous articles where the value was 4.01 (Nadeem et al., 2015).

The same can be said for the answers concerning the same recommendations, which, in the "Fuorigioco" survey, obtained an average score of 4.94 (Figure 3), while in previous surveys they showed a slightly lower average value of 4.53 (Nadeem et al., 2015).

Figure 3. Website service quality, online shopping via social network, peer recommendations, trust, attitude, loyalty intentions
Source: Own presentation of authors.

Fig,3 Website service quality,Online Shopping via social network,Peer Recommendations,Trust,Attitude,Loyalty intentions	First Survey	
	tot answer	avarage
Website service quality		
Fuorigioco is willing and ready to respond to consumer needs	112	5,98
The website shows a sincere interest in solving your problems?	112	5,81
Inquiries are answered promptly	112	5,98
Construct's avarage		**5,92**
Online Shopping via social network		
I'm interested in utilizing Facebook or Instagram to follow up on brands' online updates	117	5,34
I'm interested in utilizing Facebook or Instagram to browse brands I like	117	4,31
I'm interested in utilizing Facebook or Instagram for shopping for brands online	117	3,32
avarage		**4,32**
Peer Recommendations		
Recommendations make online shopping more simple	117	4,62
Recommendations lead to the desired product	117	4,87
Recommendations lead to new relevant products	117	5,34
avarage		**4,94**
Trust		
One can expect good advice from Fuorigoco's website	111	5,68
I am happy with the standards by which this website provider is operating	112	5,98
This website provider operates scrupulously	111	5,16
avarage		**5,61**
Attitude		
I would have positive feelings toward buying a product from Fuorigioco's website	112	4,6
It would be a good idea to buy a product from this website	111	4,56
avarage		**4,58**
Loyalty intentions		
I recommend Fuorigioco to someone who seeks my advice	112	6,01
avarage		**6,01**

In addition, it emerged that the retailer proves to be very competent and attentive to customer needs and is always willing to provide excellent advice as well as solve any problems, also online through the various fan pages. In order to analyse the retailer's ability and the trust that customers show towards him, they had to give a score ranging from 1 to 7 (1 = never and 7 = always) and it was found that the average value was 5.91. From a comparison with the data emerging from other analyses where the average score for this construct was less (5.53) (Nadeem et al., 2015), it can be confirmed that the results of the "Fuorigioco" survey are compliant.

The social profiles of the store are updated daily with the posting of photos of the products, special offers and sporting videos, and according to the respondents this helps make the visit very enjoyable.

Only 25% of respondents said they had purchased directly from the website at least once. This figure is not very positive, but it could be because the online sales service has only been activated recently and despite being publicised quite a lot, many people are not yet aware of it. Another reason underlying the scarce use of online shopping could derive from the fact that most of the Fuorigioco customers reside in Camaiore, for this reason they perhaps find it easier and more convenient to go directly to the store rather than buy from the website.

The results are slightly different from the analyses conducted in literature, where all respondents had made online purchases at least once, 38% buy on the internet monthly, 28% quarterly, 23% once every 6 months, and only 11% buy online once a year (Nadeem et al., 2015).

It must in any case be noted how excellent evaluations also emerged from the answers to questionnaire regarding the Facebook and Instagram fan pages, and the store website.

This popularity is also confirmed by the loyalty index. In order to measure this index, customers were asked if they were willing to recommend purchasing from the store to other people looking for certain products. Thanks to the results obtained, the owner can be satisfied with what he has achieved, as approximately 83% of customers say they are always willing to recommend "Fuorigioco" to other people looking for the latest model of soccer shoes or other accessories that allow for playing sport better.

As for the motivations underlying visits to the store's official profile, a distinction must be made between two categories: hedonistic and utilitarian. The former refers to the sentimental, recreational, fun-seeking aspects, while the latter focusses on the efficiency and effectiveness of a given action. (Sigurdsson et al., 2020).

In order to analyse the hedonistic motivations, respondents were asked to give a score from 1 to 7 to the following statements, where 1 corresponded to "totally disagree" and 7 "totally agree":

The time spent on this page has been really enjoyable.

During the visit to this page I felt really excited about hunting for new products and offers.

I really enjoy visiting this fan page.

The average scores for these three statements were 5.36, 4.88 and 5.14 respectively. These results lead us to believe that the motivations greatly encourage the consumer to spend time on the various fan pages.

As far as the utilitarian aspects are concerned, the same evaluation method was used although applied to another two statements:

While visiting the page, I found exactly what I was looking for.

I am very satisfied with the contents of this Facebook page.

Also in this case, the average scores were quite high, 5.21 and 5.16 respectively, therefore it is possible to affirm that both the hedonistic and utilitarian motivations are of fundamental importance for the customers of Fuorigioco, who keep themselves updated through the social networks.

By comparing the results obtained from the previous questionnaires in which it emerges that the hedonistic motivations had an average score of 4.45 and the utilitarian ones, 4.56 (Le Roux & Maree, 2016), it is possible to observe how the "Fuorigioco" customers are more influenced by both motivations.

One of the last constructs to be analysed concerned the consumer's engagement (Sigurdsson et al., 2020) with the store, measured mainly through online actions such as the frequency of viewing the fan pages, the reading of messages posted on them by the company, or the number of "likes" posted.

In this case, the respondents had to evaluate the questions with a score ranging from 1 to 5 (1 = never; 5 = regularly). The results showed that the average value was 3.62, while in literature the average value was 3.07 (Le Roux & Maree, 2016), and it is therefore possible to state that Fuorigioco's customers show greater engagement with the store than those interviewed in the previous survey.

In order to complete the analysis, it is also necessary to take the consumers' attitude towards "Fuorigioco" into account.

They were asked to evaluate the statements concerning the topic with a score from 1 to 7 (1 = totally disagree; 7 = totally agree).

In this case, the average value was 5.38, which proves to be in line with the value observed in the previous survey published (5.57) (Le Roux & Maree, 2016).

In 2019, Dini, the founder, sold the Fuorigioco retail business to another entrepreneur who has maintained its presence on Facebook and expanded its Twitter presence by implementing a website that now allows full exploitation of the e-tailing activity. The authors therefore carried out a customer survey to verify the social positioning of the retailer. The survey involved 37 buyers who were asked questions in line with those of the previous survey, (Figure 4) in the aim of finding out about the customer's behaviour on the web and social networks, as well as information on the ratings that customers attributed to the retailer.

Figure 4. Age of respondents
Source: Own presentation of authors.

Second Panel		
Age tot answer	37	%
under 15 years old	0	0,00%
between 15 and 20	5	13,51%
between 20 and 30	17	45,95%
over 30 years old	15	40,54%

The results of the interviews substantially confirm the results of the previous survey, where customers say they mainly use Facebook, although in this survey many also use Instagram, especially for recreational and informative purposes (Figure 5). Almost all of them know and visit the Fuorigioco pages with both hedonistic and utilitarian motivations.

Figure 5. Average time spent on Social Networks
Source: Own presentation of authors.

Second Panel		
Avarage time spent on Social network	39	%
< 10 minutes	16	14,41%
between 10 and 30 minutes	9	8,11%
between 30 minutes and 1 hour	5	4,50%
between 1 and 2 hours	5	4,50%
> 2 hours	4	3,60%

The degree of the buyers' engagement is significant, as well as the positive attitude towards the physical sales point, the social networks, and the website (Figure 6). (Beyari & Abareshi, 2018; Sigurdsson et al., 2020).

The empirical study conducted by the authors highlights the positive opinions of the respondents towards the social activity and the Fuorigioco store in both the first (Figure 7) and second surveys (Figure 8).

Figure 6. Website service quality, online shopping via the social network, peer recommendations, trust, attitude, loyalty intentions
Source: Own presentation of authors.

Fig,6 Website service quality,Online Shopping via social network,Peer Recommendations,Trust,Attitude,Loyalty intentions	Second Panel	
	tot answer	avarage
Website service quality		
Fuorigioco is willing and ready to respond to consumer needs	38	5,34
The website shows a sincere interest in solving your problems?	38	5,5
Inquiries are answered promptly	38	5,29
avarage		**5,38**
Online Shopping via social network		
I'm interested in utilizing Facebook or Instagram to follow up on brands' online updates	38	5,34
I'm interested in utilizing Facebook or Instagram to browse brands I like	39	5,23
I'm interested in utilizing Facebook or Instagram for shopping for brands online	38	5,13
avarage		**5,23**
Peer Recommendations		
Recommendations make online shopping more simple	38	4,92
Recommendations lead to the desired product	38	4,95
Recommendations lead to new relevant products	39	4,9
avarage		**4,92**
Trust		
One can expect good advice from Fuorigoco's website	36	5,61
I am happy with the standards by which this website provider is operating	37	5,54
This website provider operates scrupulously	38	5,5
avarage		**5,55**
Attitude		
I would have positive feelings toward buying a product from Fuorigioco's website	36	5,19
It would be a good idea to buy a product from this website	36	5,42
avarage		**5,31**
Loyalty intentions		
I recommend Fuorigioco to someone who seeks my advice	36	5,44
avarage		**5,44**

Figure 7. Professionality and Trust in Fuorigioco's owner
Source: Own presentation of authors.

Fig.7 Professionality and Trust of Fuorigioco's owner	First Survey	
	tot. Answer	avarage
Is the Fuorigioco's owner always ready to solve the consumer's problems?	112	6,01
Does the fFuorigioco's owner answer prompty at the consumer's request posted on Facebook or Instagram?	111	5,68
Is the Fuorigioco's owner active on social network?	110	5,96
Do you think that the Fuorigioco's fanpages help you to find out the shop?	112	4,46
The Fuorigioco's fanpage help with good reccomendations	112	5,81
Is the Fuorigioco's owner professional?	112	5,98
In the shop, can you find out actrattive products?	111	6
Is the Fuorigioco's owner able to satisfy the consumer's needs?	112	5,98
I am happy with the standards by which this website provider is operating	112	5,98

Figure 8. Professionality and Trust in Fuorigioco's owner
Source: Own presentation of authors.

Fig.8 Professionality and Trust of Fuorigioco's owner	Second Panel	
	tot. Answer	avarage
Is the Fuorigioco's owner always ready to solve the consumer's problems?	38	5,34
Does the Fuorigioco's owner answer prompty at the consumer's request posted on Facebook or Instagram?	38	5,29
Is the Fuorigioco's owner active on social network?	38	5,5
Do you think the Fuorigioco's fanpages help you to find out the shop?	38	4,87
The Fuorigioco's fanpage help with good reccomendations	36	5,61
Is the Fuorigioco's owner professional?	36	5,47
In the shop, can you find out actrattive products?	36	5,78
Is the Fuorigioco's owner able to satisfy the consumer's needs?	36	5,67
I am happy with the standards by which this website provider is operating	37	5,54

This attitude leads customers to recognise that the retailer is very competent, attentive to their needs, and always willing to solve problems and provide advice. (Figures 7 and 8). In addition, in the case of Fuorigioco, users believe that the social pages are managed with adequate frequency (daily, weekly)

and updated with materials useful to the buyer (new product photos, special offers, sports videos) with the total satisfaction of customers, 90% of whom in fact believe that they have no advice to offer the entrepreneur. These results, while not giving rise to the inclination to purchase through the social media, can still be interpreted as a high level of confidence in the retailer, as also reported in literature. (Lam et al., 2019; Lindsey-Mullikin & Borin, 2017) The trust placed by buyers in Fuorigioco is therefore expressed in the great reputation acknowledged to this distributor, testified to by the high propensity demonstrated by customers to strongly recommend this store to friends and acquaintances (average of 6 out of 7, higher than previous surveys in literature). As shown by previous research, people are more likely to trust information provided by other consumers rather than information given by companies (Nadeem et al., 2015); this means that retailers must pay attention to the phenomenon of recommendations expressed by customers through the social media, as well as their attitude towards these platforms, in order to pursue a goal of adequate competitive positioning on the market.

EXPLOITATION OF SOCIAL NETWORK OPPORTUNITY: CAPABILITIES AND BEST PRACTICE NEEDS FOR SMALL RETAILERS

Social platforms allow for the unfurling of interactions on the web that can be activated by users in large numbers, in different and distant geographical areas, and in instantaneous terms. The results can be an opportunity for the company as long as these interactions generate positive feedback about its services, products, brands, and personality. (Mangold & Faulds, 2009; Lam et al., 2019; Olanrewaju et al., 2020) It should be borne in mind, however, that social networks also generate negative information introduced by customers which, due to remaining permanently available to all users, can also lead to drastic reductions in the image of the company's products, services, brands, and personality. (Loureiro, & Bilro,2020; Pfeffer, Zorbach & Carley,2014; Casado-Díaz, Beckmann & Miller,2020) The elements described above suggest the need for the following entrepreneurial skills and abilities as well as the adoption of best practices which companies must implement in order to act successfully on the web and the social networks. These results are testified to for the first entrepreneur and also for the second entrepreneur of the Fuorigioco retail store:

1. The ability to recognize the importance of integrating various social networks such as Facebook and Instagram in interaction activities with the clientele, and to search for ways of taking advantage of a resource (social activities of users, competitors and other stakeholders) not entirely under the control of the company. (Lam et al.,2019; Demil et al., 2015);
2. The ability to be active on the social networks and to monitor the customers' needs by means of practices and skills for satisfying their curiosity and paying attention to their requests (Olanrewaju et al., 2020);
3. The ability to use the digital transformations of the commercial service provided by the web and social networks. (Simonova,Popov & Komarova, 2020). Indeed, the social networks and web have introduced a new way of creating relations between company and customer, no longer exclusively through personal contact, but rather, in a virtual manner and often in conjunction with other subjects. (Williams, M. D. (2018). Therefore, the management of the social pages for achieving full user satisfaction must be implemented through almost daily updating practices, with materials such as photos, videos and offers, all in tune with the customer's needs. (Beyari & Abareshi, 2018);

4. The ability to ensure that the high competence of the entrepreneur in his/her field of activity is perceived by the target audience by providing continuous and adequate information about the products and events through the integrated exploitation of the physical sales point, website and social networks (Lam et al., 2019);
5. The ability to ensure that reference customers perceive full satisfaction of their needs, thanks to careful and continuous monitoring both with personal contacts through the physical store, and by means of verification of feedback left by customers on the website, as well as on the social network pages. (Beyari & Abareshi, 2018).

SOLUTIONS AND RECOMMENDATIONS

In agreement with the social capital theory, social capital concerns the flows of commitment, effort, and time that individuals make available to others. (Oxoby,2009). As it accumulates, this behaviour translates into stocks of investment in norms, network and trust that improves the level of the economic system. (Wu, Huang, Chen, Daviso, & Hua,2018). Small retailers should therefore be advised to adopt social network marketing activities that implement more and more information stocks (Olanrewaju et al., 2020). In fact, the social network marketing strategy allows companies to increase communication with their clientele as well as intra-communication among customers (Jiang, Rashid, & Wang,2019; Ha, Kankanhalli, Kishan, & Huang,2016). This situation has a positive impact on the elements that make up the social capital, and namely, practices, network, and trust.

FUTURE RESEARCH DIRECTIONS

The analysis allowed authors to identify optimal solutions for marketing activities that can be implemented by small retailers via the exploitation of social networks. The solutions should in any case be subjected to careful monitoring for verifying their effectiveness more clearly, also in relation to the characteristics of limited resources and the lack of formality typical of SMEs (Harris & Deacon, 2011).

In the authors' opinion, the adoption of the marketing configurations suggested in our model leads to full exploitation of the valid positioning held by the sportswear retailer investigated and explores several elements in order to identify the pathways for implementing and developing the e-tailing activities on the social network sites, (Jiang, Rashid, & Wang,2019; Ha et al.,2016), in particular with regard to the tools that can be used to ensure adequate implementation of the digital marketing activities. (Olanrewaju et al., 2020). However, it is necessary to bear in mind all the limitations linked to the size of the interviews and the reference geographical areas. As a result, future lines of in-depth analyses could be identified with the expansion of the geographical markets and the number of retailers and purchasers examined.

CONCLUSION

This research has underscored how important it is for companies to use the social networks to acquire an adequate competitive position on the market. (Olanrewaju et al., 2020) Such integration requires the development of appropriate entrepreneurial skills and abilities. First and foremost, the retailer must be

able to understand the need to take advantage of the opportunities offered by the digital transformations, and therefore, by the presence of new technologies (internet, digital platforms, etc..) especially in the relationship between distributor and buyer. (Lam et al., 2019). In fact, we are switching from a strictly personal interaction with face-to-face contact, therefore geographically limited, to direct contact which is mediated by virtual space. Virtual space, however, greatly expands not only the geographical boundaries within which to relate to each other, but also the hours of exchanged dialogue well beyond the opening hours of a physical sales point. (Lam et al., 2019). In addition, social networks make a direct relationship possible with the company, and also among the users themselves, thus allowing for the exchange of ideas and opinions among buyers that are not directly controlled by the company. (Demil et al., 2015). Such interactions give rise to positive feedback regarding the company's services, products, brands, and personality, but at times they can also be the source of negative information introduced by customers which, due to remaining permanently available to all users, can also lead to drastic reductions in the image of the company's products, services, brands and personality (Loureiro, & Bilro, 2020; Pfeffer, Zorbach & Carley, 2014; Casado-Díaz, Beckmann & Miller, 2020).

This situation introduces the need for a change and an adapting of the entrepreneur's capacity in order to acquire the necessary skills and abilities for being able to operate in the new environment in which the customer is interlocutor, but also in concomitance and often with the co-presence of other buyers, and in this way the customer him/herself becomes a generator of information and content. (Lam et al., 2019).

REFERENCES

Beck, N., & Rygl, D. (2015). Categorization of multiple channel retailing in Multi-, Cross-, and Omni-Channel Retailing for retailers and retailing. *Journal of Retailing and Consumer Services*, *27*, 170–178. doi:10.1016/j.jretconser.2015.08.001

Beyari, H., & Abareshi, A. (2018). Consumer satisfaction in social commerce: An exploration of its antecedents and consequences. *Journal of Developing Areas*, *52*(2), 55–72. doi:10.1353/jda.2018.0022

Casado-Díaz, A. B., Andreu, L., Beckmann, S. C., & Miller, C. (2020). Negative online reviews and webcare strategies in social media: Effects on hotel attitude and booking intentions. *Current Issues in Tourism*, *23*(4), 418–422. doi:10.1080/13683500.2018.1546675

Chen, S., & Lamberti, L. (2016). Multichannel marketing: The operational construct and firms' motivation to adopt. *Journal of Strategic Marketing*, *24*(7), 594–616. doi:10.1080/0965254X.2016.1148759

Demil, B., Lecocq, X., Ricart, J. E., & Zott, C. (2015). Introduction to the SEJ special issue on business models: Business models within the domain of strategic entrepreneurship. *Strategic Entrepreneurship Journal*, *9*(1), 1–11. doi:10.1002ej.1194

Ha, S., Kankanhalli, A., Kishan, J. S., & Huang, K. W. (2016). *Does social media marketing really work for online SMEs? An empirical study*. Academic Press.

Harris, J., & Deacon, J. (2011). Marketing in context – the marketing authenticity of owner/entrepreneurs of small firms: Case evidence from Welsh (UK) SME food and drink producers and retailers. *Small Enterprise Research*, *18*(1), 33–50. doi:10.5172er.18.1.33

Jiang, C., Rashid, R. M., & Wang, J. (2019). Investigating the role of social presence dimensions and information support on consumers' trust and shopping intentions. *Journal of Retailing and Consumer Services*, *51*, 263–270. doi:10.1016/j.jretconser.2019.06.007

Kannan, P. K., & Li, H. A. (2017). Digital marketing: A framework, review and research agenda. *International Journal of Research in Marketing*, *34*(1), 22–45. doi:10.1016/j.ijresmar.2016.11.006

Karatum, S. (2017). The Place of Digital Marketing on Turkish Small Businesses. Journal of International Trade. *Logistics and Law*, *3*(2), 36.

Lam, H. K., Yeung, A. C., Lo, C. K., & Cheng, T. C. E. (2019). Should firms invest in social commerce? An integrative perspective. *Information & Management*, *56*(8), 103164. doi:10.1016/j.im.2019.04.007

Le Roux, I., & Maree, T. (2016). Motivation, engagement, attitudes and buying intent of female Facebook users. *Acta Commercii*, *16*(1), 1–11. doi:10.4102/ac.v16i1.340

Lin, X., Wang, X., & Hajli, N. (2019). Building E-commerce satisfaction and boosting sales: The role of social commerce trust and its antecedents. *International Journal of Electronic Commerce*, *23*(3), 328–363. doi:10.1080/10864415.2019.1619907

Lindsey-Mullikin, J., & Borin, N. (2017). Why strategy is key for successful social media sales. *Business Horizons*, *60*(4), 473–482. doi:10.1016/j.bushor.2017.03.005

Loureiro, S. M. C., & Bilro, R. G. (2020). Be or Not Be Online Engaged: Exploring the Flow From Stimuli to e-WOM on Online Retail Consumers. In Exploring the Power of Electronic Word-of-Mouth in the Services Industry (pp. 18-34). IGI Global.

Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. *Business Horizons*, *52*(4), 357–365. doi:10.1016/j.bushor.2009.03.002

Nadeem, W., Andreini, D., Salo, J., & Laukkanen, T. (2015). Engaging consumers online through websites and social media: A gender study of Italian Generation Y clothing consumers. *International Journal of Information Management*, *35*(4), 432–442. doi:10.1016/j.ijinfomgt.2015.04.008

Narayana, O. L. (2018). *An Empirical Study on Effectiveness of Digital Marketing in the New Era*. Academic Press.

Olanrewaju, A. S. T., Hossain, M. A., Whiteside, N., & Mercieca, P. (2020). Social media and entrepreneurship research: A literature review. *International Journal of Information Management*, *50*, 90–110. doi:10.1016/j.ijinfomgt.2019.05.011

Oxoby, R. (2009). Understanding social inclusion, social cohesion, and social capital. *International Journal of Social Economics*, *36*(12), 1133–1152. doi:10.1108/03068290910996963

Peretti, P. (2011). *Marketing digitale: scenari, strategie, strumenti.* Apogeo srl.

Pfeffer, J., Zorbach, T., & Carley, K. M. (2014). Understanding online firestorms: Negative word-of-mouth dynamics in social media networks. *Journal of Marketing Communications*, *20*(1-2), 117–128. doi:10.1080/13527266.2013.797778

Sigurdsson, V., Larsen, N. M., Sigfusdottir, A. D., Fagerstrøm, A., Alemu, M. H., Folwarczny, M., & Foxall, G. (2020). The relationship between the firm's social media strategy and the consumers' engagement behavior in aviation. *Managerial and Decision Economics*, *41*(2), 234–249. doi:10.1002/mde.3052

Simonova, V., Popov, E., & Komarova, O. (2020, January). Social Networks as a Tool for Leadership in Entrepreneurship Ecosystem. In *5th International Conference on Social, Economic, and Academic Leadership (ICSEALV 2019)* (pp. 58-62). Atlantis Press.

Song, Y. (2015). From offline social networks to online social networks: Changes in entrepreneurship. *Informações Econômicas*, *19*(2), 120–133. doi:10.12948/issn14531305/19.2.2015.12

Souiden, N., Ladhari, R., & Chiadmi, N. E. (2018). *New trends in retailing and services*. Academic Press.

Willems, K., Smolders, A., Brengman, M., Luyten, K., & Schöning, J. (2017). The path-to-purchase is paved with digital opportunities: An inventory of shopper-oriented retail technologies. *Technological Forecasting and Social Change*, *124*, 228–242. doi:10.1016/j.techfore.2016.10.066

Williams, M. D. (2018). Social commerce and the mobile platform: Payment and security perceptions of potential users. *Computers in Human Behavior*. doi:10.1016/j.chb.2018.06.005

Wu, W., Huang, V., Chen, X., Davison, R. M., & Hua, Z. (2018). Social value and online social shopping intention: The moderating role of experience. *Information Technology & People*, *31*(3), 688–711. doi:10.1108/ITP-10-2016-0236

ADDITIONAL READING

Bordonaba-Juste, V., Lucia-Palacios, L., & Polo-Redondo, Y. (2012). Antecedents and consequences of e-business adoption for European retailers. *Internet Research*, *22*(5), 532–550. doi:10.1108/10662241211271536

Demangeot, C., Demangeot, C., Broderick, A. J., & Broderick, A. J. (2016). Engaging customers during a website visit: A model of website customer engagement. *International Journal of Retail & Distribution Management*, *44*(8), 814–839. doi:10.1108/IJRDM-08-2015-0124

Kitapci, O., Taylan Dortyol, I., Yaman, Z., & Gulmez, M. (2013). The paths from service quality dimensions to customer loyalty: An application on supermarket customers. *Management Research Review*, *36*(3), 239–255. doi:10.1108/01409171311306391

Song, L., Weisstein, F. L., Anderson, R. E., Swaminathan, S., Wu, G. J., Feng, S., & Tan, K. (2016). The Effects of Expectation Disconfirmations on Customer Outcomes in E-Markets: Impact of National Culture. *Journal of Marketing Channels*, *23*(4), 217–229. doi:10.1080/1046669X.2016.1224305

Xifei, F., & Jin, Q. (2015). The Five Dimensions of E-tailing Service Reliability. *Journal of Marketing Development and Competitiveness*, *9*(1), 83.

Yeh, Y. P., & Yeh, Y. P. (2016). Market orientation and service innovation on customer perceived value: The case of supermarket retailers. *Management Research Review*, *39*(4), 449–467. doi:10.1108/MRR-08-2014-0205

Yeng, W. F., & Yazdanifard, R. (2015). Opportunities and Challenges in the World of Retailing and the Importance of Adaption to the New Markets. International Journal of Management. *Accounting and Economics*, *2*(9), 1110–1121.

KEY TERMS AND DEFINITIONS

Best Practice: The capacity to apply valid tool in the implementation of the firm activity.

Customer Review: The propensity to disseminate opinion among other consumers about the products, services or personality of a company.

Customer Satisfaction: The degree of satisfaction provided by the goods or services of a company.

E-Tailing: The application of electronic commerce to the retailing sector.

Hedonistic Motivation: The search for entertainment, games, pastimes, or anything can give pleasure.

Involvement: The characteristic of customers to interact with firm and give assistance to other consumers.

Utilitarian Motivation: The search for efficiency, effectiveness, and everything functional to a specific objective.

Chapter 5
Leveraging Entrepreneurial Ambition Through Innovative Technologies and Knowledge Transfer Within a National Defense Technological and Industrial Base

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ABSTRACT

While active agents of an entrepreneurial ecosystem, governments can play a crucial role as catalysts of entrepreneurial ambition as they develop modern defense capabilities, and in the process, by focusing on technological innovation and knowledge transfer. The supporting argument to this claim lies in the assumption that by exploiting the potential of these innovative technologies, namely their dual-use capacity and spillover effect, they may prove to have a contagion effect in new business formation. Drawing on secondary data, namely a literature review, this chapter raises the discussion for further research on how governments', as active agents of an entrepreneurial ecosystem, can leverage entrepreneurship while developing superior defence capabilities. By linking the development of these capabilities, through an innovative national technological industrial base (DTIB), to new business formation, the notion that entrepreneurship is far from being rooted in a commercially competitive market setting alone is equally reinforced in the context of the chapter.

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INTRODUCTION

History has shown that economic and social progress has been throughout the time the result of individuals' needs and willingness to change. In fact, the initiative to introduce change, either by thinking new ways and means of doing things, or through an open mind to perceive the world in a novel way, has been at the core of change in our economic systems and social structures. However, within the realm of a globalized world as the one we live in nowadays, and due to these rapid and somewhat disruptive changes, societies have become far more complex. As a result, governments are now either too small or too big to respond, alone, to the new emerging challenges and unable to assume, *per se*, the burden of change. Consequently, dealing with these challenges requires individual effort and a strong will to step forward and assume one's share of the responsibility to change and act in the light of these challenges. Progress and development are now more than ever dependent on individual initiative and a strong entrepreneurial mindset. In fact, societies are becoming today more dependent of the ordinary citizen's ability to identify and convert, in an innovative manner, the opportunities found in their environment into economic and social value. Finding new forms of leveraging entrepreneurial activity and business formation is essential in today´s world. These forms are found by exploiting changes, either in technology, materials, a new type of business, or even consumer behavior and needs. Entrepreneurship, as a social and economic value-creating process, is a combination of creativity and innovation in identifying and converting these various forms of entrepreneurial activity. Another relevant aspect identified in the literature that is central to one of the characteristics of an entrepreneur, and that determines his capacity to thrive and succeed, is the way change is successfully managed and dealt with.

However, although entrepreneurship has been widely acclaimed and applied in business, government, and all other forms of social and economic activities, one can assume from the vast body of literature that as a concept, there is no consensus as to its meaning. According to Ma and Tan (2006), "entrepreneurship as a theoretical construct and practical phenomena remains poorly defined and its interpretation fragmented" (p.704). As a complex topic, it seems to be challenging to obtain a standard definition (Binnui & Cowling, 2016). While for some, it is perceived as an economic function, carried out by individuals acting independently or within organizations (Carlson et al. 2013), for others, it is a particular type of mindset (Ma & Tan, 2006) an attitude or a kind of drive.

Irrespective of the valid concept or meaning of entrepreneurship, an issue that is not central to the main topic under debate within this chapter, there is still general acceptance as to the role it plays in economic growth, due to three reasons (Burns, 2011). Firstly, entrepreneurship is known to increase the number of companies, which itself leads to economic growth. Secondly, entrepreneurship is known as a mechanism for knowledge spillovers, a key factor underlying endogenous growth and start-ups. Finally, entrepreneurship tends to generate diversity and variety among enterprises in any location, and by doing so, contributes to economic growth too.

Therefore, facilitating entrepreneurship in its various forms has become a crucial priority. Society and governments, in particular, need to work together in favor of a robust and dynamic entrepreneurial ecosystem, one in which entrepreneurship is recognized as being transversal to all social and economic activities within both the public and private domains. So, for entrepreneurship and entrepreneurial behavior to thrive, entrepreneurs must look for opportunities in every economic sector and area of activity, including the public sector in all its various activities.

Since governments are also an essential part of the entrepreneurial ecosystem, their role as catalysts for new business formation, influenced by public policy and intervention in key strategic areas, should

not be underestimated. One of these areas is Defense and, in particular, the underlying potential of a strong and competitive Defense Technological and Industrial Base. The supporting argument to this claim is the idea that for governments to ensure an effective modern Defense system, they must develop superior Defense capabilities and rely on innovative technology together with a robust and highly competitive R&D infrastructure to sustain the system. It is precisely through the combination of these critical factors (i.e., innovative technologies and competitive R&D infrastructure) that a proper environment is created for new business formation and entrepreneurial behavior. In fact, entrepreneurs may, perhaps, be compelled to seek new business opportunities generated by the dual-use capacity and spillover effect of these innovative technologies developed within a modern DTIB. Besides, research and innovation in the Defense sector are, nowadays, more correlated to the technology currently developed in the private sector (Ramatisios & Pollis, 2018).

This chapter draws on secondary data and aims to showcase, through practical examples and general propositions supported in the literature, how governments', as active agents of an entrepreneurial ecosystem, can leverage entrepreneurship by developing superior, cutting-edge technologies and high-end Defense capabilities. Linking knowledge transfer, innovative technologies and ideas generated within a dynamic Defense Technological and Industrial Base, with new business formation, reinforces the notion that entrepreneurship is far from being rooted in a commercially competitive market setting alone. As depicted in this chapter, new business formation, and entrepreneurial activity, in general, can also be found in the realm of Defense and related government policies. In this particular example, entrepreneurship is thought to bridge the gap between a government-centered activity, with its public enterprise system, and private Defense industry with the capacity to reach out, through a contagion effect, to other non-Defense and commercial markets.

The determinant role of governments, while pivotal agents of the entrepreneurial ecosystem, capable of leveraging new business formation within a specific context, like Defense, for instance, appears to be a rather pertinent topic of research, and one that has not been profoundly studied in the area of Entrepreneurship yet. Therefore, the research conducted within the context of this chapter, and the underlying research problem, were not intended for descriptive precision, nor are the sustaining general proposition herein presented necessarily based on statistical theories.

Consequently, the real purpose of this discussion, as stated, is to draw attention to other equally potential sources of entrepreneurship building and of new business formation that, supposedly, are still subject to further study, and in the process, to pave the way for new research and validation. From a research perspective, this supposedly understudied connection between the development of an innovative DTIB and entrepreneurship building is, within the context of this chapter, a potential gap identified in the literature that justifies future research in this area of study. Highlighting this determinant role of an innovative DTIB in new business formation, played by governments as crucial agents of the entrepreneurial ecosystem, while stressing the need for future research, is then the main contribution of this study to the theory and practice of Entrepreneurship.

METHODS

As mentioned in the introduction section, the research presented within this chapter isn't intended for descriptive accuracy either for the development of a theoretical framework. The underlying objective, as previously stated, is to depict the role of governments in leveraging entrepreneurial activity and new

business formation through a less traditional and perhaps even understudied source of Entrepreneurship, such as the Defense industry or, more specifically, the DTIB. Therefore, the research design was set to accommodate the perception and understanding of the research problem in line with evidence and examples found in the literature and, while doing so, to support the following research goals:

1. Provide a new insight and understanding of how entrepreneurship building can be leveraged through distinct sources;
2. Identify and understand the various mechanisms by which the development of an innovative DTIB can impact entrepreneurship;
3. Enhance researchers' and entrepreneurs' recognition of other equally relevant sources of entrepreneurship building and stimulate interest within the specific area.

Based on the nature of the problem under discussion and the research goals, an exploratory study was conducted using secondary research based on a literature review as a technic. The intent of the selected method, as with any exploratory research, was to collect insightful information to support the research goals described above.

LITERATURE REVIEW

Defense, Economic Growth and Entrepreneurial Activity

It is common for some to consider the impact of the government's intervention and spending on Defense at the level of national security and internal stability alone. This perspective is by far too narrow, restrictive and misleading about the real value and strategic importance of this particular area for new business formation. Therefore, viewing Defense exclusively from this angle, rather than an investment with positive social and economic returns extensive to the entire economy, is probably a questionable approach to understanding the dynamic role of this sector in the economy.

Nevertheless, the dynamic role of Defense in the economy is still seen in the literature to be controversial, with the findings based on the results of the various studies showing a lack of consensus (Dunne and Nikolaideu, 2012; Sida and Zhe, 2018). Some advocate that Defense spending promotes economic growth as a result of increased purchasing power and aggregate demand (Atesoglu, 2002; Yildirim, Sezgin and Öcal, 2005; Kollias, Mylonidis, and Paleologou 2007; Yilgor, Karagöl, and Saygili 2014), and that this outcome may be more country-specific (Chen et al. 2014; Deslie, et al, 2017; Zhong et al., 2017). In this vein for the European Commission (2017) 1€ invested in Defense generates a revenue of 1,6€, particularly in highly qualified jobs, technology innovation and exports. On the hand others have claimed that Defense spending impedes economic growth (d'Agostino, Dunne, and Pieroni 2012; Hou and Chen 2013; Korhan et al. 2013; Dunne and Tian 2015; Manamperi, 2016), invoking as an argument the diversion of essential technological and managerial resources from the private sector. Finally, some believe that there is no causal connection between Defense spending and growth or that any possible connection can be rendered benign (Shahbaz, Leitão & Uddin, 2012; Heoa & Yec, 2016).

Despite some contradictory results concerning the link between Defense and economic growth, yet, the prevailing argument within the scope of this chapter is that this link exists and that its importance should not be underestimated in the choices and strategic decisions taken to leverage entrepreneurial

ambition and new business formation. However, this does not imply that Defense spending, as with all public spending, is not to be scrutinized to the extent that only those investments which secure the reasoned acceptance of their purpose are upheld (i.e. to secure an effective Defense system while promoting economic development). Consequently, it is in the best interest of policymakers to look at Defense as a means of economic growth and a driver of entrepreneurship.

The relationship between the area of Defense, economic growth and entrepreneurial activity, in the form of new business formation, is depicted in Figure 1 and is sustained in the context of the current debate by three key arguments.

Figure 1. Defense entrepreneurial cycle

Firstly, the growing demand for technologically advanced and innovative Defense systems in response to the new ever evolving types of threats. Hybrid and asymmetric conflicts, cybersecurity, humanitarian aid, peacekeeping, or peace enforcing and stabilization missions, are some of these new threats that are compelling governments to develop Defense capabilities focused on equipment and innovative technologies commensurate with these threats. The main military capability development focus is now, amongst others, ISTAR capabilities, computerized data encryption, artificial intelligence, new materials, and satellite communications (Gonzaléz and Lopéz, 2013). It is this new technological component, required in a modern and effective Defense system, that can serve as a part of the stimulus package to promote entrepreneurship in both the Defense and non-Defense industries. The reason for this is twofold: the potential for innovation as a means of creating value by exploiting change, a factor that is also known to fuel entrepreneurship, and the dual-use characteristic of most of these technologies. This specific characteristic implies that the development and application of these technologies can also be extended to other sectors of the economy, too, thus contributing to new business opportunities and economic growth.

The second argument supporting the relationship between the three elements described previously is that developing a modern and sustainable Defense system requires a highly competitive and innovative R&D and industry infrastructure. The basis of this infrastructure is a robust and well-articulated technological and industrial base, which, in return, is expected to generate the transfer of knowledge (*Spillover*) and other synergetic and contagion effect (*spinoff/spin-in*) that will ultimately create economic growth and the opportunity for entrepreneurship to thrive. Besides, the argument that R&D activity may, in general, constitute a crucial source of productivity growth, seems to be supported by extensive empirical research (Moretti et al., 2016; Lichtenberg and Siegel, 1989; Guellec and Potterie, 2001, 2019; Argilés et al, 2008).

Finally, the third argument is based on the idea that in contrast to the traditional Defense systems, some of the new technologies and R&D capabilities required to sustain a modern system are becoming less labor and capital intensive. Consequently, economies of scale and dimension are now perhaps, in certain circumstances, of less importance. These facts alone may turn out to be an opportunity and an incentive for start-ups, for whom size is sometimes an incapacitating feature. Small business enterprises are at the heart of entrepreneurship and economic growth in most of the world economies are now able to find in the Defense sector, and in its technology and industrial base, the way to unlock a competitive edge in today's hypercompetitive markets. Hasik (2008) considers that some of the most innovative weapon systems that have debuted in the past ten years were developed with the important contribution of small businesses, and the "alliances of small companies in the armament industry have been established in large part to combine entrepreneurial drive with economic wherewithal" (p.6). According to the same author, small companies are likely to have an advantage particularly in industries where three of the following characteristics can be observed: highly innovative, but low in R&D intensity and involving markets or future technological trajectories of high uncertainty (Zoltan et al., 2003, 1987, Hasik, 2008); a high proportion of skilled labor is required and production is more skill-intensive than capital-intensive; relatively high proportion of the industry is composed of large firms but available still for smaller competitors. According to the literature apparently some of armament industries seem to present these characteristics.

Countries like the United States of America, India and Europe are already recognizing the importance of the participation of SMEs in the industrial base as a fundamental means to maintain a modern and effective Defense system. In the case of the USA, policy making, and the strategic approach is to pursue a wide variety of methods to unlock small business capabilities and improve processes that will ultimately enhance how these companies do business with the Department of Defense (DOD,2020). The Defense Advanced Research Projects Agency (DARPA) is another excellent example of the USA's commitment to leverage small businesses and entrepreneurial activity. The agency seeks, through its programs for small business innovation and technology transfer (SBIR and STTR), to create an environment that considers small-business concerns as a primary source of innovative solutions (DARPA, n.d), and by doing so, helps to create a dynamic entrepreneurial ecosystem. As mentioned, India is another good example of how the Defense sector can leverage entrepreneurship and enrich a country's DTIB. The country launched in 2018 an innovation ecosystem for Defense (Innovations for Defense Excellence - iDEX) – and through it the Defense India Start-Up Challenge, with the purpose to foster innovation and technology development in Defense and Aerospace, by engaging SMEs, StartUps, Individual Innovators and Academia (iDEX, n.d). This imitative recognizes the potential of Defense as a means of new business formation. In the European Union, for example, the establishment of the Permanent Structured Cooperation (PESCO)[1], by allowing the 25 participating Member States to develop and operate cooperative Defense capabilities, within the Union framework, with a view to strengthening a more competitive and innovative European technological and industrial base, as well as to increase the operational readiness and the availability of their forces and means, is also expected to contribute to a dynamic entrepreneurial environment. Through this process and the underlying European Defense Fund – EDF[2], Europe intends to develop a robust and innovative DTIB, through which SMEs will be encouraged and facilitated to participate in cross-boundary consortia and in so doing be able to diversify into new markets and exploit synergies between Defense and civil sectors (European Commission, 2017). In fact, the European Commission has recognized that Defense-related small and medium-sized enterprises (SMEs) are key enablers of innovation and growth (European Commission, n.d). An idea that is itself an incentive to new business

formation and the validation of Defense's contribution to economic growth. In spite of the differences in the approach and political sensitivities in regard to PESCO, being some more inclusive (Germany) while others more ambitious and demanding (France) concerning the spirit and writing of the Lisbon Treaty (Melo, 2019), the fact is that this initiative, as with all the other related policies and programmes, is expected to pave the way for new business opportunities across member-states under the dual-use concept, increased R&D capabilities and high-end industry development. New start-ups and SMEs will then be able to sustain growth and competitiveness, either by concentrating on market niches or through strategic alliances and conglomerates as a way to overcome size and economies of scale, as well as a host of bureaucratic entry barriers.

The Role of DTIB on Knowledge Transfer and Entrepreneurial Drive

The term DTIB refers to "the organization of infrastructure, institutions, and ideas that convert state resources into means of warfare" (Briani et al.2013, p13). Masson (2013) provides the following meaning within an European Union context for each component of the term: "D" stands for Defense and irrevocably ties the expression EDTIB to the political arena, linking it to potent concepts like sovereignty, autonomy and security; as for the "T" (Technology) and "I" (Industrial), these two refer more to the economic arena, namely the production structures, technological and industrial competences and know-how, innovative corporate behavior, and links between the scientific and the industrial worlds; the "B" stands for Base, a vague notion covering all field-level players, companies (large, SMEs), laboratories and public or private research centers.

Underlying the development of BTID is the notion that the field of Defense integrates and is transversal to several technological sectors, hence the investment in its development should be looked at from a broader perspective, and by envisioning the global impact in the national economy. In this regard, the focus should be on cutting-edge technologies that benefit the country's economy, by harnessing the potential of its intellectual capital and of the areas and research centers in which it holds a competitive advantage. This is also a way to stimulate entrepreneurial activity that will ultimately render highly competitive new businesses.

New business formation in a highly competitive global economy demands innovation as a key driver of differentiation and sustained competitive advantage, the two ingredients that will ultimately lead to start-up stimulus and survival. Therefore, the development of the DTIB should be concerned with building priority Defense capabilities, which ought to be concatenated with the development of the country's scientific and technological system. This implies that the potential for innovation and the transfer of knowledge needs to be stimulated by the DTIB as a bidirectional process involving all sectors (public, private, educational, scientific and academic).

By promoting the development of Defense capabilities through a strong dual-use type of interaction between the military and civil R&D, is then probably the best approach for the DTIB to facilitate the transfer of knowledge as an essential source of entrepreneurial drive. According to Lee and Sohn (2017), a dual-use type of approach also proves to be beneficial in terms of national competitiveness. However, according to the same authors (Lee & Sohn, 2017), the implementation of an R&D project following this approach in order to succeed needs to address some key aspects. One of these aspects is how to combine what may seem as dissonant objectives between Defense and commercial R&D. The answer seems to lie in new technological areas, and by focusing on R&D with higher potential for convergence. Another aspect is that the transaction of the technologies resulting from these R&D activities must be facilitated.

Therefore, it is mandatory that the planning of dual-use projects also contemplates the possibility of the resulting technologies to be transferred. Until now the transfer of the Intellectual Property Rights (IPR) seems to be the main obstacle hampering the strengthening of the cross-border Defense cooperation due to security and confidential issues.

Seen from the aforementioned perspective, the investment in Defense R&D is beneficial in that it presents a means by which governments can stimulate and channel innovation to different sectors of the economy. However, it is also important to mention that this positive perception of the beneficial effect of R&D investment, within this particular context, is far from being consensual. Some may look at this investment as little more than an argument to justify the increase in military spending (Molas-Gallart, 1992; Leske, 2018). As for the most skeptical, there is little or no relation at all between the investment in Defense R&D and economic growth, but instead, and as a result, the probability of occurring a "crowding out effect" (Lichtenberg, 1984, 1989) through the diversion of R&D resources and investment, otherwise needed in the private sector.

Despite the diverging positions regarding this matter, there are still sufficient arguments in the literature sustaining this beneficial effect, and particularly in the case of the investment in an array of new technologies like artificial intelligence, new materials, quantum computing, Internet of Things, biotechnology, sensors, command and control systems, amongst others more. The reasoning sustaining this relationship lies in the potential of these technologies mentioned above for integration in Defense platforms, as perhaps they might be more adjusted to the current needs and demands of a modern Defense system. Furthermore, research and innovation in the field of Defense, have become more correlated with the technology developed in the private sector. It is this correlation and synergetic effect, together with R&D networks generated in the process of developing these technologies, that will eventually enable the transfer of knowledge and the innovation stimulus required to create entrepreneurial drive.

The Dynamics and Mechanisms of Leveraging Entrepreneurship Through a Defense Industrial and R&D Infrastructure

As mentioned previously, the perception of Defense, and the resulting product as a means to secure vital national interests, alone, is a misleading idea. It is an idea that tends to neglect the underlying dynamics and leveraging mechanisms of a Defense industrial and R&D infrastructure in terms of entrepreneurial ambition, namely in the form of new businesses formation. This Defense-reducing vision should be replaced by one that recognizes the infrastructure upon which Defense capabilities are developed, as a means for governments, as key agents of an entrepreneurial ecosystem, to stimulate entrepreneurship as a byproduct of this infrastructure.

It is the author's understanding that several mechanisms and means exist by which an industrial and R&D infrastructure can induce entrepreneurial drive in the form of new business formation. One of these mechanisms is the so-called Spillover effect (known sometimes as externalities), conceptually perceived as the effects of economic activities that benefit those beyond their originators (Roos, 2012). According to Branstetter (2001), over time, the foundation of general knowledge grows. As a result, more differentiated products can be introduced without a continual increase in the research resources that must be expended. From a Defense viewpoint, the Spillover effect is perceived as the transfer of knowledge from a more advanced military area to an intrinsically less advanced commercial area (Perani, 1997). By capitalizing on the transfer of knowledge involving, for example, innovative dual-use technologies, entrepreneurs can encounter new business opportunities and, consequently, the inspiration for start-up

or spinoff ventures. For clarity, it is essential to mention that although these two concepts may have in common a pathway to entrepreneurship and new business formation, in reality, they tend to be conceptually distinct. One of the key differences seems to be in the way resources acquired to sustain the new venture are originated and managed. In regard to spinoffs, resources are originated from a mother company, whereas, in the case of start-ups, these resources tend to derive from the individual alone. Nevertheless, what is perhaps central to the distinction between the two concepts, and of relevance to the debate concerning their role and importance to entrepreneurship, is the idea found in the literature that after all entrepreneurial drive and ambition is not just the result of individually acquired ideas and innovation. Instead, it is equally the result of an individual's learning curve, and the continuity of one´s acquired experience in a particular field inside an existing venture.

Along with Spillover, governments' strategic approaches conducted to promote interaction between Defense R&D and civilian R&D, may also prove to be relevant mechanisms and means of entrepreneurship stimulus. Five approaches have been documented and identified in the literature (Brzoska, 2006) under the following designations: *Warfare and Welfare, Civil-military Integration, Spin-off, and Spin-in*.

In the case of *Warfare and welfare* approach, although the main priority is essentially the buildup of military and Defense capabilities, yet implementation is thought to allow, simultaneously, the development of strategic civilian industries.

Civil-military Integration is described as the process that aims to unite the Defense Technology and Industrial Base and the Commercial Technology and Industrial Base into a unified National Technology and Industrial Base (OTA, 1994). However, it seems that complex Defense systems requiring high levels of systems integration may not be appropriate for this type of approach, but instead, for those Goods and Services that find equivalent use in the Commercial and Defense sectors. From a conceptual viewpoint, this type of approach advocates the convergence between the civilian and Defense industry, and allows the activities of these industries to be performed in shared facilities and by using commercial processes and practices as a means to overcome two growing concerns: the erosion of the traditional Defense industry and the need to integrate companies from the commercial sector with the capacity to produce technologies and products applicable to the Defense sector (Linscott, 1999). This approach not only values the importance of civilian R&D in the military domain but tends to use it for military and civilian purposes, indistinctly, through the same technological capabilities, scientific knowledge, and researchers (Brzoska, 2006). Given the possibilities that entrepreneurs and Start-Ups have to expand and diversify their business and ideas to other sectors, while sharing common resources and capabilities, may prove to be an incentive for these key players.

Spinoff, within the context of this chapter, conceptually refers to the application of a product or service for commercial purposes originally developed for governmental use (Alec, et al., 1992). The idea is of this approach is to extend the know-how and Defense technology to other sectors of the economy. Although the primary objective of the Defense R&D might be to improve Defense capabilities, the gains in the transfer of knowledge for civilian purposes are intended by both the governments and enterprises. It should go without saying that the Spinoff approach has found some skepticism in the literature regarding its beneficial effect. For some, it is no more than an argument to justify an increase in military spending (Molas-Gallart, 1992; Leske, 2018), since the idea that military R&D is responsible for the great technological advancements is a fallacy for public opinion-making alone. The argumentation defended herein advocates an opposite position, showcasing, instead, an optimistic rather than a skeptical view of the *Spinoff* approach as a driver of entrepreneurship. The simple fact that an approach of this kind can enable the flow of knowledge and innovation to different sectors of the economy, and upon which

entrepreneurs can capitalize on in the form of new businesses, may prove to be sufficiently representative of its beneficial effect. The tendency to treat Defense as a separate entity from the economy, and other economic activities, seems to be a somewhat restrictive view of its contribution to economic development. Such a view misses the real value of a Defense product and the related pool of technology, upon which new business formation and R&D networks can be created. Although the distinctive nature of military/Defense technology may have seemed logical in the past in regard to civilian/commercial technology, nowadays, however, this is perhaps less logical in several cases given the dual-use characteristics of the technologies applied in a modern Defense system. Apparently, it seems that both military and civil technology stem from a common source of scientific and engineering knowledge (Buzan & Sen, 1990). Besides, there is no Economy without Defense. Thus, the line that has been drawn in the past is now by all means much more blurred.

The Spin-in approach is perceived to have an opposite effect to Spinoff. In the case of the former, civil R&D and the underlying industrial base tend to replace the dominant position of military R&D (Brzoska, 2006). It appears, therefore, that the innovations resulting from R&D in the civil sector are carried over to Defense purposes after being adequately tested. This more recent trend in the relationship between civilian and military R&D is based on the assumption that the competitive nature of the commercial sector and its market orientation will increase not only the speed of incorporating technological advances in Defense systems but also reduce the costs of these systems (James, 2004).

FINAL CONSIDERATIONS

Today, entrepreneurship is at the heart of social and economic development. Society and the economy, in general, are relying more than ever on the individual's resolve and strong entrepreneurial mindset. As evidenced in the literature, leveraging entrepreneurship in its various forms is of great importance for economic growth. It is a task that requires both an entrepreneurial culture and the establishment of a dynamic entrepreneurial ecosystem. Within this ecosystem, governments have a decisive role in creating the stimulus and momentum for entrepreneurial ambition. This role that is determined either by policies and legislative initiatives, capable of promoting entrepreneurship in its multiple forms or by enabling access and the transfer of knowledge and innovative technologies that support key activities within the governments' domain. The access for commercial purposes to these technologies and the transfer of knowledge, within the same context, through a dynamic and robust R&D infrastructure and network, is seen as an opportunity for new business formation.

One of the key activities capable of generating entrepreneurial drive is the area of Defense. The literature is conclusive as to the unequivocal need for governments to modernize and reinforce technologically this particular sector. Modernizing, within this context, implies the development of an innovative and highly competitive DTIB, one that will help to build superior Defense capabilities while also fostering economic growth in other sectors of the economy too. Thus, the belief is that the stimulus and contagion effect of Defense on entrepreneurship is expected to derive from the dual-use nature of the technologies applied in this context, together with the transfer of knowledge supported by an innovative national R&D infrastructure and networks. In this case, the duality of these technologies is expected to be the key driver, namely by encouraging flexibility and contradicting the idea that technological development is a compartmentalized process and, therefore, circumscribed to specific areas. Furthermore, it is known that civilian and military end-uses can stem from the same technology.

Naturally, one should not forget that there are still differences and that from a systems viewpoint, certain specificity tends to separate the Defense product from the civilian one. However, the fact there is still a common use at both ends for the same technology does not mean that these differences should be seen as a deterrent of entrepreneurial drive and new business formation. Therefore, in the case of Defense, the opportunity for leveraging entrepreneurship, and the main challenge involved in the process, is not so much in the distinction between what is of military or civilian nature. Irrespective of this difference, what perhaps matters most is the ability to identify and select those technologies that can be transferred from one sector to the other, while posing fewer problems of technological adaptation required in the process, or that can enable technological co-production and the combination of both Defense and civilian/commercial specificities in the innovation process. This is, perhaps, a relevant aspect for both SMEs and new businesses, for whom scale, and limited resources, are known to be, in many instances, a barrier. Additionally, it also seems to favour different mechanisms of new business formation (i.e., spinoffs, spin-ins, start-up.).

Finally, envisioning Defense as a leverage mechanism of entrepreneurship tends to put aside the idea that the investment in Defense is an unnecessary burden to national budgets, and that the notion that small nations should not engage in Defense R&D is misleading. On the contrary, Defense R&D can be of strategic importance to both small and large countries. Furthermore, although in the case of small countries size and scale are still important issues, it would appear that perhaps in the new Defense paradigm these factors are of less importance, and in actual fact what truly matters is whether new businesses can find themselves a niche market where skills and intellectual capital overcome the prerequisite need for financial resources. It is theses technological and industrial niches that will eventually serve as a stimulus to entrepreneurship and pave the way to facilitate European Defense cooperation and the integration into international consortia.

FUTURE RESEARCH

The connection or relation between Defense and entrepreneurship as a research topic seems to be at present understudied. Understanding this link and how governments, as agents of the entrepreneurial ecosystem, can leverage entrepreneurship while developing modern and superior Defense capabilities through an innovative Technological and Industrial Base, is from an academic and managerial viewpoint both a promising and relevant area of study.

Complimentary to the discussion in this chapter, more studies are suggested in the following aspects to provide a more in-depth multi-dimensional and quantitative interpretation of the research problem:

1. Impact of EU Defense policymaking (i.e., PESCO) and the buildup of an European Defense Technological and Industrial Base in startup formation;
2. The potential of superior Defense capabilities development within the EU in entrepreneurship building;
3. Which technologies and models of start-up building are more suitable and capable of generating a synergetic and collaborative European entrepreneurial ecosystem?
4. Quantitative interpretative model of the Defense Entrepreneurial Cycle.

REFERENCES

Alec, J. A., Branscomb, L. M., Brooks, H., Carter, A. B., & Epstein, G. L. (1992). *Beyond spinoff: Military and commercial technologies in a changing world*. Harvard Business School Press.

Argilés, R. O., Potters, L., & Vivarelli, M. (2008). The productivity impact of R&D investment: evidence from European Microdata. *Jena Economic Research Papers*. Retrieved from: https://www.researchgate.net/publication/45133802_The_productivity_impact_of_RD_investment_evidence_from_European_microdata

Atesoglu, H. S. (2002). Defense spending promotes aggregate output in the United States: Evidence from cointegration analysis. *Defence and Peace Economics*, *13*(1), 55–60. doi:10.1080/10242690210963

Binnui, A., & Cowling, M. (2016). A conceptual framework for measuring entrepreneurship of young hi-technology firms. *GSTF Journal on Business Review*, *4*(3), 32–47.

Branstetten, L. G. (2001). Are knowledge spillovers international or intranational in scope?: Microeconometric evidence from the U.S. and Japan. *Journal of International Economics*, *53*(1), 53–79. doi:10.1016/S0022-1996(00)00068-4

Briani, V., Marrone, A., Molling, C., & Valasek, T. (2013). *The development of a European Defense and Technological Base (EDTIB) Directorate- General of For External Policies of the Union - European Parliament*. Retrieved from: https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/433838/EXPO-SEDE_ET28201329433838_EN.pdf

Brzoska, M. (2006). *Trends in global military and civilian research and development (R&D) and their changing interface.* Retrieved from: https://ifsh.de/pdf/aktuelles/india_brzoska.pdf

Burns, P. (2011). *Entrepreneurship and small businesses: Start-up, growth and maturity* (3rd ed.). Palgrave MacMillan. doi:10.1007/978-0-230-20848-3

Chen, P., Lee, C., & Chiu, Y. (2014). The nexus between defense expenditure and economic growth: New global evidence. *Economic Modelling*, *36*, 474–74. doi:10.1016/j.econmod.2013.10.019

d'Agostino, G., Dunne, J. P., & Pieroni, L. (2012). Corruption, military spending and growth. *Defence and Peace Economics*, *23*(6), 591–604. doi:10.1080/10242694.2012.663579

DARPA. (n.d.). *DARPA's commitment to small businesses*. Retrieved from: https://www.darpa.mil/work-with-us/commitment-to-small-businesses

Desli, E., Gkoulgkoutsika, A., & Katrakilidis, C. (2017). Investigating the dynamic interaction between military spending and economic growth. *Review of Development Economics*, *21*(3), 511–526. doi:10.1111/rode.12268

DOD. (2020). *Small businesses strategy submitted to congress. Industrial Policy – Department of Defense.* Retrieved from: https://www.businessdefense.gov/News/News-Display/Article/2064882/dod-small-business-strategy-submitted-to-congress/

Dunne, J. P., & Nikolaidou, E. (2005). Military spending and economic growth in Greece, Portugal and Spain. *ResearchGate*. Retrieved from: https://www.researchgate.net/publication/228553733_Military_Spending_and_Economic_Growth_in_the_Peripheral_Economies_of_Europe_A_Causal_Analysis_for_Greece_Spain_and_Portugal

Dunne, J. P., & Tian, N. (2015). Conflict, economic growth and spillover effects in Africa. *Working Papers from Economic Research Southern Africa*, 561. Retrieved from: https://econpapers.repec.org/RePEc:rza:wpaper:561

European Commision. (2017). *Industry in Europe: Facts & figures on competitiveness and innovation*. Retrieved from: http://publications.europa.eu/resource/cellar/354c1e8b-1db0-11e7-aeb3-01aa75ed71a1.0001.03/DOC_1

González, A. M., & Nuria, R. L. (2013). A productivity and efficiency analysis of the security and Defense technological and industrial base in Spain. *Defence and Peace Economics*, *24*(2), 147–171. doi:10.1080/10242694.2012.663581

Guellec, D., & Potterie, B. P. (2001). R&D and productivity growth: Panal data analysis of 16 OECD countries. *OECD Science, Technology and Industry Working Papers*. doi:10.1787/652870318341

Hasik, J. (2008). *Arms and innovation: Entrepreneurship and alliances in the twenty-first century defense industry*. The University of Chicago Press. doi:10.7208/chicago/9780226318899.001.0001

Heoa, B. U. & Yec, M. (2016). Defense spending and economic growth around the globe: The direct and indirect link. *International Interactions*, *42*(*5*), 774-796.

Hou, N., & Chen, B. (2013). Military expenditure and economic growth in developing countries: Evidence from system GMM estimates. *Defence and Peace Economics*, *24*(3), 183–193. doi:10.1080/10242694.2012.710813

iDEX. (n.d.). *An ecosystem that fosters innovation and technology technology development for Defense and aerospace*. Government of India – Department of Defense Production. Retrieved from: http://idex.gov.in

James, A. (2004). *US Defense R&D Spending: An analysis of the impacts, rapporteur's report for the EURAB Working Group ERA Scope and Vision.* The University of Manchester. Retrieved from: https://research.mbs.ac.uk/innovation/Portals/0/docs/4_EURABfinalreport.pdf

Kollias, C., Mylonidis, N., & Paleologou, S. (2007). A panel data analysis of the nexus between Defense spending and growth in the European Union: A reply. *Defence and Peace Economics*, *18*(6), 581–583. doi:10.1080/10242690701516853

Lee, B. K., & Sohn, Y. S. (2017). Exploring the effect of dual use on the value of military technology patents based on the renewal decision. *Scientometrics*, *112*(3), 120–127. doi:10.100711192-017-2443-6

Leske, A. (2018). Uma revisão sobre a inovação em defesa: Do spin-off ao spin-in. *Brazilian Journal of Political Economy*, *38*(2), 377–391. doi:10.1590/0101-31572018v38n02a09

Lichtenberg, F. (1984). The relationships between federal contract R&D and company R&D. *The American Economic Review*, *74*(2).

Lichtenberg, F. R., & Siegel, D. (1989). The impact of R&D investment on productivity: New evidence using linked R&D LRDATA. *National Bureau of Economic Research*. Retrieved from: https://www.nber.org/papers/w2901.pdf

Linscott, W. B. (1999). Civil-Military Integration: The Context and Urgency. *Acquis. Ver*, 395-405. Retrieved from: https://apps.dtic.mil/docs/citations/ADA372194

Ma, H., & Tao, J. (2006). Key components and implications of entrepreneurship: A 4-P framework. *Journal of Business Venturing*, *21*(5), 704–725. doi:10.1016/j.jbusvent.2005.04.009

Manamperi, N. (2016). Does military expenditure hinder economic growth? evidence from Greece and Turkey. *Journal of Policy Modeling*, *38*(6), 1171–1193. doi:10.1016/j.jpolmod.2016.04.003

Masson, H. (2013). Defining the European Defense Technological and Industrial Base »: Debates & dilemmas (I). *Fondation pour la reserche strategique*. Retrieved from: https://www.frstrategie.org/en/publications/notes/defining-european-Defense-technological-and-industrial-base-debates-dilemmas-i-2013

Melo, A. C. (2019). A Cooperação Estruturada Permanente, o Fundo Europeu de Defesa, e a Lei de Programação Militar. *EuroDefense*. Retrieved form: https://www.eurodefense.pt/categoria/artigos-tematicos/

Moretti, E., Steinwender, C., & Van Reenen, J. (2016). *The intellectual spoils of war? Defense R&D, productivity and spillovers*. Retrieved from: https://eml.berkeley.edu/~moretti/military.pdf

OTA. (1994). Assessing the potential for civil-military integration: Technologies, processes, and practices. *Office of Technology Assessment*. Retrieved from: https://www.princeton.edu/~ota/disk1/1994/9402/9402.PDF

Perani, G. (1997). Military technologies and commercial applications: *Public Policies in NATO Countries*. Retrieved from: https://www.nato.int/acad/fellow/95-97/perani.pdf

Rematisios, I., & Pollalis, Y. A. (2018). Strategic value of NATO's investment in science, technology & innovation (STI): Management of information and knowledge as intangible Assets. *Journal of Defense Resources Management*, *9*(2), 5–17.

Roos, G. (2012). Manufacturing into the future. Technical Report. *Government of Australia*. Retrieved from: https://www.researchgate.net/publication/274392157_Manufacturing_into_the_Future

Shahbaz, M., Leitão, N. C., & Uddin, G. S. (2012). *Should Portuguese Economy Invest in Defense Spending? A Revisit*. Munich Personal RePEc Archive. Retrieved from: https://mpra.ub.uni-muenchen.de/42289/

Sida, P., & Zhe, L. (2018). Comparative study of the impact of defense expenditure on economic growth in China and US. *Journal of Discrete Mathematical Sciences and Cryptography*, *21*(6), 1323–1328. doi:10.1080/09720529.2018.1529720

Taspinara, G. K. & Sadeghieh, M. (2015). Military expenditure and economic growth: The case of Turkey. *Procedia Economics and Finance*, *25*, 445-462.

Yildirim, J., Sezgin, S., & Öcal, N. (2005). Military expenditure and economic growth in Middle Eastern countries: A dynamic panel data analysis. *Defence and Peace Economics*, *16*(4), 283–295. doi:10.1080/10242690500114751

Yilgör, Y., Karagöl, E. T., & Saygili, C. A. (2014). Panel causality analysis between Defense expenditure and economic growth in developed countries. *Defence and Peace Economics*, *25*(2), 193–203. doi:10.1080/10242694.2012.724879

Zhong, M., Chang, T., Samrat, G., Rangan, G., & Lou, T. W. (2017). The nexus between military expenditures and economic growth in the BRICS and the US: An empirical note. *Defence and Peace Economics*, *28*(5), 609–620. doi:10.1080/10242694.2016.1144897

Zoltan, J. (1987). Innovation, market structure, and firm size. *The Review of Economics and Statistics*, *69*(4), 567–574. doi:10.2307/1935950

Zoltan, J. A., & Audretsch, D. B. (2003). Innovation and technological change. An Interdisciplinary Survey an Introduction. In Handbook of Entrepreneurship Research (pp. 57-79). Boston: Springer.

KEY TERMS AND DEFINITIONS

Defense Technological and Industrial Base: A country´s infrastructure combining in an articulated manner the key institutions, collective resources, competencies, and R&D skills for the development of innovative defense capabilities that are essential to ensure the State´s Sovereignty preemptive action against potential threats.

Dual Use: The development and application of technology oriented towards both civilian and military interests and for mutual benefit.

Entrepreneurial Activity: An activity that is conceptually related to creative, innovative, and disruptive action conducted towards the creation of new business formation and other activities of social and economic value.

Entrepreneurial Ecosystem: The social and economic environment, including governmental and private institutional agents and stakeholders, supposedly working in an articulated manner as enablers/facilitators of entrepreneurial activity.

Spillover: Contagion or economic effect that has occurred in a specific economic activity as a result of an event that has taken place, intentionally or unintentionally, in an unrelated context.

ENDNOTES

[1] PESCO is a framework and a process introduced by the Lisbon Treaty on European Union to deepen Defense cooperation between the EU Member States. Consolidated Texts of the EU Treaties as Amended by the Treaty of Lisbon, Foreign and Commonwealth Office, London, January 2008 (Article 42o-6, 43o, 46 and Protocol 10).

[2] The European Defense Fund is intended to support collaborative Defense research technology and industrial development to fulfil defined and common Defense priority capabilities.

Chapter 6
Agile Business Analysis for Digital Transformation

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ABSTRACT

The use of cutting-edge digital technologies and the realization of right project, program, and portfolio (3P) initiatives can trigger the intended company-wide change and the digital transformation. Today, organizations need to increase their agility for managing their information technology (IT) projects and transforming their business models. The integration of agile perspective and business analysis (BA) approach has a great potential to increase the success of digital transformation. This study aims to provide an overview of state-of-the-art in agile business analysis in scope of digital transformation. In accordance with the well-known frameworks, general principles and promising techniques of Agile BA are highlighted and discussed. The regarding agile practices provide valuable guidelines for researchers and practitioners that how they can assist continuous feedback, continuous learning, continuous improvement, and continuous integration capabilities of organizations; and also how to maximize value to the stakeholders in agile project lifecycles and agile business transformations.

INTRODUCTION

In recent years, digital transformation paradigm has gained great importance by organizations in order to manage changing dynamics of globalization and remain competitive in digital world. In order to realize strategic Projects, Programs and Portfolios (3P) and operate efficient business models along with globalization, the integration of Information Systems (IS) with businesses; namely digital transformation of organizations became inevitable.

Understanding digital transformation phenomenon is essential; it is a journey of an organization starting from digitization, digitalization and finally the most pervasive phase digital transformation. Gartner Glossary (2020a) highlights the term digitization as "*the process of changing from analog to digital form*". The integration of Information Technologies (IT) with existing tasks allows to convert analog

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information into digital information. As one further step, digitalization, aims to alter and optimize existing business processes by applying digital technologies; in other words, targets process improvements through new technologies or communication platforms and user experience (UX) enhancement (Verhoef et al., 2019). Accordingly, Gartner Glossary (2020b) defines digitalization as "*the process of moving to a digital business*" and "*the use of digital technologies to change a business model and provide new revenue and value-producing opportunities*".

Beyond digitalization, digital transformation is the company-wide change that aims to lead the development of new business models or new business logic; namely to lead business model innovation with new value creation 3P in organizations. As stated by Verhoef et al. (2019), digital transformation is a company-wide phenomenon with broad organization implications; the core business model of the firm is subject to change using digital technology. Verhoef et al. (2019) highlights digital transformation as "*a change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for the firm*". In other words, companies focus on business model innovation affecting the whole company and the way of doing business as well as the way of creating business value.

It is obvious that digital transformation process is about *not only* utilizing digital technologies to facilitate changes in organizations or industry, *but also* creating new value networks, redesigning business models and developing right digital strategies in order to drive better operational performances. The use of cutting-edge digital technologies with a right strategy for digital business transformation can trigger the intended company-wide change and can facilitate right 3P initiatives and management practices. Organizations need to realize an effective 3P management using well-defined and adaptive methods in order to align their strategies with the global needs of competitive digital era.

Today, the competence and mindset of implementing adaptive approaches and agile practices for management of IT projects, programs or portfolios are becoming notable enablers of strategic digital transformation. Recently, various agile approaches are taking a considerable place in the agenda of companies. In order to realize agile 3P management lifecycles, pure agile approaches started to evolve into various forms such as hybrid agile approaches over time for utilizing benefits of different approaches concurrently. However, we need more to deliver successful IT projects. Identifying and articulating the need for change, seamless requirements elicitation and analysis, requirements traceability and monitoring processes with viable solution evaluation mechanisms are inevitable competence requirements for organizations. In other words, IT projects can succeed with the help of effective requirement engineering practices, in other words right mix of Business Analysis (BA) methodologies, tools and techniques.

The concept of BA is not novel; has a critical role in 3P management lifecycles. BA is "*the practice of enabling change in an organizational context, by defining needs and recommending solutions that deliver value to stakeholders*" (IIBA and Agile Alliance, 2015). There is a great effort of standardization bodies, researchers and practitioners over the world to introduce more effective and systematic implementation of BA for supporting project management capabilities of organizations. The notable issue is that today agile and adaptive methodologies are requiring efficient Agile Business Analysis (Agile BA) practices, instead of cumbersome, traditional BA work.

Researchers and practitioners are seeking for promising adaptive Agile BA practices in order to achieve successful project outcomes with high quality, speedy and flexible digital transformation; to maximize the value delivered by an organization to its stakeholders; and to support continuous improvement, namely continuous change. In this regard, the purpose of this chapter is to shed light on the importance of Agile BA in scope of digital transformation. As a building block in digital transformation, Agile BA principles

and potential Agile BA techniques are investigated; trends and recommendations are presented with their benefits. As digital transformation requires an effective 3P management, Agile BA experience and competence of organizations can have a valuable potential for enabling digital transformation. Exploration of Agile BA methodologies will ensure new insights and opportunities for agile digital transformation.

RESEARCH BACKGROUND

Understanding Digital Transformation

The term digital transformation is not a new phenomenon. The roots of digital transformation as digital revolution can be traced back to late 1950s. With the third industrial revolution, adoption of digital technologies changed the way of doing business such as digital record keeping. Over time, the diffusion of IT into the all dimensions of organization required wide transformation of business processes and creation of new business models.

Venkatraman (1994) highlights the term "*IT-enabled business transformation*" with evolutionary and revolutionary levels of transformation. Organizations first perform localized improvements and internally integrate through IT functionalities. Later, in scope of revolutionary transformation, they redesign and redefine their business processes and business network for transforming IT into competitive advantage and financial performance.

In order to succeed digital transformation, the study of Berman (2012) explains two complementary approaches that can be followed by organizations: reshaping customer value propositions; and transforming the operations with the help of digital technologies. Organization can enhance, extend or redefine their existing customer value propositions with the help of accurate information and analytics. Delivery of new customer value propositions can be achieved with the remodeling and redesigning the business operations effectively and efficiently. Doing both approaches at the same time allows for broadest industry transformation.

The study of Vial (2019) reviews various definitions of digital transformation in order to put forward conceptual clarity challenges. In accordance with different views, Vial (2019) presents a brief conceptual definition for digital transformation as "*a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies*".

In this regard, the enablers and building blocks of digital transformation are presented through an inductive framework by Vial (2019). These building blocks can be reviewed as follows: "use of digital technologies" such as Internet of Things (IoT), Industry 4.0, Blockchain, Artificial Intelligence, (AI) Mobile, Analytics and more; "disruptions" that are occurring in the society and industry; "strategic responses" triggering need for digital business strategy and digital transformation strategy in organizations; "changes in value creation paths" through use of promising digital technologies and in order to remain competitive which can generate not only "positive impacts" on organization performance, operational efficiency, industry improvements, but also "negative impacts" in terms of security and privacy. As last two blocks; "structural changes" such as organizational culture and structure and "organizational barriers" such as resistance to change, inertia can have effects on "changes in value creation". Changes in value creation paths can be achieved by rebuilding business models and redesigning of business

processes (Berman 2012; Morakanyane et al., 2017); by reshaping value propositions, value networks, digital channels and agility (Vial, 2019).

One key driver towards digital transformation indicated by Li et al. (2019) is organizational mindfulness as a prerequisite of information processing capability which advances market agility of an organization. Another key driver of digital transformation is digital maturity of organization which is developed by organizational strategy, culture and talent (Ryan et al., 2019). Organizations need to adjust their digital technology portfolios and projects effectively. Realizing appropriate 3P and introducing of new digital platforms for their own business models is essential to reach desired IT capability and maturity. Such projects can strengthen firms' ability to collect, disseminate, store and analyze data; and can provide unique opportunities for firms to enhance their agility and also digital transformation (Roberts & Grover, 2012).

Lederer et al. (2017) also indicates that digital transformation is about optimization of processes with the aim of operational excellence; the process of value-adding business model creation. The role of Business Process Management (BPM) paradigm is emphasized in forming the basis of digitalization and driving the digital transformation efforts of organizations. BPM is a structured approach that supports business processes with the help of methods, techniques and software to design, enact, control and analyze operational processes (Zairi, 1997; Dumas et. al, 2013; Baiyere et al. 2020). Today, in context of digital transformation, traditional BPM paradigms -that follows a strict action sequence- do not provide quick response to business needs (Martins & Zacarias, 2017). Modern implementations are required for continuous process improvement (CPI) and business process redesign (Lederer et al, 2017, Ryan et al., 2019). Adoption of agile and lean approaches to process improvement and business model creation is a great concern of most organizations today (Martins & Zacarias, 2017; Xu and Koivumäki, 2019).

Implementing digital technologies is not enough to achieve digital transformation. As mentioned, digital transformation includes many components including effective portfolio or project management for integrating disruptive technologies or developing new digital platforms; business process improvements and redesign practices; introducing new business models and innovative value creation paths and more. The pervasiveness of digital technologies and the urgency to adapt new opportunities and business practices is a current concern. Organization need to increase their *agility* by adopting agile approaches to digital transformation. At this point, agile approaches have a great potential to assist the reconfiguration of business processes and models, governance and management of 3P.

Agility for Project Management and Business Transformation

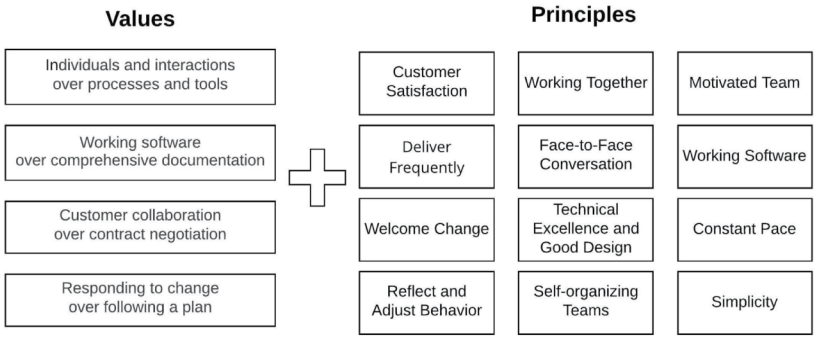
As an important step in agile movement, the Agile Manifesto was published in 2001. Agile Alliance (2001) defines the term agile as "*the ability to create and respond to change*" and "*a way of dealing with, and ultimately succeeding in, an uncertain and turbulent environment*". It is the ability of organizations to take advantage of changes as opportunities (Sharifi & Zhang, 2000). Although some agile exercises were already used independently by practitioners before 2001 in response to the chaotic and unplanned conditions, the manifesto with its four core values and twelve principles created the foundation of agile as shown in Figure 1.

Agile approaches for adaptiveness and responsiveness to change were mostly used and adopted by *software development teams* in order to improve effectiveness of software development projects. Before 2001, traditional software development implementations are focusing on mostly plan driven practices that begin with heavyweight requirements elicitation and high-level design and development processes (Dora and Dubey, 2015). Traditional software development methodologies are based on a sequential series of

steps like requirements definition, solution building, testing and deployment. They require defining and documenting a stable set of requirements at the beginning of a project; they are dependent on a set of processes and documentation. These documentations are developed as the work progresses and guide further development (Leau et al., 2012). Knowing and documenting all of the requirements before development phase provides valuable project outcomes; however, a change during the development lifecycle can create serious problems. Over time, implementations of heavyweight requirements engineering in projects become an obstacle for frequent changing requirements and achieving continuous improvement; digital transformation needs to be fast and adaptive (Dyba and Dingsoyr, 2009; Dingsøyr et al., 2010).

With Agile Manifesto in 2001, agile software development has rapidly become a mainstreams software development model in use today through industrial adoption of several its concrete manifestations such as Scrum and XP (Fowler and Highsmith, 2001; Loiro et al., 2019). Agile Alliance (2001) defines agile software development as "*an umbrella term for a set of frameworks and practices based on the core values and principles expressed in the Manifesto for Agile Software Development and the 12 Principles behind it*". Agile mindset for software development addresses the collaborative development, reduction of unnecessary work, minimizing wasteful documentation and shorter development lifecycles in order to effectively guide and manage software development and control the variation of agile software development (Dingsøyr et. al, 2010; Dingsøyr and Moe, 2014; Conboy 2009). Agile methods allow to adopt changing business and user requirements, to deliver working software frequently and to achieve close collaboration of all stakeholders and project team.

Figure 1. Review of agile manifesto



Agile software development is defined as adaptive, cooperative, incremental and straightforward by Suryaatmaja et al. (2019). Currently, diverse implementations of agile software development approaches are available over the world such as Scrum, Extreme Programming (XP), Feature Driven Development (FDD), Adaptive Software Development (ASD), Dynamic Software Development Method (DSDM), Crystal, Kanban and many other adaptive approaches (Awad, 2005; Phil, 2015; Flora et al., 2014; Collabnet Versione, 2019). Some of the popular ones are reviewed with their key practices and challenges in Table 1 in accordance with studies of Awad (2005), Phil (2015), Flora et al. (2014), Javanmard et al. (2015) and Ozdenizci Kose (2019).

According to the state of Agile Survey that VersionOne has been conducting annually since 2007, top three reasons for adopting agile methodologies are accelerating software delivery, enhancing ability to manage changing priorities and increasing productivity (Collabnet Versione, 2019). Therefore, adopting suitable agile software development process is considered as a strategic management decision with long term implications. In this regard, Scrum and XP approaches are highlighted as the most common agile methodologies used by today's organizations.

Table 1. Review of common agile methodologies

Methodology	Key Practices	Advantages	Challenges
Scrum	Iterative increments; 2 to 4 weeks iterations as sprints; product backlog; spring backlog; sprint planning; the daily scrum (or stand-up); sprint reviews; sprint retrospectives	High level communication; high involvement of user as Product Owner; self-organizing teams and feedback	Weak documentation; can easily get off track; changing requirements
XP (Extreme Programming)	Iterative increments; 1 to 6 weeks iterations; user stories; pair programming; test driven development; refactoring	Active end user involvement; frequent feedback opportunities; strong technical practice	Weak documentation; unclear needs of clients; lack of disciplines; small teams that are suitable only for smaller projects
DSDM (Dynamic Systems Development Method)	Iterative; detailed documentation; prototyping; feasibility and business study	Strong control on project lifecycle; user involvement through frequent releases; requirement priority approach	Complex and time-consuming documentation; expects continuous user involvement
FDD (Feature Driven Development)	Iterative; 2 days to 2 weeks iterations; suitable for complex projects; many members and multiple teams working in parallel; modeling with detailed documentation	Method simplicity; Easy to understand because of documentation; user involvement through frequent reports	Less communication within and out of team; individual code ownership; complex approach for small projects
ASD (Adaptive Software Development)	Incremental; 4 to 8 weeks iterations; basic documentation; learning cycle	User involvement through frequent releases	Weak documentation; small teams and suitable only for smaller projects
Crystal	Incremental, informal and face-to-face team communication	High risk and highly important component given first; efficient coordination and communication of bigger teams; user involvement through frequent releases	Planning and development are not depended on requirements

Another critical finding about the agile maturity in the agile survey report (Collabnet Versione, 2019) is underlined as "*vast majority of respondents (83%) said their organization were below a high level of competency with agile practices, further revealing opportunities for improvement through supporting training & coaching*." Big majority of the organizations are using agile practices like daily stand ups,

short iterations, sprint or iteration planning, retrospectives, sprint review, test-driven techniques, burn-down charts; however, the adoption of agile practices and agile approaches to market conditions is still evolving and maturing. It is important to highlight that agile software development is not only about practices and frameworks but also a "mindset" with its core values and principles.

The cooperation provided by agile mindset supports getting the potential of higher customer satisfaction and quicker adaptation to rapid changing business requirements (Cho, 2010; Miller and Larson, 2005). Agile approaches focus on context-specific development by achieving lower defect rates, performing faster development, and by being responsive to rapidly changing requirements (Boehm and Turner, 2003). Beyond software development perspective, agile approaches started to be utilized in other areas of digital transformation such as business process redesign, process improvement, new value path creation, new opportunity discovery, new product development and more. Consideration of agile in business transformation allows organizations to discover changes or new opportunities, and to react quickly (Martins & Zacarias, 2017; Xu and Koivumäki, 2019).

Importance of Business Analysis

In order to realize efficient IT projects and digital business transformation; researchers and practitioners are taking advantage from BA which provides well-structured tools and techniques to identify needs; recommend solutions; elicit, document, and manage "requirements" to deliver expected benefits (PMI, 2017a).

The term BA provides a disciplined approach for introducing and managing the change to organizations whether they are non-profit or profit or government organizations. According to Project Management Institute (PMI) (2017a), BA allows to optimize the delivery of business value by providing the information needed to make wiser investment decisions on portfolios, programs, and projects once the decision to pursue an organizational change or transformation has been made.

Report of PMI (2017b) indicates the importance of BA as follows: "*Poor performance occurs when organizations lack maturity in significant BA processes and fail to recognize the value it provides. When BA is properly accounted for and executed on projects and programs, high-quality requirements are produced; stakeholders are more engaged; the solution delivers intended value; and projects are more likely to be delivered on time, within scope, and within budget. For many organizations, effective BA is not an integral part of their project work. That contributes to projects not delivering the intended value*".

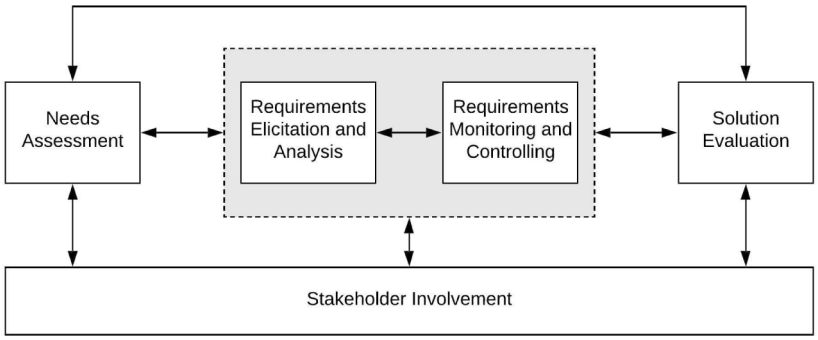
BA can be defined as the work of "*requirements engineering*". As illustrated in Figure 2, PMI (2017a) defines knowledge areas of traditional BA as needs assessment, requirements elicitation, requirements analysis, requirements monitoring and controlling, solution evaluation and stakeholder engagement in all steps.

Currently, as a reaction to traditional software development methodologies, agile approaches have become popular that aims to expedite the software development lifecycle and to ensure that output satisfies "requirements". Integrating traditional requirements engineering perspective with agile software development processes generally does not work well; traditional BA techniques implementation on agile methodologies can seem overwhelming (Käpyaho & Kauppinen, 2015: 335-336; Parker, 2013).

Today, practitioners and researchers are seeking for lighter requirements engineering practices, in other words lightweight BA, that can handle the issues of abstract or unclear requirements and specifications, changing requirements, and at the same time that can satisfy the Agile Manifesto philosophy; fast delivery of software, high user involvement and executive support during software project implementa-

tion. More collaboration and less engineering practices are accepted as the key characteristics of agile methodologies.

Figure 2. Knowledge areas of BA
Source: PMI, 2017a



Ambler (2018) emphasizes agile analysis as "*highly evolutionary and collaborative process where developers and project stakeholders actively work together on a just-in-time (JIT) basis to understand the domain, to identify what needs to be built, to estimate that functionality, to prioritize the functionality, and in the process optionally producing artifacts that are just barely good enough.*"

Today, enabling more Agile BA and agile requirements engineering practices is an interesting research field. Researchers are working on how requirements engineering approaches and techniques can be considered within context of agile business transformation and projects. Accordingly there are also some studies which provide useful information about implementation of agile requirements engineering practices, lighter requirement practices and its challenging issues (Ochodek, & Kopczyńska, 2018; Wagner et al., 2018; Kasauli et al., 2017; Schön et al., 2017; Musa et al., 2017; Käpyaho & Kauppinen, 2015; Leffingwell, 2010; Cao et al., 2008; Martins & Zacarias, 2017; Xu and Koivumäki, 2019).

The studies of Paetsch et al. (2003) and Schön et al. (2017) review the agile requirements engineering activities in five phases: discovery and elicitation of new requirements (through techniques such as interviews, use case, observation, focus groups, brainstorming, prototyping etc.); refinement and analysis of new ideas and requirements; prioritization of requirements through requirement value measurement; checking and review of requirements; and then documentation.

Fancott et al. (2012) puts forward that agile requirements engineering mainly relies on conversations with business and implicit knowledge of the stakeholder. Analysts needs to constantly ensure that the features demanded by the customers align with the business goals, and benefits from frequent feedbacks from customers. Results of successive iterations help analysts to refine requirements, mitigate risk early in the project and deliver right solution on time within budget.

As stated by the studies of Käpyaho et al. (2015) and Paetsch et al. (2003), the guidelines for requirements engineering provided by agile methods are ambiguous since the concepts related with agile requirements engineering are still being developed. Some common characteristics of agile requirements engineering are strong use of face-to-face communication, iterative requirements elicitation and design,

continuous requirements prioritization, prototyping or other modeling activities to make sense of requirements, Test Driven Development (TDD) and acceptance testing to ensure the quality and right direction (De Lucia, & Qusef, 2010; Käpyaho et al., 2015).

Another study conducted by Cao & Ramesh (2008) in software development organizations indicates that face-to-face communication, prototyping and reviews and tests are common agile practices. However, it is seen that all of these practices bring some inherent challenges. The literature studies of Cao & Ramesh (2008), Bjarnason et al. (2011), Paetsch et al. (2003) show that projects that are realized by agile methodologies have requirements engineering challenges such as managing with very little documentation, not understanding the importance of writing tests first, not understanding the big picture, neglecting quality requirements, unrealistic expectations of customers due to early user interface (UI) prototypes, neglect of non-functional requirements, unavailability of customer during acceptance test writing.

The study of Wagner et al. (2018) provides a well-defined problem list that are commonly occurring in the context of agile projects and examined how criticality of those problems is judged by practitioners. According to research findings, incomplete and/or hidden requirements and communication flows between project team and customer are the top of the list of criticalities.

AGILE APPROACH FOR BUSINESS ANALYSIS

Today, BA is a critical competence requirement for organizations in order to deliver high quality project outcomes, transform business processes efficiently, and achieve maximum value. Agile BA is the integration of BA with agile mindset that can facilitate agile digital transformation within organizations. Since traditional BA practices in agile context have constraints for the practitioners and researchers, agile and adaptive mindset for performing BA is highly essential in today's digital era. For the effective management of 3P and improvement of business processes, high quality and agile *needs assessment* for the problem domain and *traceability the solution* is critical issue.

As one of the important bodies providing IIBA endorsed training programs, BAE (Business Analysis Excellence Pty Ltd) highlights that "*Agile BA can provide a competitive advantage in fast-paced and complex environments and has moved beyond software development initiatives to any business domain. Organizations have adopted agile practices at all levels of planning and in many diverse business areas."* (BAE, 2018a)

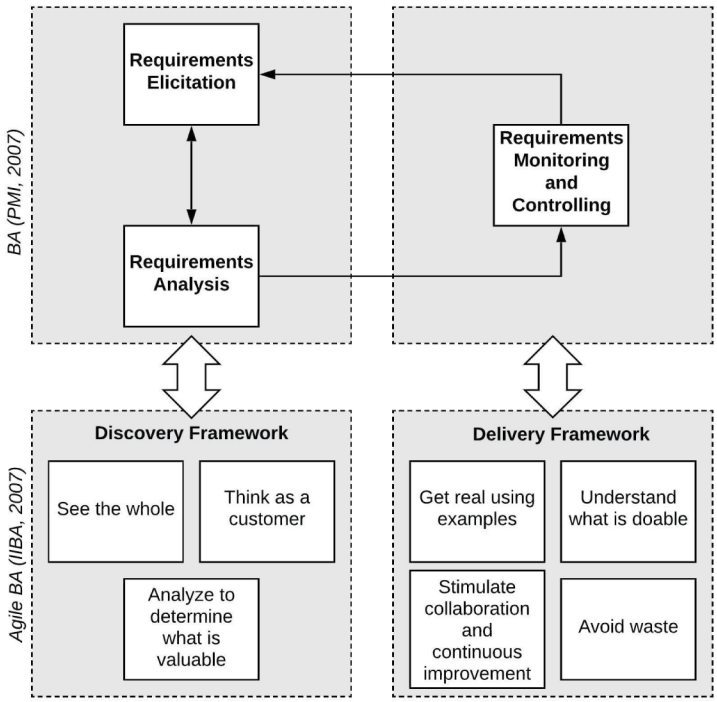
Agile BA focuses on continuous feedback and continuous learning in order to *prioritize delivery, reduce waste* and *raise customer value* (BAE, 2018b). Continuous feedback can be encouraged by engagement of internal or external stakeholders such as customers, team members, experts, investors and other partners in BA. Feedback mechanism allows organizations to comprehend if they are delivering right value for customer; which will trigger continuous learning in organizations. The collected feedback helps to prioritize the work items in product backlogs and focuses on the most valuable story for the customer. In this regard, feedback mechanism forms the basis of Agile BA.

As mentioned in Figure 1, Agile Manifesto highlights four core value: individuals and interactions, customer collaboration, working software and respond to change. The core values of Agile software development emphasize *being people centric* and *results driven*. In this regard, Agile Extension to the BABOK® Guide by IIBA and Agile Alliance (2017) states seven key principles for realizing Agile approach in BA for practitioners: *see the whole, think as a customer, analyze to determine what is valuable,*

get real using examples, understand what is doable, stimulate collaboration and continuous improvement, and *avoid waste*.

See the whole, *think as a customer* and *analyze to determine what is valuable* principles address elicitation and analysis of requirements in context of BA. Understanding the big picture and focusing on needs of customers allow to discover the most valuable requirements as user stories and perform necessary analysis on them instead of non-value adding user stories. *Get real using examples*, *understand what is doable*, *stimulate collaboration and continuous improvement* and *avoid waste* principles address delivery of requirements, monitoring and controlling of requirements in context of BA. Depending on these seven principles, two main frameworks are presented for Agile BA: *the discovery framework* and *the delivery framework*, which corroborate somewhat with the traditional BA knowledge areas (PMI, 2017a) as reviewed in Figure 3.

Figure 3. Knowledge areas of BA



So, *what do we know about recent Agile BA techniques?* In accordance with the seven principles of Agile BA, techniques required for Agile BA need to mainly focus on prioritization of work in an agile manner, extracting most valuable work, and responding to change. Regarding the seven principles and knowledge areas, promising techniques for realizing Agile BA are described and reviewed comprehensively in two phases: Agile Requirements Elicitation and Analysis, and Agile Requirements Monitoring and Controlling.

Agile Requirements Elicitation and Analysis

This section presents state-of-the-art techniques for requirements elicitation and analysis in accordance with the guidelines of PMI (2017a), and IIBA and Agile Alliance (2017). Recent promising requirements discovery techniques are reviewed; future trends and directions are presented for advancing requirements discovery in various agile projects of software development, process improvement and business transformation.

Personas

Persona is a very popular "user centric" practice for enhancing elicitation of requirements in agile software development. When system as project outcome has a large number of users or customers, developing persona -as a class of users- with enough characteristics is a good choice for understanding the big picture as whole system. A persona was first introduced by Alan Cooper which is virtual person or archetypical user or customer of the system (Pruitt & Grudin, 2003). PMI (2017a) defines Persona as "*a fictional character created to represent an individual or group of stakeholders, termed a user class."* This fictional character has descriptive features like a name, demographics, skills, goals, behaviors, motivations, hobbies and more.

Robertson & Robertson (2012) states that "*Personas are useful when real users are not available or are too numerous for you to interview all of them. The persona is a virtual character that substitutes for the human users. We strongly suggest using a persona when you do not have access to the real users or customers. Almost always, the persona is a better representation of the user than a human proxy."*

Persona analysis allows to design user experiences by extracting the big picture. In order to draw out the stakeholder -actual person- requirements, fictional characters are used to determine how a user interacts with the solution. Through persona analysis, business analysts can easily put forward the whole picture by thinking about persona's needs. By thinking like persona as someone real or treating the persona as a real person, business analysts can ask questions like "*What does Alice want now*?" or "*How does Alice want to do*?" or "*What would Alice do in this situation*?". When developing personas, narratives, namely stories are created. This technique is widely preferred and used by agile practitioners to analyze a group of users, understand their needs and product design and behavior requirements. It is a powerful tool for understanding stakeholder needs and targeting product design and behavior for each class of user, and also creating user stories.

User Stories

In order to think as a customer, in addition to personas, user stories are valuable assets in Agile BA. PMI (2017a) describes the term user story as *"a one or two sentence description written from the viewpoint of the actor that describes a function that is needed."* User stories are generated to document stakeholder or user requirements depending on the value of benefit achieved by users with the completion of the corresponding story.

Personas -virtual characters with the problem- are used for developing user stories; broad features are decomposed into user stories, and then elaborated to acceptance criteria. The boundaries of each user story should be defined by acceptance criteria which describes conditions that the solution must provide in order to be accepted by user or stakeholder. A user story can be written in the following format: *as*

an <actor>, I need to <function>, so that I can <benefit>. Who, What and Why questions should be summarized in a user story; for example, *As a student, I want to generate a transcript report, so that I can evaluate my overall performance*. User stories should meet some criteria, generally identified as INVEST criteria which stands for Independent, Negotiable, Valuable, Estimable, Sized to fit, Testable (Wake, 2003). Identified user stories in a product backlog should be simple and powerful statements describing the functionality, need or goal from the perspective or the user (IIBA and Agile Alliance, 2017).

It is essential to highlight that the primary technique for representing requirements is to work with user stories in most agile environments. Development of user stories allows to understand the requirements of the solution effectively and efficiently. They are the fundamental constructs of Product Backlog which presents all the work that needs to get done in an agile system development project.

Backlog Grooming

Backlog Grooming, in other words Backlog Refinement is a must practice within context of Agile BA work. Product Backlog including list of requirements as user stories for an iteration prioritized by highest customer value (IIBA and Agile Alliance, 2017). Agile software development projects cannot succeed without continuous prioritization work. The backlog and user stories should periodically revised and updated by the Product Owner and agile team members as the acceptance criteria is developed.

Collaboration of all team members, stakeholders and customers is essential for refinement and management of Product Backlog. Backlog Grooming ensures sufficiently detailed and clearly defined user stories with the implementation of story decomposition, story elaboration, prioritization of stories and sequencing.

Value Stream Mapping for Lean Mindset

Another considerable agile practice is to perform Value Stream Mapping (VSM) for presenting the big picture of as-is and to-be environments. As a variation of process flows, VSM is firstly originated in Lean Manufacturing methodologies, but now it has gained high popularity in agile project management frameworks. Scaled Agile (2020) highlights value streams as *"the series of steps that an organization uses to implement solutions that provide a continuous flow of value to a customer"*. Scaled Agile Framework (SaFE) also encourages the development of value streams for set of solutions in its portfolio.

As a lean methodology, VSM is a powerful tool in order to *"identify process steps that add value (value stream) and those that do not add value (waste)"* as indicated by PMI (2017a). The flow of information, people and materials is required to provide solution (e.g., system, product, or service) to a customer is analyzed by VSM technique; in other words, the "value" created by solution is identified and optimized through process maps.

The main focus behind VSM technique is to achieve shortest lead time and highest quality, and to deliver maximum value for customer. The value stream process maps are visualized by flowcharts for effective problem detection and problem solving. In Agile BA context, the developed maps enable to explore process value adding and non-value adding steps in existing business process and also in future state of business process. Moreover, it can help to quickly discover non-value adding steps, separate waste/constraints/delays from value added steps, eliminate waste, discover opportunities for improvement, optimize a process and create a future state process in an agile manner. The technique is especially valuable within scope of agile business process improvement and reengineering projects.

Story Mapping with Minimum Viable Product

Story mapping is a visual view of the sequence of activities or user stories to be supported by a solution. As a promising Agile BA practice, Story Mapping is *"used to sequence user stories, based upon their business value and the order in which their users typically perform them, so that teams can arrive at a shared understanding of what will be built"* (PMI, 2017a).

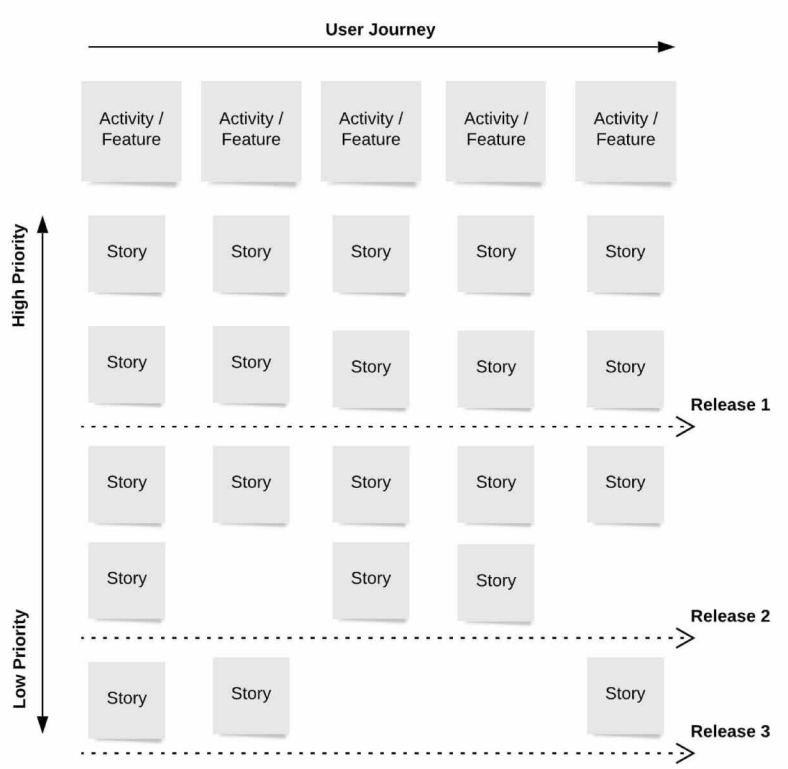
A story map includes two main components: the backbone and the walking skeleton. The backbone part includes the Minimum Viable Product (MVP) which aims to present the smallest set of core capabilities, user stories as requirements that should be in the first release product for the solution to provide its purpose PMI (2017a). At this point, business analysts should clearly identify the target market involving early adapters of the solution. Story mapping allows to build the MVP line on the board and facilitates team to develop the release that includes MVP features. In adaptive and agile approaches, MVP has a notable importance since it allows to reduce cost and risk by gaining customer feedback before releasing the full solution and tests actual usage scenario instead of relying on market research (IIBA and Agile Alliance, 2017). By this way, customers do not face with a product that they don't want, which reduces the risk.

The walking skeleton presents the full set of functionality and requirements that the stakeholders require for the solution to be accepted as functional (PMI, 2017a). The stories are ranked in order of highest business value at the top to lowest business value at the bottom as shown in Figure 4. Story maps help to communicate the features, stories and requirements effectively and quickly through collaboration with stakeholders. Story mapping can be generated by using sticky notes on white-boards or using software tools during workshops or brainstorming sessions. Since it describes the customer's journey in a flow, this visual technique has also a considerable support for developing user stories, managing product backlog and refining backlog.

Storyboarding

Another valuable agile practice is storyboarding which can be defined as a kind of prototyping. Unlike story mapping, storyboarding presents sequence of illustrations or images that explains the big picture. It is also known as navigation flow, dialogue map, or dialog hierarchy. Storyboarding is generally used with user stories in order to detail the sequence of activities visually and to show the interactions of user with the system through workshops or brainstorming sessions. Storyboarding mainly contributes and support UI and UX design as a popular agile analysis technique today. Storyboarding allows to elaborate and validate requirements visually and effectively with the stakeholders since it easily communicates to team what needs to be develop (PMI, 2017a).

Figure 4. Story mapping



User Experience Design

Beyond UI design, today UX design is most concerned with how systems or application will look and feel and how customer will interact. It enables to focus on consumer's journey: *How does the user feel and think about their experience?* UX designers are mainly responsible from building wireframes and high-fidelity prototypes, creating interaction design, developing content structure and information architecture, and performing usability testing tasks.

Currently, UX design has gained a great attention in adaptive and agile environments. Agile approaches started to place more UX studies to get in touch with customers and understand their overall look and feel for each release. Business analysts should collaborate with UX designers in order to integrate personas, user stories and customer's journey with visual screens and prototyping. Understanding the user flow and experience and getting continuous feedback from customers have a critical role in streamlining the agile development process. Currently, various UX design software and tools are available in software industry for expanding the Agile UX design studies.

Impact Mapping

Impact Mapping is a lightweight, fast and collaborative planning technique through face-to-face brainstorming and workshop sessions to present the big picture of a software development project. Agile teams

and stakeholders discover the information from different perspectives; visualizes the organizational goals and deliverables; answers how these deliverables connect to use needs and how user outcomes relate higher level organizational goals. During impact mapping technique, a visual tree map is developed and continuous refined with the continuous feedback mechanism.

An impact map includes organizational goals, actors contributing to achieve these goals, impacts as actions that actors can take to realize these goals and deliverables helping to achieve these goals. The technique allows to connect goals and actors with impacts and deliverables. The information is structured as a mind map; importance and priority are described with symbols or colors. Instead of feature development (what) perspective, the value creation (why) perspective is the main focus of impact mapping. This practice, but not limited, easily engages stakeholders together, exposes deliverables with their impacts, and facilitates effective planning and prioritization of deliverables and impacts (Neuri Consulting, 2020; IIBA and Agile Alliance, 2017).

Kano Analysis

As mentioned, agile approaches and also Agile BA give high importance for determining and developing the most valuable feature(s) or item(s). Prioritization is very important step of agile software development. Prioritization of user stories in product backlog and refinement of backlog iteratively should be performed by agile team members, customers and Business Analyst. Kano analysis is a powerful tool for analyzing the valuable items and enhances the prioritization work with stakeholders and customer in agile environments effectively.

Kano analysis is not a new concept; it was developed by Professor Noriaki Kano in 1980s for product development and customer satisfaction analysis. According to PMI (2017a), five product categories shown in Figure 5 are generally used in Kano model to understand and analyze the product features and characteristics. This categorization helps the team members to capture each feature's expected contribution for customer's satisfaction level (Sauerwein et al., 1996). The categories can be summarized as follows:

- Basic are must features; their absence causes extreme dissatisfaction;
- Performance represents features that provide more satisfied customers;
- Delighters (also known as Excitement) represents the features that have "great" effect on customers; when they are available, they provide extreme satisfaction; but absence of those features do not create a dissatisfaction;
- Indifferent represents the features that neither satisfy not dissatisfy customers;
- Reverse represents the features that customers do not want; decrease customer satisfaction directly.

The practice has a great potential in Agile BA for understanding and analyzing product features and quality from customer perspective, and prioritizing and sequencing user stories. It helps to determine which user stories or requirements are significant to develop before releasing the full solution.

Purpose Alignment Model

Another valuable technique for supporting the most valuable analysis and prioritization is Purpose Alignment Model. This model aims to evaluate the ideas in terms of customer and business value and categorizing options in accordance with the business purpose. Similar to Kano model, this model also

provides a strong mechanism for making prioritization in agile environments and performing strategic decisions. The greatest value providing features, requirements and capabilities are explored with this model; by the way it enhances the prioritization work with stakeholders and customer effectively.

Purpose alignment model evaluates the characteristics, features or user stories in two perspectives: market differentiation and criticality (PMI, 2017a). The market differentiation dimension focuses on whether the feature creates a differentiation; on the other side the mission critical dimension focuses on whether the feature is critical for the company and its mission. In this regard, four categories are identified where a feature or story can be categorized as shown in Figure 6:

- Differentiating features are mission critical and present high differentiation in the market;
- Parity features are mission critical, but present low differentiation in the market;
- Partner features present high market differentiation, but are not considered as critical;
- Who cares features are neither differentiating nor critical for the organization.

Figure 5. Kano model
Source: PMI, 2017a

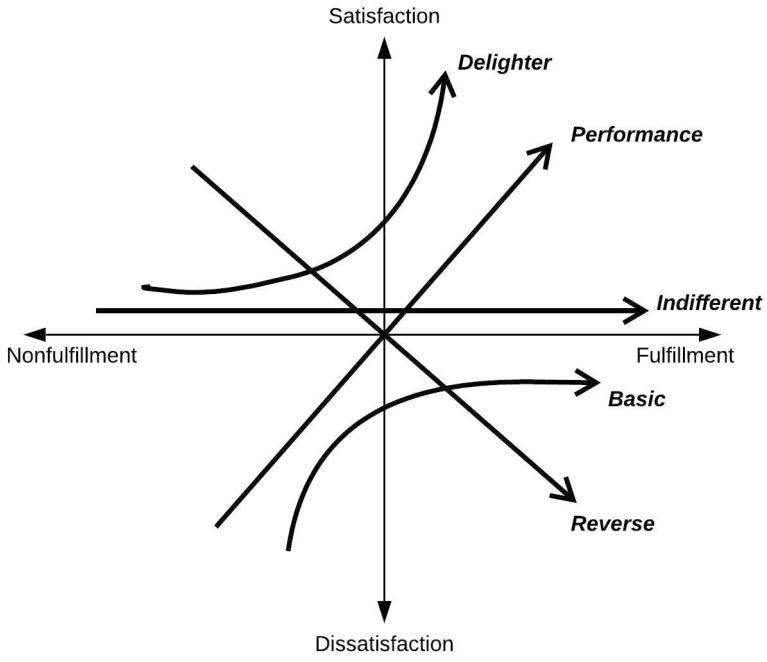
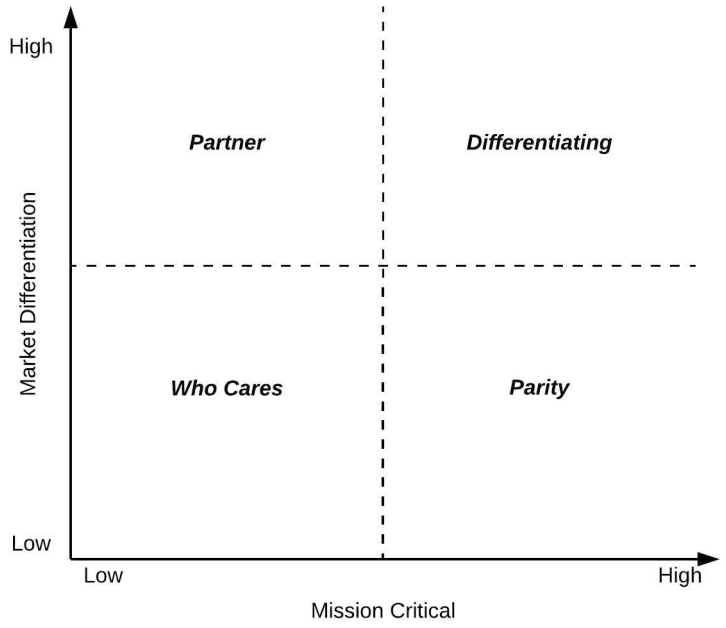


Figure 6. Purpose alignment model
Source: PMI, 2017a



MoSCoW Model

MoSCoW stands for *Must have, Should have, Could have,* and *Won't have* classification of priority. This practice is very easy and effective for agile teams in order prioritize of stories and features during Product Backlog management. With MoSCoW model, most critical set of stories can be explored, sequenced, prioritized and managed in backlog by agile team members.

The agile approaches focus on continuous feedback and continuous assessment of business value to enhance the prioritization and determination of most valuable work at that time. Agile BA practice is the art of maximizing and delivering the value continuously. Drawing the big picture; thinking as a customer; being customer or centric; and identifying most valuable requirements, features or user stories are primary purposes of most agile approaches. Hence, the techniques regarding Agile Requirements Elicitation and Analysis phase should be enriched with valuable techniques by researchers and practitioners over time.

Agile Requirements Monitoring and Controlling

This section presents state-of-the-art practices for agile requirements delivery, monitoring and controlling phase in accordance with the guidelines of PMI (2017a) and IIBA and Agile Alliance (2017). Similarly, recent techniques are reviewed; and future directions are suggested for advancing release and monitoring of requirements in various agile projects of software development, process improvement and business transformation.

Behavior Driven Development (BDD) for More Automated Testing

As a software development methodology, Behavior Driven Development (BDD) is an extension, branch of TDD. The technique focuses on *"customer behavior"* in order to meet customer needs. The technique mainly allows to get real using examples. The aim is to increase value, eliminate waste and advance communication between stakeholders and agile team members.

As highlighted by IIBA and Agile Alliance (2017), BDD expresses customer needs in natural language which allows all team members to understand easily. Beyond user story format, BDD uses Gherkin format that allows to express product needs as concrete scenarios or real examples: *GIVEN <a context> WHEN <an event> THEN <expected outcome>*. Given conditions and expected outcomes are triggered only one When event. The format aims to put forward multiple dimensions of the corresponding system or product solution: user role, user actions, data rules and business rules.

The scenarios written in BDD format describe events, conditions and actions which can serve as acceptance criteria for user stories and also as tests. Real scenarios of BDD enhance the development of test cases; scenarios can be effectively converted into automated tests. Executable form of behavior codes is compiled and executed to verify that code matches the behavior and validate functionality. Easy and quick automation of customer behavior scenarios speeds up agile analysis verification and validation of requirements. BDD is also a continuous practice; enables not only agile delivery of requirements, but also agile delivery customer value incrementally. As studied by Egbreghts (2017), Table 2 provides a brief description of execution steps performed by TDD and BDD.

Lean Traceability and Kanban Boards

Remember that, lean is the process philosophy that aims to eliminate and avoid waste. Waste can be defined as something that negatively affects the process quality and productivity. In order to avoid waste in agile software project management, lightweight BA practices should be explored and implemented for requirements delivery, traceability and even for documentation of Agile BA practices. In this regard, a promising approach is incorporating Kanban principles as a lean methodology into agile software development methodology.

Table 2. Comparison of TDD and BDD execution

	TDD	BDD
1	Write a test	Write a test scenario
2	Run the test and check if it fails	Execute the scenario and check if it fails
3	Write a code sufficient for the test to pass	Write a code sufficient to implement the expected behavior
4	Run the test and check if it passes	Execute the scenario check if it passes
5	Refactor the code	Refactor the code

Source: Egbreghts, 2017

PMI (2007a) defines Kanban as *"an adaptive life cycle in which items are pulled from a backlog and started when other product backlog items are completed"* and also it *"establishes work-in-progress limits to constrain the number of product backlog items that can be in progress at any point in time"*.

Currently, Kanban boards are used in adaptive environments within continuous improvement scope of Kanban, to monitor and track work in-progress (WIP) by agile team members. It is a variation of the original Kanban cards. Kanban boards allow to visually plan the work and depict the workflow and capacity, support agile team members. The visual representation enhances planning, monitoring and controlling of the user stories and work; shows clearly planned, in-progress, completed and incomplete user stories; and avoids bottlenecks in item development and release management. Various software tools for Kanban board are introducing today for agile projects in scope of digital transformation; as an example, Figure 7 shows a view from one of the popular Kanban boards; Trello (2020) by Atlassian.

Figure 7. An example for Kanban board
Source: Trello (2020)

Reviews and Retrospectives

In order to monitor and control the requirements, retrospectives and review meetings should be encouraged in adaptive and agile digital transformation. Especially in Scrum framework, retrospectives and reviews are highly used by stakeholders with the purpose of continuous improvement of agile environment.

Retrospectives are used to benefit from the past experience and plan the future. Meetings should be scheduled and conducted on a regular basis such as after each iteration of agile environment. As stated by PMI (2017a), the following questions are discussed in these meetings: *What worked well? What is not working or is unclear? What will we commit to doing in next iteration? What could be improved? What changes can we make now?*

With the collaboration -of all team members, stakeholders, product owners and business analysts- and communication approach, team members can make actionable commitments. By the way, continuous feedback and continuous improvement can be ensured effectively by retrospectives and reviews.

DISCUSSION AND RECOMMENDATIONS

Traditional BA knowledge areas indicate three requirements engineering phases which are triggered with needs assessment, supported throughout the lifecycle with stakeholder engagement and ends up with solution evaluation. Requirements elicitation, analysis and requirements monitoring and controlling are the building blocks of BA. General knowledge of BA states various techniques; however, it is clear that incorporating all these techniques into agile approaches is impossible due to the nature of agile approaches; some of these techniques can work well in agile environments.

Requirements elicitation and analysis focuses on discovering and examining product information in sufficient detail depending on customer needs, organizational goals and business objectives. There are various techniques from interviews, document analysis, observation, focus groups to collaborative games, wireframing, timeboxing, affinity diagrams, context diagrams and more. In terms of agile perspective, high potential and promising techniques are highlighted for realizing value adding requirements elicitation and analysis. Using personas, developing user stories and story boards, creating value steam maps, building story maps, focusing on MVPs, working with UX designs enable to explore the requirements in an agile manner effectively. These techniques can be easily integrated to agile digital transformation. They allow to extract the big picture of system solution with its features from the eye and mindset of customer. Describing features and user stories helps to explain the customer's journey in an agile manner. Especially, visual representation of customer's journey through UX designs as high-fidelity prototypes including interactions without coding enables to purely develop the navigation flows, and even value stream process flows. Today, UX designers with appropriate UX design platforms should be considered by organizations to react quickly to changes.

Besides requirements discovery, continuous requirements prioritization is another significant part of release planning and backlog management. In order to enhance prioritization of requirements, three popular known models are suggested and explained which can be effectively integrated to agile approaches. These models provide assessment of requirements in different valuable perspectives. Kano Model allows to analyze features and user stories in terms of customer satisfaction level; on the other side Purpose Alignment Model enables to assess features in terms of market differentiation and business criticality; and another model, MoSCoW provides an easy evaluation of requirements based on the need for customers and stakeholders. Continuous requirements prioritization can be enhanced by continuous feedback mechanism. In this regard, workshops, face-to-face brainstorming sessions, review meetings after each iteration and retrospectives are inevitable supporting mechanisms for continuous feedback environment and prioritization of requirements. These agile mechanisms should be encouraged and used by members of any type project in terms of digital transformation.

The next phase, requirements monitoring and controlling focuses on ensuring that requirements are approved, managed and tracked. Today, implementing BDD methodology which originally emerged from TDD methodology is a powerful delivery tool for many agile software development projects. It enhances the automated testing practices which means high quality acceptability and traceability of user stories as product releases. BDD is also stated by IIBA and Agile Alliance (2017) as an enabler of getting real

using examples principle. In addition to BDD, lean mindset should be also incorporated to agile software development processes. Lean methodology feeds continuous feedback, continuous improvement and waste elimination which are current needs of agile environments.

Instead of manual testing, implementation of BDD advances automated testing processes and continuous integration in agile organizations. Continuous integration practice under lean methodology is becoming very popular which aims to reduce the lack of automation in processes and avoid transportation and waiting waste. For improving productivity and increasing automation in testing practices of agile environments, it should be considered that BDD and lean principles should work together.

Use of Kanban board technique as one of the popular ways of implementing lean mindset have the capability for improving traceability and monitoring of requirements. Similarly, review meetings after each iteration and retrospectives support continuous feedback and improvement; in turn traceability of requirements. In this regard, a useless meeting means a kind of waiting waste for the attendee; notable and valuable actions should be taken after each meeting. As a principle of Agile BA, agile team members, stakeholders and business analysts must avoid waste; value adding review meetings, workshops, brainstorming sessions and also high-quality retrospectives should be conducted for continuous integration and continuous feedback. Another important lean need for Agile BA is producing lightweight documents. Working with visual representations -like UX designs, interaction diagrams, process flows, and story maps- is a good way for documenting Agile BA in scope of agile digital transformation.

CONCLUSION

The pervasiveness of digital technologies and the urgency to adapt new opportunities and business practices are significant subjects in the age of digital transformation. Organizations need to increase their agility and realize agile digital transformation. At this point, agile approaches have a great potential to assist the reconfiguration of business processes and models, governance and management of 3P. Agile and adaptive methodologies are requiring powerful Agile BA practices, instead of heavyweight requirements engineering. Need for change identification, clear problem definition, seamless requirements elicitation and analysis, lean requirements traceability and monitoring processes are inevitable competence needs for organizations.

This chapter reviews recent issues and directions on Agile BA; and presents state-of-the-art techniques of BA for adaptive and agile lifecycles that can be used for software project management, process improvement, business transformation and more. In context of the frameworks of IIBA and Agile Alliance (2017) and knowledge areas of PMI (2017a), promising agile techniques are examined in order to ensure new insights and opportunities. The regarding best agile practices present valuable guidelines for researchers and practitioners that how they can advance continuous feedback, continuous learning, continuous improvement and continuous integration capabilities of organizations, and also how to maximize value to the stakeholders in agile project lifecycles and agile business transformations.

REFERENCES

Agile Alliance. (2001). *Agile manifesto*. http://agilemanifesto.org/

Ambler, S. W. (2018). *Agile Analysis. Agile Modeling*. Available at: http://www.agilemodeling.com/essays/agileAnalysis.htm#AgileAnalysis

Awad, M. A. (2005). A comparison between agile and traditional software development methodologies. University of Western Australia.

BAE. (2018a). *Agile Business Analysis: Why you should start taking note of the Agile Extension to the BABOK Guide*. Available at: https://business-analysis-excellence.com/agile-business-analysis-start-taking-note-agile-extension-babok-guide/

BAE. (2018b). *Agile Business Analysis – The role of agile analysis, key principles and the planning horizons.* Available at: https://business-analysis-excellence.com/agile-business-analysis-the-role-of-agile-analysis-key-principles-and-the-planning-horizons/

Baiyere, A., Salmela, H., & Tapanainen, T. (2020). Digital transformation and the new logics of business process management. *European Journal of Information Systems*, 1–22. doi:10.1080/0960085X.2020.1718007

Berman, S. J. (2012). Digital transformation: Opportunities to create new business models. *Strategy and Leadership*, *40*(2), 16–24. doi:10.1108/10878571211209314

Bjarnason, E., Wnuk, K., & Regnell, B. (2011, July). A case study on benefits and side-effects of agile practices in large-scale requirements engineering. In *Proceedings of the 1st Workshop on Agile Requirements Engineering* (p. 3). ACM. 10.1145/2068783.2068786

Cao, L., & Ramesh, B. (2008). Agile requirements engineering practices: An empirical study. *IEEE Software*, *25*(1), 60–67. doi:10.1109/MS.2008.1

Cho, J. J. (2010). An exploratory study on issues and challenges of agile software development with scrum. *All Graduate theses and dissertations, 599*.

Cockburn, A. (2004). *Crystal clear: a human-powered methodology for small teams*. Pearson Education.

Collabnet Versione. (2019). *StateofAgile Report: 13th Annual State Of Agile Report*. Available at: https://www.stateofagile.com/#ufh-i-521251909-13th-annual-state-of-agile-report/473508

Conboy, K. (2009). Agility from first principles: Reconstructing the concept of agility in information systems development. *Information Systems Research*, *20*(3), 329–354. doi:10.1287/isre.1090.0236

De Lucia, A., & Qusef, A. (2010). Requirements engineering in agile software development. *Journal of Emerging Technologies in Web Intelligence*, *2*(3), 212–220. doi:10.4304/jetwi.2.3.212-220

Dingsøyr, T., Dybå, T., & Moe, N. B. (2010). *Agile software development: current research and future directions*. Springer Science & Business Media. doi:10.1007/978-3-642-12575-1

Dingsøyr, T., & Moe, N. B. (2014). Towards principles of large-scale agile development. *International Conference on Agile Software Development*, 1-8.

Dora, S. K., & Dubey, P. (2015). Software Development Life Cycle (SDLC) Analytical Comparison and Survey on Traditional and Agile Methodology. *National Monthly Referred Journal of Research Science and Technology, 2*(8).

Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2013). Introduction to business process management. In *Fundamentals of business process management* (pp. 1–31). Springer. doi:10.1007/978-3-642-33143-5_1

Dyba, T., & Dingsoyr, T. (2009). What do we know about agile software development? *IEEE Software*, *26*(5), 6–9. doi:10.1109/MS.2009.145

Egbreghts, A. (2017). A Literature Review of Behavior Driven Development using Grounded Theory. *27th Twente Student Conference on IT*.

Fancott, T., Kamthan, P., & Shahmir, N. (2012). Towards next generation requirements engineering. *2012 IEEE International Conference on Social Informatics*, 328-33. 10.1109/SocialInformatics.2012.11

Flora, H. K., & Chande, S. V. (2014). A systematic study on agile software development methodologies and practices. *International Journal of Computer Science and Information Technologies*, *5*(3), 3626–3637.

Fowler, M., & Highsmith, J. (2001). The agile manifesto. *Software Development*, *9*(8), 28–35.

Gartner Glossary. (2020a). Available at: https://www.gartner.com/en/information-technology/glossary/digitization

Gartner Glossary. (2020b). *Digitalization*. Available at: https://www.gartner.com/en/information-technology/glossary/digitalization

IIBA and Agile Alliance. (2015). *A Guide to Business Analysis Body of Knowledge*. Author.

IIBA and Agile Alliance. (2017). *Agile Extension to the BABOK®Guide*. Author.

Javanmard, M., & Alian, M. (2015). Comparison between Agile and Traditional software development methodologies. *Cumhuriyet Science Journal*, *36*(3), 1386–1394.

Käpyaho, M., & Kauppinen, M. (2015, August). Agile requirements engineering with prototyping: A case study. In *2015 IEEE 23rd International requirements engineering conference (RE)* (pp. 334-343). IEEE. 10.1109/RE.2015.7320450

Leau, Y. B., Loo, W. K., Tham, W. Y., & Tan, S. F. (2012). Software development life cycle AGILE vs traditional approaches. In *International Conference on Information and Network Technology* (*Vol. 37*, No. 1, pp. 162-167). Academic Press.

Lederer, M., Knapp, J., & Schott, P. (2017, March). The digital future has many names—How business process management drives the digital transformation. In *2017 6th International Conference on Industrial Technology and Management (ICITM)* (pp. 22-26). IEEE.

Leffingwell, D. (2010). *Agile software requirements: lean requirements practices for teams, programs, and the enterprise*. Addison-Wesley Professional.

Li, H., Wu, Y., Cao, D., & Wang, Y. (2019). Organizational mindfulness towards digital transformation as a prerequisite of information processing capability to achieve market agility. *Journal of Business Research*. Advance online publication. doi:10.1016/j.jbusres.2019.10.036

Loiro, C., Castro, H., Ávila, P., Cruz-Cunha, M. M., Putnik, G. D., & Ferreira, L. (2019). Agile Project Management: A Communicational Workflow Proposal. *Procedia Computer Science*, *164*, 485–490. doi:10.1016/j.procs.2019.12.210

Martins, P. V., & Zacarias, M. (2017). An agile business process improvement methodology. *Procedia Computer Science*, *121*, 129–136. doi:10.1016/j.procs.2017.11.018

Miller, K. W., & Larson, D. K. (2005). Agile software development: Human values and culture. *IEEE Technology and Society Magazine*, *24*(4), 36–42. doi:10.1109/MTAS.2005.1563500

Morakanyane, R., Grace, A. A., & O'Reilly, P. (2017). Conceptualizing Digital Transformation in Business Organizations: A Systematic Review of Literature. In Bled eConference (p. 21). doi:10.18690/978-961-286-043-1.30

Neuri ConsultingL. L. P. (n.d.). Available at: https://www.impactmapping.org

Ozdenizci Kose, B. (2019). Recent Agile Requirement Engineering Practices In It Projects: A Case Analysis. *Business & Management Studies: An International Journal*, *7*(4), 1776–1805.

Paetsch, F., Eberlein, A., & Maurer, F. (2003, June). Requirements engineering and agile software development. In WET ICE 2003. Proceedings. Twelfth IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises, 2003 (pp. 308-313). IEEE. doi:10.1109/ENABL.2003.1231428

Parker, J. (2013). *Requirements Engineering vs. Business Analysis*. Enfocus Solutions. Available at: https://enfocussolutions.com/requirements-engineering-vs-business-analysis/

Phil, M. (2015). Comparative analysis of different agile methodologies. *International Journal of Computer Science and Information Technology Research*, *3*(1).

PMI, Project Management Institute (2017a). *The PMI Guide to Business Analysis*. PMI.

PMI, Project Management Institute. (2017b). *Business Analysis: Leading Organizations to Better Outcomes*. Available at: https://www.pmi.org/business-solutions/white-papers/-/media/pmi/documents/public/pdf/white-papers/business-analysis-outcomes.pdf?v=702d20b8-6248-4f6b-b49e-bfc3ec82f560

Pruitt, J., & Grudin, J. (2003). Personas: practice and theory. *Proceedings of the 2003 conference on Designing for user experiences*, 1-15.

Roberts, N., & Grover, V. (2012). Leveraging information technology infrastructure to facilitate a firm's customer agility and competitive activity: An empirical investigation. *Journal of Management Information Systems*, *28*(4), 231–270. doi:10.2753/MIS0742-1222280409

Robertson, S., & Robertson, J. (2012). *Mastering the requirements process: Getting requirements right*. Addison-Wesley.

Ryan, J., Doster, B., Daily, S., & Lewis, C. (2019). *Business Process Redesign in the Perioperative Process: A Case Perspective for Digital Transformation*. Academic Press.

Sauerwein, E., Bailom, F., Matzler, K., & Hinterhuber, H. H. (1996). The Kano model: How to delight your customers. *International Working Seminar on Production Economics, 1*(4), 313-327.

Scaled Agile. (2020). *Value Streams*. Available at: https://www.scaledagileframework.com/value-streams/

Schön, E. M., Thomaschewski, J., & Escalona, M. J. (2017). Agile Requirements Engineering: A systematic literature review. *Computer Standards & Interfaces*, *49*, 79–91. doi:10.1016/j.csi.2016.08.011

Suryaatmaja, K., Wibisono, D., & Ghazali, A. (2019). The Missing Framework for Adaptation of Agile Software Development Projects. In *Eurasian Business Perspectives* (pp. 113–127). Springer. doi:10.1007/978-3-030-18652-4_9

Trello by Atlassian. (2020). Available at: https://trello.com/en

Venkatraman, N. (1994). IT-enabled business transformation: From automation to business scope redefinition. *Sloan Management Review*, *35*, 73–73.

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2019). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*. Advance online publication. doi:10.1016/j.jbusres.2019.09.022

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118–144. doi:10.1016/j.jsis.2019.01.003

Wagner, S., Méndez-Fernández, D., Kalinowski, M., & Felderer, M. (2018). Agile requirements engineering in practice: Status quo and critical problems. *CLEI Electronic Journal*, *21*(1), 15. doi:10.19153/cleiej.21.1.6

Wake, B. (2003). *INVEST in Good Stories, and SMART Tasks*. Available at: https://xp123.com/articles/invest-in-good-stories-and-smart-tasks

Xu, Y., & Koivumäki, T. (2019). Digital business model effectuation: An agile approach. *Computers in Human Behavior*, *95*, 307–314. doi:10.1016/j.chb.2018.10.021

Zairi, M. (1997). Business process management: A boundaryless approach to modern competitiveness. *Business Process Management Journal*, *3*(1), 64–80. doi:10.1108/14637159710161585

Zhang, Z., & Sharifi, H. (2000). A methodology for achieving agility in manufacturing organisations. *International Journal of Operations & Production Management*, *20*(4), 496–513. doi:10.1108/01443570010314818

KEY TERMS AND DEFINITIONS

Agile: The ability to create and respond to change; a way of dealing with, and ultimately succeeding in, an uncertain and turbulent environment (Agile Alliance, 2001).

Business Analysis: A disciplined approach including set of activities performed to support delivery of solutions that align to business objectives and provide continuous value to the organization (PMI, 2017a).

Business Process Management: A structured approach including methods, techniques, and software to analyze and improve business processes of a company (Zairi, 1997; Dumas et al., 2013).

Digital Transformation: A change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for the firm (Verhoef et al., 2019).

Project: A temporary endeavor undertaken to create a unique product, service, or result (PMI, 2017a).

Project Management: The application of knowledge, skills, tools and techniques to project activities to meet the project requirements (PMI, 2017a).

Requirement: A condition or capability that is necessary to be present in a product, service, or result to satisfy a business need (PMI, 2017a).

Chapter 7
The Influence of Transformational Leadership, Cultural Orientation, and Emotional Conflict on Innovation in Multicultural Teams

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ABSTRACT

Multicultural teams represent a key strategic action that generate significant competitive advantages and innovation. The authors address the question of how transformational leadership, cultural orientation, and emotional conflict impact on multicultural teams focused on innovation. The methodology used has a quantitative and transversal approach because the measurement is carried out in a specific moment. The sample is composed by 415 multicultural-team members working in multinational companies. Results indicate that the dimension of intellectual stimulation and a horizontal hierarchy are factors that influence the team innovation. In contrast, the emotional conflict did not show a significant relationship. The positive moderating effect of organizational support on intellectual stimulation and team innovation´s relationship is proven. This study contributes significantly to international human resource manage-

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ment domain by leading to a better understanding of the functioning of work teams to ensure business innovation and the need for internationalization.

INTRODUCTION

In the rapidly changing and challenging environment, innovation as a business management model has been positioned as a new paradigm for business strategy (Lopez, Jaramillo, & Susaeta, 2019; Perry-Smith, & Mannucci, 2017). Hence, organizations are oriented to constantly apply innovation in order to maintain and enhance the effectiveness, create corporate value and promote the competitive advantage (Bouncken, Brem, & Kraus, 2016; Lee, Yen, & Perromat, 2019). In this matter, diversity in workforce and collaborative work are determinant to reach an effective implementation of business (Lopez, Jaramillo, & Susaeta, 2019) thus, organizations are increasingly using team members of different nationalities, taking the path of cultural diversity and thus, giving rise to multicultural teams (Neukam, 2017; Snell, Snow, Davison, & Hambrick, 1998; Winkler & Bouncken, 2011) to generate new ideas and solving difficult problems (Fisher, Pillemer, & Amabile, 2018; Li & Huang, 2019).

According to some authors, multicultural teams are considered a key strategy to reach creativity and innovation (Bouncken, et al., 2016; Leung & Wang; 2015; Lisak, Erez, Sui, & Lee, 2016) in order to face challenges in a globalized competitive environment (Cheng, Chua, Morris, & Lee, 2012; Chua, Morris & Mor, 2012; Kraus, Mensching, Calabrò, Cheng, & Filser, 2016; Yasini, 2016) and enhance organizational performance and innovation (Xie, Wu & Zeng, 2016).

In past, several factors and their impact con teams have been analyzed. For example, leadership style (Al-edenat, 2018; Bednall, Rafferty, Shipton, Sanders & Jackson, 2018; Ochieng & Price, 2009, 2010; Jiang, Wang, Chu, & Zheng, 2019; Odoardi, Battistelli, Montani, & Peiró, 2019); multicultural personality (Van Der Zee & Van Oudenhoven, 2000); intercultural competence (Matveev, 2016, 2017); cultural empathy (Lvina, Matveev & Grishin, 2019); trust (Earley & Mosakovski, 2000; Ochieng & Price, 2009; 2010); cultural diversity (Chen, Zheng, Yang, & Bai, 2016). Dutra, Mazza, & Menezes, 2014; Han & Beyerlein, 2016; Hofstede, 1980, 1991; Kirkman, Shapiro, Lu, & McGurrin, 2016; Nielsen & Nielsen, 2011; Leung & Wang, 2015; Lvina et al., 2019); and team conflict (Jehn & Mannix, 2001; Santos, Uitdewilligen, & Passos, 2015; Tjosvold, 2008) among others.

Although there is a growing body of literature on multicultural teams (Kirkman & Shapiro, 2005), innovation and creativity in multicultural teams have been a neglected issue, therefore, more studies need to be done (Bai, Lin, & Li, 2016; Bouncken et al., 2016; Chen, et al., 2016; Goodwin, Whittington, Murray, & Nichols, 2011; Johnsson, 2018; Nielsen & Nielsen, 2011). In this sense, the main purpose of this chapter is to contribute in bridging this gap in literature, by stressing the impact of transformational leadership, cultural orientation and affective conflict on multicultural team innovation, because so far, there is no study which analyses such variables by jointly. Additionally, perceived organizational support takes a positive moderating role on analysis.

Significant findings highlight that intellectual stimulation dimension of transformational leadership and low distance power degree dimension impact on team innovation. At team level, leaders must find the way to stimulate intellectually to team member to innovate. In addition, perceive organizational support provided through transformational leaders has a positive moderating effect on intellectual stimulation and team innovation relationship. Surprisingly, affective conflict has no significant impact on innovation.

This study provides valuable managerial implications in International Resource by providing a better understanding about managing multicultural teams when innovating. For example, this knowledge is

applicable when recruiting and training newcomers in innovation teams within an organization. Future research is suggested. in a multicultural team innovation.

Multicultural Team Innovation

Previous studies consider that innovation is essential to face challenges of globalization (Rousseau, Aubé, & Tremblay, 2013; Rickards & Moger, 2006; Yasini, 2016) and long-term success (Anderson, De Dreu, & Nijstad, 2004; van Knippenberg, 2017). In this regards, multicultural teams are considered a key strategy to generate innovation performance (Bouncken et al., 2016; Neukam, 2017) and reach competitive advantage (Lee et al., 2019).

For this reason, innovation has been analysed on multiple occasions and at all levels, that is, individually (De Jong & Den Hartog, 2010; Odoardi et al., 2019; Stahl, Maznevski, Voigt, & Jonsen, 2010; Williams & McGuire, 2010), group (Bouncken et al., 2016; Neukam, 2017; Yasini, 2016), and organizational (Amabile, 1997; Amabile & Pratt, 2016; Diaz-Fernandez, Bornay-Barrachina, & Lopez-Cabrales, 2015; Xie et al., 2016).

Creativity is considered as a prelude to innovation. Studies consider that innovation as social process that generates an exchange of knowledge and new ideas, which is the starting point for innovation (Perry-Smith, 2006; Perry-Smith & Mannucci, 2017). Hence, innovation is a successful implementation of creative ideas (Amabile, 1997; Williams & McGuire, 2010).

Innovative performance definition or innovative results is also used to refer to the action of introducing new products, services, market opportunities and processes (Edinger, 2012) with the particularity that it must generate an economic benefit (Chen, Tang, Jin, Xie, & Li, 2014).

Several studies refer to innovation as a collaborative process in continuous change. In this regard, Yasini (2016, p.169), states that "an innovative process is based on knowledge and individual learning that can be enriched by new knowledge and, moreover, involves creativity, intelligence and collaborative learning" based on the development of new solutions or approaches (West, 2002). Hence, collaborative learning in work teams, is an essential tool in generating creative results, which leads to innovation such as novel ideas originated by the team (Stahl et al., 2010).

On the other hand, multicultural teams are groups of people from different nationalities and cultures who bring a mixture of experiences, skills and knowledge that enhance the team (Haas & Cummings, 2015; Matveev & Milter, 2004; Ranf, 2010; Matveev, 2016, 2017; Neukam, 2017). In same regard, Cheng, Chua, Morris, and Lee (2012) refer to groups of people who have knowledge and experience about specific markets with abilities to connect with people from different cultures. Those team members are individuals whose profile is based on value systems originated in the country or culture they were born (Nam, Lyons, Hwang & Kim, 2009). In fact, in order to consider a team as multicultural must to be integrated by, at least, two nationalities in the team (Burner, Cunningham & Hattar, 1990).

Multicultural teams are also called by several names like global teams (Ranf, 2010), culturally heterogeneous groups (Kraus, et al., 2016) international teams (Cheng et al., 2012) and transnational teams (Kaczmarek & Ruigrok, 2013; Snell et al., 1998), among others.

In this regard, based on the premise that collaboration fosters creativity which leads to innovation (Stahl, et al., 2010) and cultural diversity fosters innovation as well (Bouncken et al., 2016; Chen et al., 2016; Johnsson, 2018; Leung & Wang; 2015; Lisak et al., 2016; Lopez et al., 2019), some authors highlight to multicultural teams as a source of creativity and innovation (Leung & Wang, 2015). In the

same regard, Bouncken et al., (2016, p.1) posit that "Multi-cultural teams are seen as a wellspring of creativity and innovativeness".

Therefore, analysis of multicultural teams has paying attention since they are an increasingly strategy used by companies to generate innovation due to combination of perspectives, knowledge and skills they perform (Bouncken et al., 2016; Lisak et al., 2016). In other words, a team composed by members from different cultures whose knowledge, attitudes, values, and experiences differ one from one another is generating innovative solutions (Bornay-Barrachina, 2014; Chua et al., 2012; Puck, Rygl & Kittler, 2007; Yasini, 2016).

Based on literature reviewed, in this chapter multicultural team innovation is defined as the result produced by the multicultural team (i.e. work group of people of different nationalities who, due to their values and attitudes, bring a mixture of knowledge and enriching skills to the team) that is characterized by being new and original in a total or partial way (Bornay-Barrachina, 2014).

BACKGROUND

Transformational Leadership and Multicultural Team Innovation

Previous studies consider leadership style as a key factor influencing team performance (Chen & Wu, 2020; Choi, Kim, Ullah & Kang, 2016; Jiang et al., 2019; Odoardi et al., 2019; Williams et al., 2010) multicultural innovation team (Al-edenat, 2017; Chua et al., 2012; Kim, 2014; Ochieng & Price, 2009, 2010; Odoardi et al., 2019; Williams & Mcguire, 2010) and in organizational success (Nixon, Harrington, & Parker, 2012).

In same regard, in managing multicultural teams, several studies highlight the positive influence of transformational leadership on team innovation (Chen et al., 2014; Choi et al., 2016; Choi, Kim & Kang, 2017; Gundersen, Hellesøy & Raeder, 2012; Hüttermann & Boerner, 2011; Jiang & Chen, 2018), innovative climate which in turn facilitates innovative results (Wang, Rode, Shi, Luo & Chen, 2013) and innovative behaviour (Al-edenat, 2018; Bednall et al., 2018).; Choi et al., 206; Choi, et al., 2017).

Transformational leadership is a multidimensional construct that holds four behavioural dimensions: idealized influence; inspirational motivation; individualized consideration and intellectual stimulation (Bass & Avolio, 1994,1995; Bass, Avolio, Tung & Berson, 2003; Shin & Zhou, 2003)**.** Idealized influence is when leaders display a sense of vision and mission, gaining respect and trust. Inspirational motivation refers to be admired by followers, who fully identify with him/her and therefore seek to fulfil expectations. Individualized consideration refers to take a role of mentor or coaching, monitoring performance, providing support and specific attention to each follower needs in order to seek a full potential. Intellectual stimulation concerns to motive followers to "think out of the box" by questioning assumptions and adopting approach challenges in new ways (Bednall et al., 2018).

Transformational leader pays particular attention to each follower needs and, providing career development employees opportunities and other incentives to enhanced follower's motivation and commitment which lead to creative thinking. (Kark, Van Dijk, & Vashdi, 2018).

Researchers have identified intellectual stimulation as the dimension with greatest impact on team innovation. In other words, transformational leadership stimulates members to explore different perspectives in problem-solving, encouraging them to create solutions by breaking established traditional pat-

terns (Bass et al., 2003; Chen et al., 2014; Felfe & Goihl, 2002) which foster creativity and innovation (Bass et al., 2003).

In this regard, Choi et al. (2016) analyse innovative behaviour on 356 employees in Korean manufacturing companies, findings highlight the existence of a significant positive relationship between transformational leadership and individual innovative behaviour, along with the moderating effect of organizational support. Choi et al. (2016, p. 472), report that "transformational leader encourages the innovative behaviour of employees through fostering learning activities, knowledge sharing and intellectual stimulation which enables them to solve problems in an alternative and innovative way".

Consistent with this, transformational leaders are oriented to value cultural diversity. Better said, when leader displays a positive attitude towards diversity of perspectives, values and approaches, leaders motivate team member to value those perspectives in an open and objective way, to overcome obstacles caused by those differences in order to reach organizational objectives (Choi et al., 2016; Lisak et al., 2016).

Other studies about innovative performance of products argue that some characteristics of the transformational leader such as idealized influence and motivational inspiration drive creativity and innovation. That is, when a leader projects a collective and reliable vision about the future, promotes trust and shows a genuine interest in the well-being of the group, it makes the members feel more identified in the team, which facilitates the generation of new ideas because it motivates them to analyse problems from a different perspective (Chen et al., 2014). In addition, a transformational leader helps to mitigate emotional conflict by encouraging team members to identify with the goals and objectives of the team (Hüttermann & Boerner, 2011), motivating them to follow a shared vision and to exceed expectations (Kammerhoff, Lauenstein & Schütz, 2019).

For their part, Afsar, Badir, & Saeed (2014) and Afsar & Umrani (2019) point out when the transformational leader delegates authority to employees and grants them a level of autonomy, it makes them more willing to accept responsibility, motivating them to engage in the production of creative ideas (creativity) and to implement them (innovation). They conclude this type of leadership positively influences employees' individual innovative behaviour. Özaralli (2003) in turn, finds that when subordinates work with a transformational leader, they present high levels of creativity and innovation in self-assessment reports on team effectiveness. Subsequently, research done about telecommunications sector, posits that high levels of transformational leadership foster innovation products and services, as well as job satisfaction (Al-edenat, 2018).

Studies with a meta-analytical approach previously conducted, analyse transformational leadership at two levels: individual and group. Results show that, at the group level, the transformational leader positively influences team innovation through sharing knowledge with team members aligned with a settled down group of team cooperative norms, and the opposite effect occurs at the individual level (Jiang & Chen, 2018).

Based on premise that dimension s of transformational leadership significantly help to facilitate collaborative engagement and motivate members to exceed proposed expectations, in contrast, the effect is the opposite at the individual level (Li, Mitchell & Boyle, 2016). In other words, through idealized influence, the leader motivates members to develop a sense of collective identity and a more open attitude to discuss and resolve conflicts (Tjosvold, Law, & Sun, 2006), fostering creativity (Wang, Rode, Shi, Luo, & Chen, 2013) and team innovation (De Dreu &Weingart, 2003).

Contrary to the above, other studies establish that in the face of an excessive degree of idealized influence, team members could feel too much identified with the leader, that may feel inhibited from expressing opinions in order not to contradict or disappoint leader. Better said, there is a degree of re-

pression of ideas due to an excess of integration that later has a negative impact on performance or, on the contrary, when the member becomes overconfident and independent, by becoming in subordinated or ignoring leader (Jung & Sosik, 2002; Stanko & Gibson, 2009).

Based on literature reviewed and to contribute calling of more research needs to be done regarding on transformational leadership and team innovation (Choi et al., 2016; Choi et al., 2017; Jiang et al., 2019), the following hypothesis is formulated:

H.1: The leader's transformational leadership style, as perceived by team members, is positively related to multicultural team innovation.

Cultural Orientation and Multicultural Team Innovation

The importance of cultural orientation in teams is established in several previous studies pointing it out as competitive advantage (Lee et al., 2019; Neukam, 2017). So, the employees who possess a variety of ingrained values originating from their national culture have a better perspective on how to do business associated with better strategic decision making (Han & Beyerlein, 2016; Greve, Nielsen & Ruigrok, 2009; Neukam, 2017; Nielsen & Nielsen, 2011); and innovative results (Chen et al, 2016; Han & Beyerlein, 2016; Leung & Wang, 2015; Williams & Mcguire, 2010). This diversity of beliefs and values (based on national culture of each member) is a key aspect that should be considered when forming teams focused on product development and innovation (Dutra et al., 2014; Leung & Wang, 2015).

Javidan, Dorfman, De Luque, and House (2006); Snell et al., (1998) have referred to cultural orientation under different names, such as multinational diversity., National culture (Hofstede, 1980); diversity of nationalities and cultural diversity among others (Kirkman et al., 2016; Snell et al.,1998).

Previous work considers that nationality is a good indicator of cultural diversity because it captures in a much wider range the cultural differences than the same cultural values persé (Kirkman et al., 2016; Stahl, et al., 2010). In this respect, nationality is determined by the country of origin (Nielsen & Nielsen, 2011).

Many studies point to Hofstede's (1980) culturally oriented model that defines "culture" as the system of values and beliefs of a society and establishes four cultural dimensions:

1. **Individualism/Collectivism:** Refer to way people from a certain culture prefer to work in a group or individually;
2. **Power distance:** Classifies a society with respect to the status, authority or hierarchical level of its members;
3. **Masculinity/femininity:** Classifies a culture according to its orientation towards goals and outcomes;
4. **Uncertainty avoidance:** Refers to way in which the members of society react to situations of uncertainty.

Later, the Long- versus Short-Term Orientation was added to Hofstede's model (1991) as a fifth cultural dimension which related to degree of society is oriented to plan and deferment of gratification.

Decades later, GLOBE Project, identifies 9 cultural dimensions (Javidan, House, Dorfman, Hanges, & De Luque, 2006):

1. Avoidance of uncertainty, which refers to the management of unexpected situations or conflicts or the degree to which a society in which individuals in a society prefer planned or structured situations over unstructured ones (Campos, Mobarec, Soto & Nazel, 2007);
2. Power distance, which refers to the importance that individuals in society give social hierarchies, organizations, etc. (Campos et al., 2007);
3. Collectivism I (in society), which refers to the degree to which a society is oriented towards collectivism, i.e., that it is so much oriented towards group norms, collective activities and social cohesion (Campos et al., 2007);
4. Collectivism II (within groups), refers how individual or organization are oriented to work in collective way, that is, the importance they give to grouping in families or groups;
5. Assertiveness, which refers to an attitude of aggressiveness, dominance and confrontation in relationships. Assertive societies value competition (Campos et al., 2007);
6. Gender equality refers to the degree to which a society or culture minimizes gender inequality (Campos et al., 2007);
7. Future orientation studies the degree to which individuals in a society are committed to future plans (Campos et al., 2007);
8. Performance orientation, which looks at the degree to which society supports and rewards its members, as well as its orientation to excellence, continuous improvement, and achievement of results (Campos et al., 2007);
9. Humanistic orientation, which refers to the degree to which individuals behave in a socially responsible, altruistic, generous, fair and caring manner (Campos et al., 2007).

In line with the above, studies point out that cultural orientation in teams is a source of benefits based on the diversity of knowledge, values and perspectives that lead to the generation of innovative processes (Han & Beyerlein, 2016). In addition, they find that, as time goes by, members learn to master everyday activities and processes by overcoming the challenges presented by diversity.

Previous studies by innovation establish empirical evidence confirming the positive influence of cultural orientation on creativity and innovation in economic terms (Williams & Mcguire, 2010). A high orientation towards collectivism, a low power distance and a low avoidance of uncertainty influence innovation. This means when companies have Human Resources practices are oriented to collectivism, promotes that employees feel identified with the organization, motivated to work in teams because individual and collective interests are matched, which increases possibility to achievement of innovative results (Chen et al., 2016). On the contrary, an individualistic orientation obstructs trust between team members and causes a negative effect on innovation (Bouncken et al., 2016).

Vrânceanu and Iorgulescu (2016) conducted a comparative study according to the dimensions of Hofstede applied to Romanian service companies. Results are opposite regarding masculinity/femininity dimension and similar in terms of a high degree of power distance and a low degree of tolerance for uncertainty. In same way, Beyene, Shi, and Wu (2016) analyse companies in the textile manufacturing industry and find that high standards in all dimensions of cultural orientation negatively affect activities involved in innovative product development through the mediating effect of learning commitment and a collective vision.

Based on literature analysed, definition of national culture by Hofstede (1980) is applied at team level, particularly to multicultural teams focused on innovate. Therefore, cultural orientation is defined

as the set of ways of thinking, attitudes and values that characterize the team and that is the product of the mixture of national cultures of its members.

In same way and concordance to Hofstede's model (1980) of four cultural dimensions (i.e. individualism/collectivism; i.e. power distance; i.e. masculinity/ femininity; i.e. uncertainty avoidance) this study analyses the influence of cultural orientation on multicultural team innovation. Decision of choosing Hofstede's (1980) cultural model is due to it is strongly supported by "empirical base and theoretical (even philosophical) rationale" stated by Hofstede (2006, p.895). In addition to this, no other empirical research has identified more relevant results about culture (Magnusson, Wilson, Zdravkovic, Zhou, & Westjohn, 2008). Therefore, following hypotheses are proposed:

H.2: Cultural orientation of the team is positively related to multicultural team innovation.
H.2.1: Team's orientation towards collectivism is positively related multicultural team innovation.
H.2.2: Team's orientation towards masculinity is positively related to multicultural team innovation.
H.2.3: Team's orientation towards a low power distance is positively related multicultural team innovation.
H.2.4: Team's orientation towards a low uncertainty avoidance is positively related to multicultural team innovation.

Affective Conflict and Multicultural Team Innovation

Team conflict is defined by Tjosvold (2008, p.24) as "a set of incompatibilities that arise when the actions of one person interfere with or obstruct in some way the actions of another person". Jehn (1995) refers to conflict in team as a disagreement of ideas or interpersonal incompatibilities among team members. Two main types of conflict that can occur in work teams can be find in literature (Jehn & Mannix, 2001): task conflict, arises from disagreement about how to carry out the task; affective conflict, focuses on relationships between individuals (Papenhausen & Parayitam, 2015).

Janssens, Van De Vliert and Veenstra (1999), in turn, consider that emotional conflict is characterized by disagreements or incompatibilities originating from differences in personal values and beliefs among team members. Also, it involves feelings and emotions (Bono, Boles, Judge & Lauver 2002). For their part, De Dreu and Weingart (2003), refer to emotional conflict as a set of negative emotions such as irritation and anger that are a barrier to communication in teams with members of different values and cultures.

According to Beheshtifar and Zare, (2013), interpersonal conflict is the most frequent type of conflict in multicultural teams. Teams with people with different beliefs and paradigms originated by cultural values (i.e. cultural orientation) present high levels of conflict (Stahl et al., 2010).

Most research on conflict and innovation establishes an inverse relationship between the two variables. For example, Gisbert-López, Verdú-Jover and Gómez-Gras (2014) find that emotional conflict negatively affects the achievement of innovative results, however, they do not find the same effect on the creative climate to facilitate innovation. However, studies carried out by Leung and Wang (2015) establish that the conflict originated by cultural diversity in the team does not significantly affect the generation of creative ideas because, thanks to the communication between the members together with the interdependence of tasks, it allows the cultural differences to diminish as the project is completed. In same line, Lee, Lin, Huang, Huang and Teng (2015) report that emotional conflict has a negative impact on collaboration among team members by hindering creativity and innovation.

On the other hand, Zhou, Liu, Zhang, and Chen (2016) confirm that affective conflict is a mediator between differentiated leadership and the development of new products. That is, when the leader treats or supports each member differently, the possibility of disagreements and tensions increases, which in turn reduces the rate of innovative product development. He, Ding, and Yang (2014); who study teams in China, posit that affective conflict affects team innovation to a greater extent than cognitive conflict, which is also beneficial. In same regard, Batra (2016) posits that conflicts in teams tend to be constructive and beneficial for creation and integration of ideas.

Similarly, Parker (2016) is also committed to the cooperative approach, as he believes that open discussion of conflicts promotes constructive debate and collaboration, which facilitates the development of new products. Schulze and Seuffert (2014), as well, point out that, in order to achieve creative results, confrontation is required based on analyse that the teams with high levels of creativity and innovation showed low collaboration and consensus, this indicates that, in order to achieve creative and innovative results, the competitive approach is the most appropriate for managing conflicts.

Taking into account literature reviewed and according to Bono et al., (2002), Janssens et al. (1999) and, Papenhausen and Parayitam (2015), in this study emotional conflict is defined as the set of incompatibilities and feelings of friction between team members that involve emotions and emotional components. In this regard, it is expected to find an inverse relationship between affective conflict and innovation of the multicultural team, therefore, the following hypothesis is proposed:

H.3: Affective conflict is negatively related to multicultural team innovation.

Moderating Effect of Perceived Organizational Support on Transformational Leadership and Multicultural Team Innovation Relationship

Perceived Organizational Support is defined as the effort that company management provides to its employees by giving value to their contributions on a voluntary basis and seeking their welfare in order to meet the proposed objectives in the most efficient way (Farh, Hackett, & Liang, 2007; Rhoades & Eisenberger, 2002). Some studies point out that organizational support can be provided through promoting employees' careers (Sturges, Conway, & Liefooghe, 2010), through international work experiences (Lee & Park, 2006), or through the support offered by leaders (Amabile, Schatzel, Moneta, & Kramer, 2004).

For their part, Rhoades and Eisenberger (2002), and Shanock and Eisenberger (2006) point out that the organizational support used in the management of multicultural teams focuses on aspects such as the fair distribution of resources among team members; objective evaluation by the leader of the performance of each member and of the team as a whole; the compensation system and working conditions such as safety at work, autonomy in carrying out tasks and training programs.

Farh et al. (2007) study organizational support playing a moderating role between cultural diversity and organizational performance in Chinese companies. Similarly, Liao, Toya, Lepak and Hong (2009) point to it as a related moderating factor in the management of high-performance teams. Others, such as Cook and Wall (1980), argue that it reinforces the relationship between commitment and motivation that drives employees to generate innovative ideas. Similarly, more recent studies indicate that this type of support fosters the relationship between transformational leadership and the individual innovative behaviour of followers (Choi et al., 2016; Choi et al., 2017). In expatriate management, company support plays a very important role in international assignments because it is related to adaptation to the new culture, career planning and financial support, among others (Hu, Chen & Chen, 2010).

Following the previous works of Puck, Mohr and Rygl (2008), and Takeuchi, Wang, Marinova, and Yao (2009), in this study, authors refer to organizational support as the degree to which the member of a multicultural team perceives that their team is supported by their organization. Previous research on innovation has analysed the role that organisational support plays in obtaining innovation. In this regard, West & Anderson (1996) point to four elements necessary to foster innovation: 1) having a clear vision accepted by team members; 2) freedom to express new ideas and new approaches; 3) ability to debate constructively; and 4) receiving organizational support.

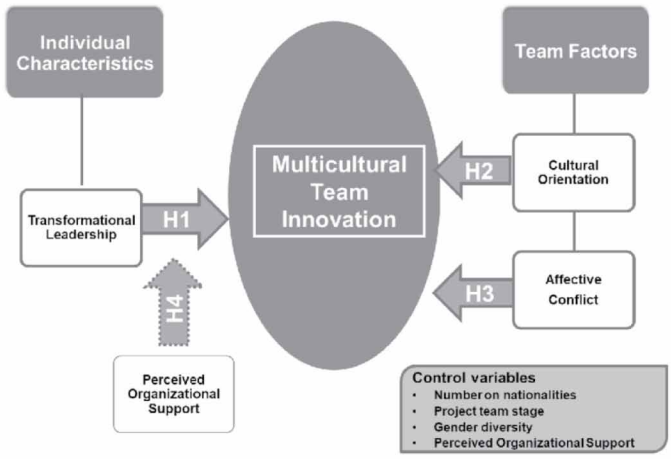
Cook and Wall (1980) establish that organizational support has a positive moderating effect on the relationship between transformational leadership and team performance innovation. That is, when the organization provides adequate resources and support to its employees through a transformational leader, it has a positive effect on the individual innovative behaviour of followers because they feel motivated and committed to contribute to innovation (Choi et al., 2016; Choi et al., 2017).

Similarly, authors such as Farh et al., (2007) study organizational support playing a moderating role between cultural diversity and organizational performance in Chinese companies. Liao et al., (2009) also analyse it under the same related moderating role in high-performance team management. Bashshur, Hernández and González-Romá, (2011) analyse the influence of organizational support on the relationship between leader and member (known as Leader-Member-Exchange) and find that when both leaders and members perceive that the team receives organizational support, performance is better than when they do not perceive support (Wong & Berntzen, 2019). Based on the literature reviewed and following to Choi et al., (2016), and Choi et al., (2017), authors expect to confirm a moderating effect on the relationship between transformational leadership and team innovation. Therefore, the following hypothesis is proposed:

H.4: Perceived Organizational Support positively moderates the relationship between transformational leadership and multicultural team innovation. That is, a high degree of perceived organizational support emphasizes the relationship between transformational leadership and team innovation, and, conversely, a low degree of perceived organizational support weakens it.

Figure 1 summarizes the Theoretical Model.

Figure 1. Theoretical model
Source: Own elaboration



METHOD

Sample and Variables

Sample entails middle and upper-level executives working in Mexican and North American internationalized companies with subsidiaries located in Mexico, South America, United States and European Union. The type of sample chosen for this study is a "convenience sample" or "directed sample" because the participants must meet a specific profile. According to Hernández Sampieri, Collado, and Baptista, (1991), non-probability samples represent an advantage for the researcher since they offer results over the analysis of specific cases because they involve a careful and controlled selection of cases with certain characteristics previously specified in the research approach.

Companies have been chosen according the following parameters: a) companies with international commercial activities related to exports, imports, mergers and acquisitions; b) companies with at least one subsidiary abroad as according to Sullivan (1994), these are good indicators of the degree of internationalization of a firm. The financial information was obtained through the public annual reports of each company, which specify the number of subsidiaries and financial indicators (Borda, Geleilate, Newburry & Kundu, 2017). In addition, to complement the above, COMPUSTAT was used, which is a database used for previous research on internationalization (Li, Li & Shi, 2011; Kraus et al., 2016).

Following the above-mentioned parameter, a total 180 companies were identified. Some examples of those companies whose employees have been surveyed were Grupo Bimbo, Maseca, Nemak, Grupo Modelo, CEMEX, Walmart, Lamosa, Ford, Coca-Cola, General Electric, PepsiCo, Danone, Aeroméxico, Grupo FEMSA, Lufthansa, Gruma, Mabe, Johnson & Johnson, among others. Human Resources Managers of those companies were contacted by email or telephone. Also, several organizations linked to internationalized companies were contacted in order to obtain access to their databases to apply the questionnaire, either electronically or in person. This support was mainly provided by the Mexican Chamber of Industry Commerce in Monterrey and by Alumni Group, Tecnologico de Monterrey and EGADE Business School.

Sample size has been determined by taking into consideration previous research which established a minimum of 100 cases for normal populations with a normal statistical trend and between 50 and 200 cases when dealing with groups formed by few subgroups (Hernández Sampieri, Collado, & Baptista, 1991) and capable of presenting an acceptable statistical power for a confidence level of 0.05 and 0.01 for each group of 100 or more in situations of moderate size effect, (.80 for alpha equal to 0.05) (Hair, Anderson, Tatham, & Black, 1999). In addition, and consistent with the above, previous research related to the management of multicultural teams also uses samples located within the mentioned interval (Chen et al., 2014; Choi, et al., 2016; Goodwin et al., 2011; Horverak, Sandal, Bye, H. & Pallesen, 2013; Ponterotto Ponterotto, Ruckdeschel, Joseph, Tennenbaum, & Brun, 2011). Also, with the aim of ensuring multiculturalism and as suggested in the literature, a multicultural team has been composed by members from two or more countries (Burner et al., 1990).

An online survey questionnaire was used as technique to collect data. 570 questionnaires were collected but 155 did not fit target profile or were no completed, leading a final sample of 415 participants. Of those, 385 (93%) were completed by online survey and 40 (7%) by paper.

Regarding demographics characteristics of sample.111 (27%) were team leaders and 304 (73%) were team members. Sample is very balanced in terms of gender, with 211 (51%) of participants being men and 204 (49%) being women. Predominant nationality in sample was Mexican with 291 (70%), followed by European with 71 (17%) and the rest divided between North American, Asian and Latin American (except Mexican). Average age reported by respondents was between 26 and 55 years old. More than half of the participants, i.e. 237 (57%) hold a master's degree, 145 (35%) hold a bachelor's degree and 29 (7%) a PhD. Therefore, a sample of working people with higher education composed mostly of Mexicans.

Team Innovation

This scale measures the participant's perception of innovation in the team. The items to measure this variable have been taken from the 2-item scale "innovative team performance" developed by Vera and Crossan (2005) and later used by Edinger (2012). Among others, participant responded to the following statements: "the team frequently introduces new innovative products/services" and "the team quickly introduces new products/services". The Likert scale used was 5 points with responses ranging from "very little" to "very much". Cronbach's Alpha=0.849. The results of the validity and reliability can be found in the Appendix.

Transformational Leadership

This variable aims to measure the degree to which team members perceive a transformational style in the team leader. For this purpose, the "Multifactor Leadership Questionnaire" by Bass and Avolio (1995, 1997) was used. This scale has subsequently been used in previous work by (Hemsworth et al., 2013). The measure is composed of 20 items, using a 5-point Likert scale varying between "never" and "always". Some examples of the items used are: "expresses an optimistic view of the future" and "acts in a way that encourages my respect for him/her". The results of the validity and reliability can be found in the Appendix.

Cultural Orientation

Cultural orientation was measured using constructs from Hofstede cultural dimensions (1980; 1991): collectivist orientation, the distance of powers, the orientation towards masculinity and the avoidance of uncertainty. For each of the dimensions, a Likert scale of five positions of agreement and disagreement has been used. Some examples of the items used with: "the well-being of the team is more important than the individual", and "managers should rarely ask for the opinion of their employees". The results of the validity and reliability can be found in the Appendix.

Affective Conflict

To measure Affective conflict authors have used the items of Jehn's conflict scale (1995) which has been widely used in studies on conflict which are: "there is friction between team members" and "there are evident personal conflicts in the team", "there is tension between team members" and "there is affective conflict between team members". Likert scale used is 5 seven positions of agreement and disagreement. This scale shows a high value of Cronbach's alpha statistic, which is 0.931. The results of the validity and reliability can be found in the Appendix.

Number of Nationalities

This section aims to obtain information on the number of nationalities in the team. Authors have used the following statement: "the number of nationalities present on your team (including yours) is:" with possible answers being: "one, two, three, four or more".

Project Stage

The purpose of this section is to know in general terms the time that the team members have been working together. The participants responded to the following question: "in relation to the total duration of the current project of your team, you can say that it is in" being the answers: "at the beginning, in the middle term, at the end, other (specify)".

Gender

Participants Responded by Gender: Male or female.

Perceived Organizational Support

To measure this variable, items were extracted from the "organizational support" scale developed by Kraimer, Wayne & Jaworski, (2001), and Eisenberger, Fasolo & Davis-LaMastro (1990). This scale has been used in previous work by (Puck et al., 2008). Examples of statements participants responded are: "my organization provides me with feedback on my work performance" and "my organization provides me with support for any problems related to my work team". The scale consists of 3 items with a response range of 5 points on the Likert scale, ranging from "strongly disagree" to "strongly agree". See Figure 1.

Econometric Tests

One of the necessary steps to be able to generalize the results obtained in the research is to check the reliability, validity and dimensionality of the measurement scales used. Authors have carried out an exploratory factorial analysis (EFA) using the Varimax rotation principal components method (to find out the dimensionality of each of the variables proposed (Del Barrio & Luque, 2000; Pérez & Sánchez, 1999). All measures showed the expected dimensionality. Then, a confirmatory factorial analysis (AFC) was performed. The scales with their appropriate items were developed into constructs based upon their factor loadings. Cronbach´s alpha to each of the measure is reported into table 1 in parenthesis on the diagonal. The software to carry out the application of the techniques used was SPSS ver.22 and structural equation modelling (SEM) software, EQS 6.1.

In the Appendix, it can be found standardized factor loadings, R^2, and main statistics from the CFA to each of the measures. Indicators of goodness of fit are within the accepted limits (Schermelleh-Engel, Moosbrugger, & Müller, 2003) it is factor loadings higher than .7 or close, composite reliability (CR) higher than .7, and the average variance extracted (AVE) equal or higher than .5 (confirming convergent validity) (Hair et al.,1999). To confirm discriminant validity, authors followed the criteria established by Fornell and Larcker, (1981). Specifically, all the AVEs were higher than the square of the correlations between each pair of factors, confirming in our case discriminant validity.

RESULTS

In Table 1, the results of the correlations and main statistics of the variables of proposals are presented. Specifically, it can be observed a positive correlation between team innovation, organizational support and transformational leadership.

Table 1. Correlations and descriptive statistics

	Mean	S.D.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Different nationalities	3.14	.934	1										
2. Duration of the Project	2.07	.579	-.019	1									
3. Gender	1.49	.500	-.059	.024	1								
4. Organizational support	3.92	.804	-.006	-.089	-.128**	**(.85)**							
5. Transformational Leadership	2.80	.673	-.036	-.019	-.038	.390**	**(.92)**						
6.Collectivism	3.70	.600	-.031	-.132**	-.141**	.182**	.156**	**(.73)**					
7. Power distance	2.35	.680	-.098*	-.100*	-.103*	.008	.011	.226**	**(.86)**				
8.Avoidance of Uncertainty	4.15	.662	-.037	-.077	-.004	.150**	.147*	.173**	.040	**(.85)**			
9. Masculinity	4.61	.603	-.072	-.089	-.139**	.008	-.006	.205**	.684**	.078	**(.91)**		
10. Conflict	3.152	1.47	.034	-.058	.031	-.249**	-.225**	.026	.137**	.030	.166**	**(.93)**	
11. Innovation	12.00	5.65	.115*	-.036	-.069	.214**	.249**	-.121*	.164**	.073	.113*	-.100*	**(.85)**

**p<.01; *p<.05; +p<.09; When appropriate Cronbach´s alpha coefficients are reported in bold in parentheses on the diagonal

Table 2. Results of the hierarchical linear regressions (H1)

	β	β
No. Nationalities Project Duration Gender Organizational support	.102 .020 -.063 .256**	.113 .018 -.046 .189**
Inspirational Motivation Idealized influence Intellectual Stimulation Individualized consideration		-.054 .110 .212** -.070
R^2 ΔF	.081 6.57**	.121 3.35*

**p<.01; *p<.05; +p<.09

Table 3. Results of the hierarchical linear regressions (H2)

	β	B
No. Nationalities Project Duration Gender Organizational support	.109* .002 -.033 .229**	.130 .022 -.011 .221**
Collectivism Masculinity Power Distance Uncertainty Avoidance		.039 .010 -.176* -.034
R^2 ΔF	.081 6.57**	.084 3.75**

**p<.01; *p<.05; +p<.09

Table 4. Hierarchical regressions results (H3)

	β	β
No. Nationalities Project Duration Gender Perceived Organizational support	.109* .002 -.033 .229**	.111* .006 -.033 .217**
Conflict		-.046
R^2 ΔF	.059 7.39**	.059 .868**

**p<.01; *p<.05; +p<.09

To test the hypotheses, multiple linear hierarchical regressions have been used. The results can be seen in Tables 2, 3, 4 & 5. Specifically, for the relationship established between transformational leadership and innovation in the team (H1), it can see in Table 2 that of the coefficients corresponding to the different dimensions of the transformational leadership construct (inspirational motivation, idealized influence, intellectual stimulation and Individualized consideration), only intellectual stimulation acquires statistical significance (β=.212*), so that partial support is obtained for H1.

With respect to the following hypothesis established on the relationship between cultural orientation and innovation of the team, the results of the regressions are presented in Table 3. Specifically, it is observed in this case that, of the dimensions analysed, it is the distance of powers that acquires statistical significance, in addition to taking the appropriate sign (β = -.176*), so that partial support is obtained for the general hypothesis H2, specifically sub-hypothesis H2.3 is supported.

According to H3, which establishes the theoretical relationship between conflict (β = -.046) and team innovation, the sample does not support such a hypothesis (Table 4), therefore H3 is rejected.

Finally, in relation to the hypothesis of moderation proposed for the variable perceived organizational support, in the relationship between transformational leadership and team innovation, the results of the linear hierarchical regression are presented in Table 5. The procedure followed in this case has been the introduction of the control variables first, followed by the introduction of the main effects, and finally in a third step, the introduction of the interaction terms, once centred. In this case, the data support a moderating effect for the leadership dimension of Intellectual Stimulation, as the interaction effect acquires statistical significance. Therefore, the H4 hypothesis is supported.

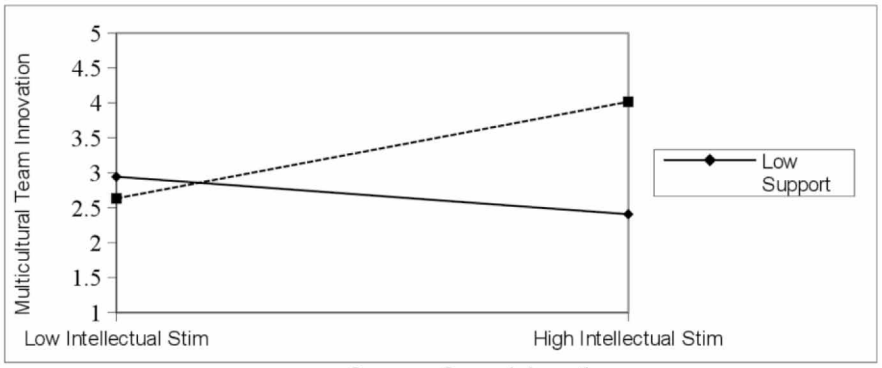
Table 5. Results of the hierarchical linear regressions (H4)

	β	β	B
Var. Control: Different nationalities Duration of the project Gender Main var: Organizational support Motivational inspiration Idealized Influence Intellectual Stimulation Individualized consideration Interaction Terms Motivation_x_Perceived Org. Support Influence_x_ Perceived Org. Support Stimulation_x_ Perceived Org. Support Attention_x_ Perceived Org. Support	 .098 -.011 -.080	 .113* .018 -.046 .189** -.054 .110 .212* .070	 .109 .020 -.057 .325 .307 .377 .405* .550 -.610 -.425 .480** -.819
R^2 ΔF	.007 1.69	.097 6.99**	.121 2.99*

**p<.01; *p<.05; +p<.09

Intellectual stimulation was plotted in relation to multicultural team innovation. The corresponding interaction is showed in Figure 2, in which, it is observed that the perceived organizational support reinforces and increases the positive effect of the intellectual stimulation for greater performance of the team.

Figure 2. The moderating effect of organizational support on the relationship between intellectual stimulation and team innovation



Source: Own elaboration

SOLUTIONS AND RECOMMENDATIONS

Previous literature points out that multicultural teams are a key strategy that represents a competitive advantage for companies operating in a globalized business environment (Janssens & Brett, 2006; Lee et al., 2019; Rickards & Moger, 2006; Yasini, 2016). This brings with it a growing interest in better understanding how this type of team works and the factors that influence its innovation (Bouncken et al., 2016; De Wit, Greer, & Jehn. 2012; Goodwin et al., 2011; Johnsson, 2018; Yasini, 2016; Williams & McGuire, 2010).

An ANOVA analysis and regression analysis were used to test the relationships between the independent variables and the dependent variable. The results obtained indicate that the intellectual stimulation dimension of transformational leadership and a low power distance cultural orientation are factors that favour team innovation. Additionally, the positive moderating effect on the relationship between intellectual stimulation and innovation is confirmed. The main theoretical and practical contributions of this study are presented below.

First. Results regarding transformational leadership are consistent with previous research that confirms a relationship between the dimension of intellectual stimulation and team innovation (Bass, Avolio, Jung, & Berson, 2003; Bednall et al., 2018; Chen et al., 2014; Choi et al., 2016; Choi et al., 2017; Felfe & Goihl, 2002; Kark et al., 2018; Lisak et al., 2016). The above indicates that transformational leaders can foster innovation in multicultural teams by encouraging team members to explore new ways of solving problems, in other words, "to think out of the box". (Bednall et al., 2018).

On the other hand, contrary to what was expected to be found, the dimensions of motivational inspiration, idealized influence and individualized consideration showed no significant relationship to team innovation. This invites us to question what has been established in previous research, which argues that transformational leadership is recommended for managing multicultural teams since, as authors have already mentioned, the results indicate that only one of the four dimensions, which is intellectual stimulation, foster team innovation, the rest of the dimensions do not show significant influence on it (Gundersen et al., 2012; Jung et al., 2003; Rowold, 2011). These results respond to the call of Choi et al., 2016 and Choi et al., 2017 on the need of doing more work about transformational leadership and innovative performance relationship at the team level.

Second. Literature establish that diversity of beliefs and values based on team member's national culture is considered a competitive advantage since improve strategic decision process making (Carpenter et al., 2001; Nielsen & Nielsen, 2011) and innovative results (Chen et al., 2016; Han & Beyerlein, 2016; Leung & Wang, 2015; Neukam, 2017; Williams & Mcguire, 2010).

In this matter, results obtained are consistent with previous studies that support that when team members feel confident and free to express what they think in an openly and effective way and participate in a constructive dialog within the team, leads to creativity and innovation (Afsar et al., 2014; Afsar & Umrani, 2019; Kark et al., 2018). In other words, when members have sort of autonomy and work under flexible rules provided by low power distance- organizational structure, team innovation is enhanced. However, it would be advisable for leaders to be cautious about this and to find an appropriate balance between the autonomy and independence granted to the members since too much of it will lead to loss of control and lead to the loss or diminution of the leader's authority, which will have a negative impact on the achievement of results. Likewise, it is advisable to provide leaders with an adequate evaluation system that allows them to identify the most inventive and creative members with the objective of constantly motivating them to continue contributing significantly to the achievement of team goals.

Contrary to expectations, the other culturally oriented dimensions of collectivism, masculinity and low uncertainty avoidance did not show a significant impact on innovation. A possible explanation for this is that when teams are focused on innovation, a collectivist orientation hinders the creative process, which could be due to the fact that the members prefer to avoid expressing ideas that are contrary to the majority in order to avoid confrontations and conflicts that could affect the harmony or benefit of the group, thus inhibiting the generation of creative and innovative solutions (Afsar et al., 2014). In the same way, a team orientation towards planning, following established rules and guidelines can hinder innovation (Jehn & Bezrukova, 2004; Williams & McGuire, 2010), this can happen because working in a structured and planned way can cause a lack of flexibility and autonomy needed in these teams to generate creative and innovative ideas. Therefore, it is possible that the participants of the analysed sample belong to teams with members from cultures with high avoidance of uncertainty and oriented to femininity, that is, to work in groups, which finds congruence with studies of Williams and McGuire (2010) who argue that a feminist cultural orientation inhibits the production of creativity and innovation.

Third. The analysis realized did not support a negative relationship between affective conflict and team innovation. Results are not consistent with literature reviewed that point out affective conflict affects the achievement of innovative results (Gisbert-López et al., 2014; He et al., 2014; Lee et al., 2015). One argument to justify this, is that due to effective communication between members, possible differences are solved and therefore, affective conflict is lower of minimum.

Another argument could be that perceived organisational support variable diminish the effect of emotional conflict. In other words, when member perceive that the team is supported by the company, the possibility of affective conflict in the team decreases. In this way, this variable has been eliminated, giving rise to the existence of a negative and statistically significant relationship between the emotional conflict and the innovation of the team, which establishes that the greater the emotional conflict present in the team, the less the innovation of the team. In this case, one suggestion for human resource managers is to establish prevention programs so that leaders learn to manage the tensions that may arise between team members using the cooperative approach to conflict management that involves activities oriented towards collaboration, effective communication, general consensus and integration of paradigms with the aim of softening the negative impact on team innovation (He et al., 2014).

A second argument to justify the low significance of the affective conflict variable may be due to the presence of the transformational leadership variable in the model that minimizes this effect, i.e. when the team has a transformational leader who provides the members with personalized attention and instils in them a common vision motivating them to exceed the expected expectations, Possible differences of opinion among the members can be subordinated to the achievement of common team goals and therefore reduce possible conflicts within the team in favour of the achievement of team objectives (Kammerhoff et al., 2019).

On the other hand, there are studies that argue that emotional conflict is constructive because it involves the understanding of each party, quality solutions and strengthening of interpersonal relationships between team members (Tjosvold, 2008). That is, those teams in which there is a low degree of emotional conflict tend to experience a better harmony of relationships between its members characterized by effective communication, trust and mutual respect (Chen et al., 2014). Therefore, taking into account the above, and in the case of teams with a view to innovating, the presence of some degree of emotional conflict could be expected, which, if properly managed, can serve to stimulate open dialogue and constructive debate through the exchange of diverse opinions and the reasoning and generation of innovative solutions to problems through the breaking of traditionally established approaches and paradigms. The above is consistent with Leung and Wang (2015) studies that consider that the presence of intercultural conflict (that which is originated by cultural differences in the team) as it decreases as the project is completed, therefore, does not affect the generation of creative ideas and innovation.

Fourth. The analysis provides enough evidence to support the moderating effect of perceived organizational support on the relationship between intellectual and team innovation which is consistent with previous research (Choi et al., 2016; Choi et al., 2017; Jiang et al., 2019). This means, when the firm provides (through transformational leaders) its members with meaningful tasks that motivating to solve problems in a creative and alternative way, team innovation is greater. Conversely, when members do not perceive support from the leader, motivation and commitment to contribute to innovative outcomes, team innovation tends to decline. Therefore, it is important to design and implement Human Resources practices aimed at providing continuous organizational support to multicultural teams. To this end, it is essential that there is effective communication between team members and management in order to determine their needs and carry out respective actions to meet them.

CONCLUSION AND LIMITATIONS

The increasing globalization of business has led companies to bet on the use of multicultural equipment as a strategy to generate successful competitive advantages. For this reason, it is of great relevance to study in a more profound way the functioning of such teams with the objective of determining which factors benefit innovation. Therefore, the aim of this empirical study was to analyse the influence of transformational leadership, cultural orientation and emotional conflict in the generation of innovation by multicultural teams.

Results of the study highlight three main findings: first, only one of the four dimensions of transformational leadership, which is intellectual stimulation, fosters innovation. In other words, transformational leaders stimulate team members to think out of the box and to analyse new perspectives in problem solving, which leads to the innovation. This suggests the importance of taking into consideration the need to cultivate this dimension in team leaders who seek to innovate.

Second, a low power distance orientation in the team stimulates innovation, that is, when in a team, there are no or minimal differences in status, members participate in decision making, work in flexible work environment (as no rules and unplanned situations) and enjoy autonomy, they feel confident to communicate their opinions openly which favours, dialogue and constructive debate which in turn enhanced creativity and innovation.

Third, is confirmed a positive moderating effect of organizational support on the relationship between intellectual stimulation and team innovation. This indicates that, when members perceive the team is supported by the company through its transformational leader, team tends to innovate.

Forth, affective conflict did not show significant evidence of being related to team innovation. This may be due to the presence of organizational support that minimizes the relationship.

This study provides useful information for Human Resource managers as it calls on leaders to be aware of the importance of intellectually stimulating members and selecting those from low power-distance cultures in order to ensure successful innovation by multicultural teams.

Finally, this study has several limitations, some of which imply future improvements or lines of research. As in all research, this study assumes the possibility of bias in participants' answers, motivated by several methodological and theoretical limitations mentioned below.

Results mainly reflect the perspective of a national culture that is the Mexican one. Since it is known that the behaviours and preferences analysed here may vary from one culture to another, from one industry to another, and from one context to another (Hofstede, 1980, 1991).

Information to carry out this research has been obtained through self-assessments of performance and, therefore, the results could be affected by some variance deviation limiting its generality. For this reason, it would be advisable that further research take into consideration other sources of information such as the opinion of the leaders' supervisors and the company's evaluation reports to increase the reliability of the results.

Measurement of the team innovation variable has been only at team level, therefore, it would be interesting to replicate the present study including the analysis of the impact of the independent variables on innovation at the organizational level (Naranjo-Valencia, Jiménez-Jiménez, & Sanz-Valle, 2016).

Another recommendation is to focus the study on high-tech companies as they represent an industry with a strong orientation towards innovation (Zhou et al., 2016). Also, expand the analysis to include measuring innovation at the individual level (De Jong & Den Hartog, 2010) and at the organizational level (Naranjo-Valencia et al., 2016).

Empirical model includes only one style of leadership, but, there are others that have also been considered in innovation studies: participatory leadership which is associated with increased individual innovation by employees (Odoardi et al., 2019); "coaching" leadership, which is recommended to encourage team members to engage in innovative processes through the development and implementation of new ways of doing things (Rousseau, Aubé, & Tremblay, 2013). and charismatic leader, who positively influences team innovation through personal sacrifice for the benefit of the fulfilment of common team goals (Jiang et al., 2019).

REFERENCES

Afsar, B., Badir, Y. F., & Saeed, B. B. (2014). Transformational leadership and innovative work behavior. *Industrial Management & Data Systems*, *114*(8), 1270–1300. doi:10.1108/IMDS-05-2014-0152

Afsar, B., & Umrani, W. A. (2019). Transformational leadership and innovative work behavior. *European Journal of Innovation Management*, *23*(3), 402–428. doi:10.1108/EJIM-12-2018-0257

Al-edenat, M. (2018). Reinforcing innovation through transformational leadership: Mediating role of job satisfaction. *Journal of Organizational Change Management*, *31*(4), 810–883. doi:10.1108/JOCM-05-2017-0181

Amabile, T.M. (1996). *Creativity and Innovation in Organizations.* Harvard Business School Background Note 396-239.

Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in Organizational Behavior*, *36*, 157–183. doi:10.1016/j.riob.2016.10.001

Amabile, T. M., Schatzel, E. A., Moneta, G. B., & Kramer, S. J. (2004). Leader behaviors, perceived, leader support, and subordinate creativity. *The Leadership Quarterly*, *15*(5), 32.

Anderson, N., De Dreu, C. K., & Nijstad, B. A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science. *Journal of Organizational Behavior*, *25*(2), 147–173. doi:10.1002/job.236

Ayoko, O. B., & Konrad, A. M. (2012). Leaders' transformational, conflict, and emotion management behaviours in culturally diverse workgroups. *Equality, Diversity and Inclusion*, *31*(8), 694–724. doi:10.1108/02610151211277581

Baptista, P., Fernández, C., & Hernández, R. (2010). *Metodología de la investigación*. Editorial The McGraw-Hill.

Bashshur, M. R., Hernández, A., & González-Romá, V. (2011). When managers and their teams disagree: A longitudinal look at the consequences of differences in perceptions of organizational support. *The Journal of Applied Psychology*, *96*(3), 558–573. doi:10.1037/a0022675 PMID:21341884

Bass, B. M., & Avolio, B. J. (1994). *Improving organizational effectiveness through transformational leadership*. Sage.

Bass, B. M., & Avolio, B. J. (1995). *The Multifactor Leadership Questionnaire*. Mind Garden.

Bass, B. M., Avolio, B. J., Jung, D. I., & Berson, Y. (2003). Predicting unit performance by assessing transformational and transactional leadership. *The Journal of Applied Psychology*, *88*(2), 207–218. doi:10.1037/0021-9010.88.2.207 PMID:12731705

Batra, P. (2016). *Education in conflict: Redefining the contours of change.* In Keynote Presentation at BERA (British Educational Research Association) annual conference, Leeds University, Leeds, UK.

Bednall, T. C., & Rafferty, A., Shipton, H., Sanders, K., & Jackson, C. (2018). Innovative behaviour: How much transformational leadership do you need? *British Journal of Management*, *29*(4), 796–816. doi:10.1111/1467-8551.12275

Beheshtifar, M., & Zare, E. (2013). Interpersonal conflict: A substantial factor to organizational failure. *International Journal of Academic Research in Business and Social Sciences*, *3*(5), 400.

Beyene, K. T., Shi, C. S., & Wu, W. W. (2016). Linking culture, organizational learning orientation and product innovation performnace: The case of Ethiopian manufacturing firms. *South African Journal of Industrial Engineering*, *27*(1), 88–101. doi:10.7166/27-1-1334

Bono, J. E., Boles, T. L., Judge, T. A., & Lauver, K. J. (2002). The role of personality in task and relationship conflict. *Journal of Personality*, *70*(3), 311–344. doi:10.1111/1467-6494.05007 PMID:12049163

Borda, A., Geleilate, J. M. G., Newburry, W., & Kundu, S. K. (2017). Firm internationalization, business group diversification and firm performance: The case of Latin American firms. *Journal of Business Research*, *72*, 104–113. doi:10.1016/j.jbusres.2016.11.006

Bornay-Barrachina, M. (2013). ¿Qué hace a los equipos ser más innovadores? El liderazgo desde una perspectiva de multidominio. *Cuadernos de Economía y Dirección de la Empresa*, *16*(1), 41–53. doi:10.1016/j.cede.2012.05.002

Bouncken, R., Brem, A., & Kraus, S. (2016). Multi-cultural teams as sources for creativity and innovation: The role of cultural diversity on team performance. *International Journal of Innovation Management*, *20*(01), 1650012. doi:10.1142/S1363919616500122

Burner, O. Y., Cunningham, P., & Hattar, H. S. (1990). Managing a multicultural nurse staff in a multicultural environment. *The Journal of Nursing Administration*, *20*(6), 30–34. doi:10.1097/00005110-199006000-00006 PMID:2348248

Campos, P. H., Mobarec, E. M., Soto, S. O., & Nazel, P. C. F. (2007). Cuantificación de las distancias culturales entre países: Un análisis de latinoamérica. *Cuadernos Americanos*, *20*(33), 253–272.

Chen, L., Zheng, W., Yang, B., & Bai, S. (2016). Transformational leadership, social capital and organizational innovation. *Leadership and Organization Development Journal*, *37*(7), 843–859. doi:10.1108/LODJ-07-2015-0157

Chen, T. J., & Wu, C. M. (2020). Can newcomers perform better at hotels? Examining the roles of transformational leadership, supervisor-triggered positive affect, and perceived supervisor support. *Tourism Management Perspectives*, *33*, 100587. doi:10.1016/j.tmp.2019.100587

Chen, Y., Tang, G., Jin, J., Xie, Q., & Li, J. (2014). CEO s′ transformational leadership and product innovation performance: The roles of corporate entrepreneurship and technology orientation. *Journal of Product Innovation Management*, *31*, 2–17. doi:10.1111/jpim.12188

Cheng, C. Y., Chua, R. Y., Morris, M. W., & Lee, L. (2012). Finding the right mix: How the composition of self-managing multicultural teams' cultural value orientation influences performance over time. *Journal of Organizational Behavior*, *33*(3), 389–411. doi:10.1002/job.1777

Choi, S. B., Kim, K., Ullah, S. E., & Kang, S. W. (2016). How transformational leadership facilitates innovative behavior of Korean workers. *Personnel Review*, *45*(3), 459–479. doi:10.1108/PR-03-2014-0058

Chua, R. Y., Morris, M. W., & Mor, S. (2012). Collaborating across cultures: Cultural metacognition and affect-based trust in creative collaboration. *Organizational Behavior and Human Decision Processes*, *118*(2), 116–131. doi:10.1016/j.obhdp.2012.03.009

Cook, J., & Wall, T. (1980). New work attitude measures of trust, organizational commitment and personal need non-fulfillment. *Journal of Occupational Psychology*, *53*(1), 39–52. doi:10.1111/j.2044-8325.1980.tb00005.x

De Dreu, C. K. W., & Weingart, L. R. (2003). Task Versus Relationship Conflict, Team Performance, and Team Member Satisfaction: A Meta-Analysis. *The Journal of Applied Psychology*, *88*(4), 741–749. doi:10.1037/0021-9010.88.4.741 PMID:12940412

De Jong, J., & Den Hartog, D. (2010). Measuring innovative work behaviour. *Creativity and Innovation Management*, *19*(1), 23–36. doi:10.1111/j.1467-8691.2010.00547.x

De Wit, F. R. C., Greer, L. L., & Jehn, K. A. (2012). The paradox of intragroup conflict: A meta-analysis. *The Journal of Applied Psychology*, *97*(2), 360–390. doi:10.1037/a0024844 PMID:21842974

Del Barrio, S., & Luque, T. (2000). *Técnicas de análisis de datos en investigación de mercados*. Pirámide.

Diaz-Fernandez, M., Bornay-Barrachina, M., & Lopez-Cabrales, A. (2015, April). Innovation and firm performance: the role of human resource management practices. *Evidence-based HRM: a Global Forum for Empirical Scholarship, 3*(1), 64-80. 10.1108/EBHRM-10-2012-0012

Dutra, C. J. C., Mazza, A. A., & de Menezes, L. M. L. (2014). Innovation in Sustainable Products: Cross-Cultural Analysis of Bi-national Teams. *Revista de Gestão Ambiental e Sustentabilidade*, *3*(2), 149–164. doi:10.5585/geas.v3i2.105

Earley, C. P., & Mosakowski, E. (2000). Creating hybrid team cultures: An empirical test of transnational team functioning. *Academy of Management Journal*, *43*(1), 26–49.

Earley, P. C., & Mosakowski, E. (2004). Cultural intelligence. *Harvard Business Review*, *82*(10), 139–146. PMID:15559582

Edinger, S. K. (2012). *Transferring social capital from individual to team: An examination of moderators and relationships to innovative performance* (PhD thesis). Faculty of the Graduate School of the University of Maryland.

Eisenberger, R., Fasolo, P., & Davis-LaMastro, V. (1990). Perceived Organizational Support and Employee Diligence, Commitment, and Innovation. *The Journal of Applied Psychology*, *75*(1), 51–59. doi:10.1037/0021-9010.75.1.51

Farh, J. L., Hackett, R. D., & Liang, J. (2007). Individual-level cultural values as moderators of perceived organizational support–employee outcome relationships in China: Comparing the effects of power distance and traditionality. *Academy of Management Journal*, *50*(3), 715–729. doi:10.5465/amj.2007.25530866

Felfe, J., & Goihl, K. (2002). Transformational leadership and commitment. *Organizational Development and Leadership*, *11*, 87-124.

Fornell, C., & Larcker, D. F. (1981). *Structural equation models with unobservable variables and measurement error: Algebra and statistics.* Academic Press.

Gisbert-López, M. C., Verdú-Jover, A. J., & Gómez-Gras, J. M. (2014). The moderating effect of relationship conflict on the creative climate–innovation association: The case of traditional sectors in Spain. *International Journal of Human Resource Management*, *25*(1), 47–67. doi:10.1080/09585192.2013.781525

Goodwin, V. L., Whittington, J. L., Murray, B., & Nichols, T. (2011). Moderator or mediator? Examining the role of trust in the transformational leadership paradigm. *Journal of Managerial Issues*, 409–425.

Greve, P., Nielsen, S., & Ruigrok, W. (2009). Transcending borders with international top management teams: A study of European financial multinational corporations. *European Management Journal*, *27*(3), 213–224. doi:10.1016/j.emj.2008.10.001

Gundersen, G., Hellesøy, B. T., & Raeder, S. (2012). Leading international project teams: The effectiveness of transformational leadership in dynamic work environments. *Journal of Leadership & Organizational Studies*, *19*(1), 46–57. doi:10.1177/1548051811429573

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1999). *Análisis multivariante* (Vol. 491). Prentice Hall.

Han, S. J., & Beyerlein, M. (2016). Framing the effects of multinational cultural diversity on virtual team processes. *Small Group Research*, *47*(4), 351–383. doi:10.1177/1046496416653480

He, Y., Ding, X. H., & Yang, K. (2014). Unpacking the relationships between conflicts and team innovation. *Management Decision*, *52*(8), 1533–1548. doi:10.1108/MD-03-2014-0127

Hemsworth, D., Muterera, J., & Baregheh, A. (2013). Examining Basss Transformational Leadership In Public Sector Executives: A Psychometric Properties Review. *Journal of Applied Business Research*, *29*(3), 853–862. doi:10.19030/jabr.v29i3.7785

Hernández Sampieri, R., Collado, C. F., & Baptista, L. (1991). *Definición del tipo de investigación. Metodología de la investigación*. Mc Graw-Hill Interamericana Editores.

Hofstede, G. (1980). Culture and organizations. *International Studies of Management & Organization*, *10*(4), 15–41. doi:10.1080/00208825.1980.11656300

Hofstede, G. (1991). *Cultures and Organizations: Software of the Mind*. McGraw-Hill.

Horverak, J. G., Sandal, G. M., Bye, H. H., & Pallesen, S. (2013). Managers' selection preferences: The role of prejudice and multicultural personality traits in the assessment of native and immigrant job candidates. Revue Européenne de Psychologie Appliquée/European. *Review of Applied Psychology*, *63*(5), 267–275. doi:10.1016/j.erap.2013.07.003

Hu, H. H., Chen, Y. T., & Chen, H. Y. (2010). A study of Taiwanese executives selected for expatriate assignments. *Contemporary Management Research*, *6*(3). Advance online publication. doi:10.7903/cmr.1138

Hüttermann, H., & Boerner, S. (2011). Fostering innovation in functionally diverse teams: The two faces of transformational leadership. *European Journal of Work and Organizational Psychology*, *20*(6), 833–854. doi:10.1080/1359432X.2010.524412

Janssens, M., & Brett, J. (2006). Cultural Intelligence in global teams: A fusion model of collaboration. *Group & Organization Management*, *31*(1), 124–150. doi:10.1177/1059601105275268

Janssens, O., Van De Vliert, E., & Veenstra, C. (1999). How Task and Person Conflict Shape the Role of Positive Interdependence in Management Teams. *Journal of Management*, *25*(2), 117–141. doi:10.1177/014920639902500201

Javidan, M., Dorfman, P. W., De Luque, M. S., & House, R. J. (2006). In the eye of the beholder: Cross cultural lessons in leadership from project GLOBE. *The Academy of Management Perspectives*, *20*(1), 67–90. doi:10.5465/amp.2006.19873410

Javidan, M., House, R. J., Dorfman, P. W., Hanges, P. J., & De Luque, M. S. (2006). Conceptualizing and measuring cultures and their consequences: A comparative review of GLOBE's and Hofstede's approaches. *Journal of International Business Studies*, *37*(6), 897–914. doi:10.1057/palgrave.jibs.8400234

Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Science Quarterly*, *40*(2), 256–282. doi:10.2307/2393638

Jehn, K. A., & Bezrukova, K. (2004). A field study of group diversity, workgroup context, and performance. *Journal of Organizational Behavior*, *25*(6), 703–729. doi:10.1002/job.257

Jehn, K. A., & Mannix, E. A. (2001). The dynamic nature of conflict: A longitudinal study of intragroup conflict and group performance. *Academy of Management Journal*, *44*(2), 238–251.

Jiang, W., Wang, L., Chu, Z., & Zheng, C. (2019). Does leader turnover intention hinder team innovation performance? The roles of leader self-sacrificial behavior and empathic concern. *Journal of Business Research*, *104*, 261–270. doi:10.1016/j.jbusres.2019.07.013

Jiang, Y., & Chen, C. C. (2018). Integrating knowledge activities for team innovation: Effects of transformational leadership. *Journal of Management*, *44*(5), 1819–1847. doi:10.1177/0149206316628641

Johnsson, M. (2018). The innovation facilitator: Characteristics and importance for innovation teams. *Journal of Innovation Management*, *6*(2), 12–44. doi:10.24840/2183-0606_006.002_0004

Jung, D. I., & Sosik, J. J. (2002). Transformational leadership in work groups: The role of empowerment, cohesiveness, and collective-efficacy on perceived group performance. *Small Group Research*, *33*(3), 313–336. doi:10.1177/10496402033003002

Kaczmarek, S., & Ruigrok, W. (2013). In at the deep end of firm internationalization. *Management International Review*, *53*(4), 513–534. doi:10.100711575-012-0159-7

Kammerhoff, J., Lauenstein, O., & Schütz, A. (2019). Leading toward harmony–Different types of conflict mediate how followers' perceptions of transformational leadership are related to job satisfaction and performance. *European Management Journal*, *37*(2), 210–221. doi:10.1016/j.emj.2018.06.003

Kark, R., Van Dijk, D., & Vashdi, D. R. (2018). Motivated or demotivated to be creative: The role of self-regulatory focus in transformational and transactional leadership processes. *Applied Psychology*, *67*(1), 186–224. doi:10.1111/apps.12122

Kim, H. (2014). Transformational leadership, organizational clan culture, organizational affective commitment, and organizational citizenship behavior: A case of South Korea's public sector. *Public Organization Review*, *14*(3), 397–417. doi:10.100711115-013-0225-z

Kirkman, B. L., & Shapiro, D. L. (2005). The impact of cultural value diversity on multicultural team performance. *Advances in International Management, 18*, 33-67.

Kirkman, B. L., Shapiro, D. L., Lu, S., & McGurrin, D. P. (2016). Culture and teams. *Current Opinion in Psychology*, *8*, 137–142. doi:10.1016/j.copsyc.2015.12.001 PMID:29506789

Kraimer, M. L., Wayne, S. J., & Jaworski, R. A. (2001). Sources of Support and Expatriate Performance: The Mediating Role of Expatriate Adjustment. *Personnel Psychology*, *54*(1), 71–99. doi:10.1111/j.1744-6570.2001.tb00086.x

Kraus, S., Mensching, H., Calabrò, A., Cheng, C. F., & Filser, M. (2016). Family firm internationalization: A configurational approach. *Journal of Business Research*, *69*(11), 5473–5478. doi:10.1016/j.jbusres.2016.04.158

Lee, C. C., Lin, Y. H., Huang, H. C., Huang, W. W., & Teng, H. H. (2015). The effects of task interdependence, team cooperation, and team conflict on job performance. *Social Behavior and Personality*, *43*(4), 529–536. doi:10.2224bp.2015.43.4.529

Lee, H. U., & Park, J. H. (2006). Top team diversity, internationalization and the mediating effect of international alliances. *British Journal of Management*, *17*(3), 195–213. doi:10.1111/j.1467-8551.2006.00501.x

Lee, M.-H., Yen, M. Y., & Perromat, L. (2019). Interaction between the Knowledge Sharing on Innovation Behavior Based on the Viewpoint of Team Diversity: Empirical Research from China. *Revista de Cercetare si Interventie Sociala*, *64*(97), 97–107. doi:10.33788/rcis.64.8

Leung, K., & Wang, J. (2015). Social processes and team creativity in multicultural teams: A sociotechnical framework. *Journal of Organizational Behavior*, *36*(7), 1008–1025. doi:10.1002/job.2021

Li, L., Li, D., & Shi, W. S. (2011). Internationalization, internalization and the performance of US biopharmaceutical SMEs. *Multinational Business Review*, *19*(1), 65–93. doi:10.1108/15253831111134830

Li, V., Mitchell, R., & Boyle, B. (2016). The divergent effects of transformational leadership on individual and team innovation. *Group & Organization Management*, *41*(1), 66–97. doi:10.1177/1059601115573792

Liao, H., Toya, K., Lepak, D. P., & Hong, Y. (2009). Do they see eye to eye? Management and employee perspectives of high-performance work systems and influence processes on service quality. *The Journal of Applied Psychology*, *94*(2), 371–391. doi:10.1037/a0013504 PMID:19271796

Lisak, A., Erez, M., Sui, Y., & Lee, C. (2016). The positive role of global leaders in enhancing multicultural team innovation. *Journal of International Business Studies*, *47*(6), 655–673. doi:10.105741267-016-0002-7

Liu, H., & Li, G. (2018). Linking transformational leadership and knowledge sharing: The mediating roles of perceived team goal commitment and perceived team identification. *Frontiers in Psychology*, *9*, 1331. doi:10.3389/fpsyg.2018.01331 PMID:30108540

Lopez, D., Jaramillo, D. A., & Susaeta, D. (2019). Innovation in Corporate Organizational Culture: Diversity. *Motivation and Organizational Pressure as Possible Realities*, *2*, 63–85.

Lvina, E., Matveev, A., & Grishin, G. (2019). Transforming cultural barriers into assets: Lessons learned from a clobal insurance broker. *Revista de Management Comparat International*, *20*(3), 226–240.

Magnusson, P., Wilson, R. T., Zdravkovic, S., Zhou, J. X., & Westjohn, S. A. (2008). Breaking through the cultural clutter: A comparative assessment of multiple cultural and institutional frameworks. *International Marketing Review*, *25*(2), 183–201. doi:10.1108/02651330810866272

Matveev, A. (2016). *Intercultural competence in organizations: a guide for leaders, educators and team players*. Springer.

Matveev, A. (2017). Intercultural Competence in Multicultural Teams. In *Intercultural Competence in Organizations* (pp. 77–102). Springer. doi:10.1007/978-3-319-45701-7_4

Matveev, A. V., & Milter, R. G. (2004). The value of intercultural competence for performance of multicultural teams. *Team Performance Management*, *10*(5/6), 104–111. doi:10.1108/13527590410556827

Nam, C. S., Lyons, J. B., Hwang, H. S., & Kim, S. (2009). The process of team communication in multicultural contexts: An empirical study using Bales' interaction process analysis (IPA). *International Journal of Industrial Ergonomics*, *39*(5), 771–782. doi:10.1016/j.ergon.2009.03.004

Naranjo-Valencia, J. C., Jiménez-Jiménez, D., & Sanz-Valle, R. (2016). Studying the links between organizational culture, innovation, and performance in Spanish companies. *Revista Latinoamericana de Psicología*, *48*(1), 30–41. doi:10.1016/j.rlp.2015.09.009

Neukam, M. N. (2017). Managing the fuzzy front-end in multicultural teams. *European Journal of Innovation Management*, *20*(4), 578–598. doi:10.1108/EJIM-11-2016-0112

Nielsen, B. B., & Nielsen, S. (2011). The role of top management team international orientation in international strategic decision-making: The choice of foreign entry mode. *Journal of World Business*, *46*(2), 185–193. doi:10.1016/j.jwb.2010.05.003

Nixon, P., Harrington, M., & Parker, D. (2012). Leadership performance is significant to project success or failure: A critical analysis. *International Journal of Productivity and Performance Management*, *61*(2), 204–216. doi:10.1108/17410401211194699

Ochieng, E. G., & Price, A. D. (2009). Framework for managing multicultural project teams. *Engineering, Construction, and Architectural Management*, *16*(6), 527–543. doi:10.1108/09699980911002557

Ochieng, E. G., & Price, A. D. F. (2010). Managing cross-cultural communication in multicultural construction project teams: The case of Kenya and UK. *International Journal of Project Management*, *28*(5), 449–460. doi:10.1016/j.ijproman.2009.08.001

Odoardi, C., Battistelli, A., Montani, F., & Peiró, J. M. (2019). Affective Commitment, Participative Leadership, and Employee Innovation: A Multilevel Investigation. *Journal of Work and Organizational Psychology*, *35*(2), 103–113. doi:10.5093/jwop2019a12

Özaralli, N. (2003). Effects of transformational leadership on empowerment and team effectiveness. *Leadership and Organization Development Journal*, *24*(6), 335–344. doi:10.1108/01437730310494301

Papenhausen, C., & Parayitam, S. (2015). Conflict Management Strategies as Moderators in the Antecedents to Affective Conflict and its Influence on Team Effectiveness. *Journal of Business and Management*, *21*(1).

Parker, H. (2016). Team effectiveness and open discussion of conflict in collaborative new product development: A cross-national study. *Journal of Business Research*, *69*(11), 4757–4762. doi:10.1016/j.jbusres.2016.04.026

Perez, S., & Sanchez, Z. M. F. S. (1999). Metodología para investigación en marketing y dirección de empresas. Madrid: Editorial Pirámide.

Perry-Smith, J. E. (2006). Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, *49*(1), 85–101. doi:10.5465/amj.2006.20785503

Perry-Smith, J. E., & Mannucci, P. V. (2017). From creativity to innovation: The social network drivers of the four phases of the idea journey. *Academy of Management Review*, *42*(1), 53–79. doi:10.5465/amr.2014.0462

Ponterotto, J. G., Ruckdeschel, D. E., Joseph, A. C., Tennenbaum, E. A., & Bruno, A. (2011). ¨Multicultural personality dispositions and trait emotional intelligence: An exploratory study. *The Journal of Social Psychology*, *151*(5), 556–576. doi:10.1080/00224545.2010.503718 PMID:22017073

Puck, J., Rygl, D., & Kittler, M. (2007). Cultural antecedents and performance consequences of open communication and knowledge transfer in multicultural process-innovation teams. *Journal of Organisational Transformation & Social Change*, *3*(2), 223–241. doi:10.1386/jots.3.2.223_1

Puck, J. F., Mohr, A. T., & Rygl, D. (2008). An empirical analysis of managers' adjustment to working in multi-national project teams in the pipeline and plant construction sector. *International Journal of Human Resource Management*, *19*(12), 2252–2267. doi:10.1080/09585190802479488

Ranf, D. E. (2010). Cultural differences in project management. *Annales Universitatis Apulensis Series Oeconomica*, *2*(12), 1–18.

Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *The Journal of Applied Psychology*, *87*(4), 698–714. doi:10.1037/0021-9010.87.4.698 PMID:12184574

Rickards, T., & Moger, S. (2006). Creative leaders: A decade of contributions from Creativity and Innovation Management Journal. *Creativity and Innovation Management*, *15*(1), 4–18. doi:10.1111/j.1467-8691.2006.00365.x

Rousseau, V., Aubé, C., & Tremblay, S. (2013). Team coaching and innovation in work teams. *Leadership and Organization Development Journal*, *34*(4), 344–364. doi:10.1108/LODJ-08-2011-0073

Rowold, J. (2011). Relationship between leadership behaviors and performance: The moderating role of a work team's level of age, gender, and cultural heterogeneity. *Leadership and Organization Development Journal*, *32*(6), 628–647. doi:10.1108/01437731111161094

Santos, C. M., Uitdewilligen, S., & Passos, A. M. (2015). Why is your team more creative than mine? The influence of shared mental models on intra-group conflict, team creativity and effectiveness. *Creativity and Innovation Management*, *24*(4), 645–658. doi:10.1111/caim.12129

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.

Schulze, A., & Seuffert, V. (2014). Conflicts, cooperation, and competition in the field of science and technology. Handbook of the Psychology of Science, 303-30.

Shanock, L. R., & Eisenberger, R. (2006). When supervisors feel supported: Relationships with subordinates' perceived supervisor support, perceived organizational support, and performance. *The Journal of Applied Psychology*, *91*(3), 689–695. doi:10.1037/0021-9010.91.3.689 PMID:16737364

Shin, S. J., & Zhou, J. (2003). Transformational leadership, conservation, and creativity: Evidence from Korea. *Academy of Management Journal*, *46*(6), 703–714. doi:10.5465/30040662

Snell, S. A., Snow, C. C., Davison, S. C., & Hambrick, D. C. (1998). Designing and supporting transnational teams: The human resource agenda. *Human Resource Management: Published in Cooperation with the School of Business Administration*, *37*(2), 147-158.

Stahl, G. K., Maznevski, M. L., Voigt, A., & Jonsen, K. (2010). Unraveling the effects of cultural diversity in teams: A meta-analysis of research on multicultural work groups. *Journal of International Business Studies*, *41*(4), 690–709. doi:10.1057/jibs.2009.85

Stanko, T. L., & Gibson, C. (2009). *The role of cultural elements in virtual teams. In Cambridge handbook of culture, organizations, and work*. Cambridge University Press.

Sturges, J., Conway, N., & Liefooghe, A. (2010). Organizational support, individual attributes, and the practice of career self-management behavior. *Group & Organization Management*, *35*(1), 108–141. doi:10.1177/1059601109354837

Sullivan, D. (1994). Measuring the degree of internationalization of a firm. *Journal of International Business Studies*, *25*(2), 325–342. doi:10.1057/palgrave.jibs.8490203

Takeuchi, R., Wang, M., Marinova, S. V., & Yao, X. (2009). Role of domain-specific facets of perceived organizational support during expatriation and implications for performance. *Organization Science*, *20*(3), 621–634. doi:10.1287/orsc.1080.0403

Tjosvold, D. (2008). The conflict-positive organization: It depends upon us. *Journal of Organizational Behavior*, *29*(1), 19–28. doi:10.1002/job.473

Tjosvold, D., Law, K. S., & Sun, H. (2006). Effectiveness of Chinese teams: The role of conflict types and conflict management approaches. *Management and Organization Review*, *2*(2), 231–252. doi:10.1111/j.1740-8784.2006.00040.x

Van Der Zee, K. I., & Van Oudenhoven, J. P. (2000). The Multicultural Personality Questionnaire: A multidimensional instrument of multicultural effectiveness. *European Journal of Personality*, *14*(4), 291–309. doi:10.1002/1099-0984(200007/08)14:4<291::AID-PER377>3.0.CO;2-6

Van Knippenberg, D. (2017). Team innovation. *Annual Review of Organizational Psychology and Organizational Behavior*, *4*(1), 211–233. doi:10.1146/annurev-orgpsych-032516-113240

Vera, D., & Crossan, M. (2005). Improvisation and innovative performance in teams. *Organization Science*, *16*(3), 203–224. doi:10.1287/orsc.1050.0126

Vrânceanu, C. A., & Iorgulescu, M. C. (2016). A Look at Hofstede's Cultural Dimensions in Two Service Sectors from Romania. *Amfiteatru Economic Journal*, *18*(10), 875–884.

Wang, P., Rode, J. C., Shi, K., Luo, Z., & Chen, W. (2013). A workgroup climate perspective on the relationships among transformational leadership, workgroup diversity, and employee creativity. *Group & Organization Management*, *38*(3), 334–360. doi:10.1177/1059601113488163

West, M. A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology*, *51*(3), 355–387. doi:10.1111/1464-0597.00951

West, M. A., & Anderson, N. R. (1996). Innovation in top management teams. *The Journal of Applied Psychology*, *81*(6), 680–693. doi:10.1037/0021-9010.81.6.680

Williams, L. K., & McGuire, S. J. (2010). Economic creativity and innovation implementation: The entrepreneurial drivers of growth? Evidence from 63 countries. *Small Business Economics*, *34*(4), 391–412. doi:10.100711187-008-9145-7

Winkler, V. A., & Bouncken, R. B. (2011). How does cultural diversity in global innovation teams affect the innovation process? *Engineering Management Journal*, *23*(4), 24–35. doi:10.1080/10429247.2011.11431917

Xie, X., Wu, Y., & Zeng, S. (2016). A theory of multi-dimensional organizational innovation cultures and innovation performance in transitional economies. *Chinese Management Studies*, *10*(3), 458–479. doi:10.1108/CMS-01-2016-0023

Yasini, P. (2016). Specific characteristics of innovation management process. *International Journal of Organizational Leadership*, *5*(2), 162–171. doi:10.33844/ijol.2016.60406

Zhou, J., Liu, S., Zhang, X., & Chen, M. (2016). Differential leadership, team conflict and new product development performance. *Chinese Management Studies*, *10*(3), 544–558. doi:10.1108/CMS-10-2015-0240

APPENDIX

Transformational Leadership Scale

Table 6.

Item	Factorial Loadings	R^2	Composite Reliability	AVE	CFA Indicators
Inspirational Motivation (4 items)	.698 .706 .710 .710	.487 .498 .504 .504	0.664 0.794 0.757 0.572	0.735 0.709 0.646 0.646	CHI-CUADRADO (χ^2) = 253.23 (p)= .000 (df=112) LISREL FIT INDEX (GFI)=.880 LISREL FIT INDEX (AGFI)=.835 BENTLER-BONETT NORMED FIT INDEX= .860 BENTLER-BONETT NON-NORMED FIT INDEX=.900 COMPARATIVE FIT INDEX (CFI)=.916 BOLLEN FIT INDEX (IFI)=.917 McDONALD FIT INDEX (MFI)=.893 ROOT MEAN-SQUARE ERROR OF APP (RMSEA)= .065
Idealized Influence (7 ítems)	.637 .588 .725 .749 .783 .810 .664	.406 .346 .591 .540 .490 .652 .593			
Intellectual Stimulation (4 ítems)	.873 .682 .770 .602	.762 .510 .593 .436			
Personnal Atention (2 ítems)	.880 .810	.774 .669			
Collectivism (6 items)	.688 .625 .853	.451 .491 .727	0.343 .857 0.720 0.622	0.739 0.801 0.702 0.712	CHI-CUADRADO (χ^2) = 165.4 (p)= .069 (df=140) LISREL FIT INDEX (GFI)=.95 LISREL FIT INDEX (AGFI)=.93 BENTLER-BONETT NORMED FIT INDEX= .95 BENTLER-BONETT NON-NORMED FIT INDEX=.99 COMPARATIVE FIT INDEX (CFI)=.99 BOLLEN FIT INDEX (IFI)=.99 McDONALD FIT INDEX (MFI)=.97 ROOT MEAN-SQUARE ERROR OF APP (RMSEA)= .021
Masculinity (5 ítems)	.709 .853 .772 .918 .897	.502 .727 .595 .844 .804			
Power Distance (6 ítems)	.704 .639 .654 .797 .773 .765	.495 .408 .427 .635 .597 .586			
Uncertainty Avoidance (5 ítems)	.558 .720 .889 .736 .713	.311 .518 .791 .541 .509			

Cultural Orientation Scale

Table 7.

Item	Factorial Loadings	R^2	Composite Reliability	AVE	CFA Indicators
Conflict (4 items)	.815 .901 .905 .893	.665 .813 .819 .798	.772	.710	CHI-CUADRADO (χ^2) = 4.87 (p)= .087 (df=2) LISREL FIT INDEX (GFI)=.99 LISREL FIT INDEX (AGFI)=.96 BENTLER-BONETT NORMED FIT INDEX= .98 BENTLER-BONETT NON-NORMED FIT INDEX=.97 COMPARATIVE FIT INDEX (CFI)=.99 BOLLEN FIT INDEX (IFI)=.99 McDONALD FIT INDEX (MFI)=.99 ROOT MEAN-SQUARE ERROR OF APP (RMSEA)= .059
Organizational Support Perceived (3 ítems)	.694 .898 .848	.482 .806 .719	.802	.635	

Chapter 8
Legalistic Entrepreneurship in the Digital World

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ABSTRACT

This study aims to explain the legalistic entrepreneurship by introducing the type of legalistic entrepreneurship that transforms compliance with laws into entrepreneurship action, and answer the question of how information and communication facilities brought by the digital world can be turned into opportunities in the face of legal obstacles. In this chapter, the concept and components of legalism, the conceptual framework of legalistic entrepreneurship, processes, personal characteristics of legalistic entrepreneurs are explained. In the conclusion section, recommendations are made to policymakers, entrepreneurs, and academicians on virtual commerce and initiatives to be developed in the digital environment and legalistic entrepreneurship.

INTRODUCTION

Entrepreneurship is one of the indispensable elements of trade life for centuries. The industrial revolution and the development of the technology developed commercial life, and entrepreneurship was entered a very different dimension with the contribution of the digital world to humanity. Virtual stores, virtual services continue to develop in the face of the infinity of the needs of individuals. Technological development lagged behind digital development and this difference was reflected in commercial life. Technological developments in production have difficulty in responding to the differentiation of consumer needs. But digital innovations are constantly renewing itself to meet growing consumer needs. Web designs, virtual shopping sites, smartphone applications are constantly being developed to serve consumers (Bessant, & Tidd, 2007). Depending on these developments, social media applications are used as the purpose of organizational strategy.

Thanks to the advertisements made through social media applications, promotion strategies gained a different momentum. Thanks to these cookies, consumers can review the ads that are of interest to

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them, and through these ads, shopping can be done in accordance with the taste of the individual. The interaction and communication contribution of the Internet to our social lives provides benefit to the promotion strategies of the organizations. The speed of access to information brought by the internet network leads to consumer-organization interaction. Thus, the physical distance has become insignificant for consumption and commercial life.

Increasing consumer needs with internet and digital developments have brought new initiatives. These initiatives continue to meet different consumer needs with the innovations of the digital world today. In the face of endless consumer needs, many types of entrepreneurship have emerged, leading to the emergence of different ideas in a globalizing world. Freedom, innovative actions, and the idea of continuous renewal created by globalization are reflected in the ideas of entrepreneurs. In this context, Many types of entrepreneurship such as academic entrepreneurship (Gianiodis, Meek, & Chen, 2019), intrapreneurship (Hisrich, 1990), women's entrepreneurship (Hechavarria, Bullough, Brush, & Edelman, 2019; Özsungur, 2019a; Özsungur, 2019b), female entrepreneurship (Minniti, 2010), virtual entrepreneurship (Klamma, Spaniol, & Renzel, 2006), social entrepreneurship (Huda et al., 2019; Mair, Robinson, & Hockerts, 2019; Rawhouser, Cummings, & Newbert, 2019; Saebi, Foss, & Linder, 2019), corporate entrepreneurship (Kreiser et al., 2019; Molina, & García-Morales, 2019), green entrepreneurship (Allen, & Malin, 2008) have been proposed in the literature. While all these types of entrepreneurship are based on the field of entrepreneurship, they do not focus on the reflection of the entrepreneur's inner world. The starting point and inspiration of these types of entrepreneurship are the fields in which individuals are influenced by innovative actions, transforming risks into opportunities. The entrepreneurship model where entrepreneur characteristics and legal commitment are reflected in entrepreneurship action is not available in the literature. On the other hand, there are no studies that model the effects of laws and rules on the types of entrepreneurship in the literature. The effects of the constraints imposed by local economies on the entrepreneurial model in the free space of globalization have not been investigated.

The differences in legal procedures between countries lead to differences in practice in commercial life (Kidder, 1974). Export incentives and restrictions, market-entry restrictions, production and distribution procedures, quotas, rules, and restrictions on after-sales services may restrict entrepreneurs' freedom of movement. Consequences of non-compliance with the rules/laws may hinder market entry, production, and access to future consumers. This is an important obstacle for entrepreneurship. While entrepreneurs are innovative individuals who transform risk into opportunities, it may not always be possible to turn risks into opportunities against laws. The entrepreneur may turn risks into opportunities within the framework of laws, by not entering into markets prohibited by law and/or by complying with laws. This way of action is to turn risk into an opportunity. Failure to comply with laws and rules is a risk, and taking entrepreneurial action on the condition of compliance with laws is to turn the risk of non-compliance into an opportunity. An entrepreneur facing a market entry barrier due to quotas in a country can turn risks into opportunities by exploring lawful and different innovative ways of entering the market. Entrepreneurs, on the other hand, can carry out the same innovative actions by entering the new market in another country permitted by law. In this case, the risk of non-compliance with the law is an opportunity for other lawful initiatives. The type of entrepreneurship realized in this way is "Legalistic Entrepreneurship". Although there are studies on legal entrepreneurship in the literature, these studies do not meet the concept of legalistic entrepreneurship (Kidder, 1974; Evans & Gabel, 2013; Rezaei, Goli, & Dana, 2014; Sobel, 2008; Aidis & Van Praag, 2007; Rajagopalan & Wagner, 2012; Whitman, 2002; Wiśniewski, 2012; Kwapisz, 2019). In this context, the aim of the study is to reveal and clarify the type of legalistic entrepreneurship that transforms compliance with the law behavior to an entrepreneurial

act. The starting point of the study is to answer the question of how the information and communication ease brought by the digital world can be turned into an opportunity against legal obstacles.

RESEARCH METHODOLOGY

This study was prepared by a systematic review method (Robinson & Lowe, 2015; Uman et al., 2008). Identification, review, analysis, summarization, discussion, and presentation processes were followed respectively. First of all, the research question (What is the consumption and entrepreneurship processes in the context of digital service innovation?) and its framework were determined. For this research, the concepts of legalistic entrepreneurship, legalism, legalistic entrepreneurs were reviewed in the literature. The literature review was carried out in Google Scholar, Emerald Insight, Science Direct, Taylor & Francis, Sage Publications databases.

The obtained information was categorized into subject headings and the identified framework was systematically organized (Uman, 2011). While constituting the titles, the framework and the obtained information were coded (Petticrew & Roberts, 2008). The concepts were chosen following the research topic. The chapter title was created by combining the new knowledge with the creative idea. During the creation of the chapter title, it was considered whether the representation of two concepts by one concept.

LEGALISTIC ENTREPRENEURSHIP

Legalism

Legalism is the principle of acting following the legal rules of a country or region and is a set of beliefs and behaviors that failure to comply with the rules may lead to negative consequences (Shklar, 1986). Legalism is to transform the behavior of the person who has adopted this pattern into a philosophy of life. An individual with a legalistic personality prioritizes compliance with the laws of the country or region where he/she lives. To behave according to the rules is more than a positive behavior pattern for a legalistic person. Complying with the rules is important with regard to the benefits and outcomes to be achieved.

Legalism may result in two types of behavior patterns. The first is to comply with the law, and the second is the misconception of complying with the law. As the individual acts in accordance with the law as a result of the targeted behavior, respect can be gained in the eye of the state or legal institutions. On the other hand, unlawful behavior may develop due to by considering that the laws are complied with. This behavior can be caused by a lack of information, misunderstanding, or misleading. When an individual acts unintentionally against the law, this can lead to a negative thought, anxiety. The reason for this is the thought that the dignity brought by legalism may be lost, the fear of punishment for unlawfulness, the thought of the possibility of acting against the rights of people.

Legalistic is a behavior of adhering excessively to law. Legalism, which means an excessive commitment to the law, implies a high level of commitment to the rules. The key components of legalism are, adoption, commitment, comply with rules, and sustainable adoption (Figure 1).

Figure 1. The key components of legalism

For legalism to emerge, laws need to be adopted and internalized. The individual should adopt the laws that s/he internalized and accepted as a way of living. Adoption of laws, the scarcity of the factors that bind the individual to life is influenced by psychological, social, economic comfort factors revealed by compliance with laws. The positive outcomes of complying with the law ensure that the individual is peaceful and happy. Laws are a guaranteed factor in achieving the goals of the individual. Compliance with the law constitutes the idea that the actions will gain legitimacy on a legal basis. This thought ensures the individual a sense of trust.

The protection of the rights of individuals by law creates an organic bond on a legal basis. As individuals follow the rules, they rely on the state that sets the rules and know that their rights will be protected. Thus, a link is formed between the individual and the laws. This bond can develop over time as commitment. The relationship between the individual and the law can reach the level of commitment, the individual's way of life, mission, and vision are connected with the harmonization of laws. Commitment to the law includes elements of commitment and respect.

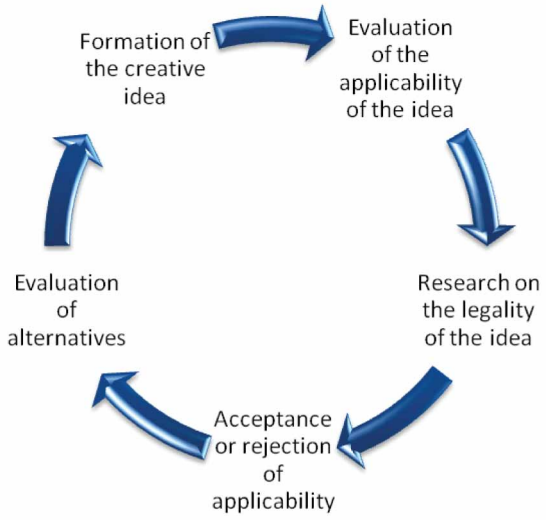
Following the adoption of loyalty behavior by the individual, the behavior of obeying the rules is displayed. This behavior is performed by the individual in his / her life continuously. The thought that compliance with the rules will provide positive output to the individual in terms of the results to be obtained leads to the development of a continuous behavior (Herrington, Kew, Kew, & Monitor, 2010). This behavior turns into a philosophy of life that goes beyond the rules. Complying with the law becomes a strict rule in all actions and transactions. Thus, the priority condition for the determined targets is the criterion of compliance with the law. When this situation, which has become a philosophy of life, is continuous and sustainable, a "legalistic" situation emerges. Sustainability requires the defense of laws in all spheres of life and the rejection of ideas and facts that are against the law. Thus, compliance with the law becomes continuous and sustainable.

Conceptual Framework

Entrepreneurship is the transformation of risks into opportunities through proactive behaviors, and the constitution of creativity through innovative actions (Browder, Aldrich, & Bradley, 2019; Donckels, & Miettinen, 2019; Drobyazko, 2019), and the sum of organizational management and skills of adaptation to innovations. Entrepreneurship is the process in which new ideas are created or differentiated existing ideas with an innovative approach (Galindo-Martín, & Méndez-Picazo, 2020). Opportunities and risks are explored in the entrepreneurship process and innovation is provided in process management (Lounsbury, Cornelissen, Granqvist, & Grodal, 2019).

Legalistic entrepreneurship is a type of entrepreneurship related to the commitment to the law. This concept, which was introduced to the literature for the first time, occurs as a result of internalizing the commitment of the entrepreneur to the law and making it a philosophy of life and adapting it to entrepreneurial action. Legalistic entrepreneurship is a type of entrepreneurship that provides a legal credibility image, based on the idea that adherence to the law is the focal point of entrepreneurial actions and that the transformation of risks into opportunities will be realized in compliance with the law. The idea of entrepreneurship as a result of innovative actions goes through a cognitive process (Mitra, 2019). After the idea is formed, the possible consequences of taking action are examined by the individual. Legalistic entrepreneurship, therefore, requires a certain process. This process is as follows: Formation of the creative idea-evaluation of the applicability of the idea-research on the legality of the idea-acceptance or rejection behavior-evaluation of the alternatives (Figure 2).

Figure 2. Legalistic entrepreneurship process



Formation of the Creative Idea

The idea of entrepreneurship emerges as a result of experiences, information obtained from researches, feedbacks, and intellectual actions. The resulting thoughts are evaluated from a cognitive perspective. The

creative idea can emerge for the first time, or it can emerge as the development of an existing thought. Whether the idea is creative or not is related to whether or not the idea has been put forward before. The development of a previously proposed idea is also an act of creativity.

In the digital world, it is a creative idea for virtual games to be the subject of social life characters and social phenomena. It is a creative idea to perform virtual shopping following personal characteristics and to allow the provision of virtual services. Providing home care services online and providing elderly care services with smartphone applications are entrepreneurial actions as creative ideas. Besides, Two-Dimensional (2D) Barcode applications and virtual money are crucial samples of entrepreneurship. These creative ideas are realized with proactive behaviors to meet the needs of the digital world on time.

Evaluation of the Applicability of the Idea

In this process, an assessment is made as to whether the thought is applicable in practice. During the evaluation, the most suitable areas that can find the application field of the idea of entrepreneurship are searched. Factors such as market, consumer mass, country, region, period, export status, and production are the research topics (Hellmann, & Thiele, 2019). When the applicability of the idea is decided, the implementation problems of these factors are checked. The entrepreneur should evaluate in advance in which countries the idea of digital shopping initiative will operate. The religious and cultural characteristics of the country of operation may not be appropriate for the implementation of the idea of entrepreneurship. Besides, the lack of infrastructure related to technology may be insufficient for the region where the idea will be applied. Besides, inadequate distribution channels, climate, lack of human resources, raw material supply problems are among the problems of implementation of the idea.

Research on the Legality of the Idea

After investigating the problems related to production and service provision, the laws that are valid in the region where the idea will be applied are investigated. Entrepreneur investigates formal procedures for production, marketing, service delivery, procurement, distribution, export, after-sales services, and start-up while turning his creative ideas into action (Ryff, 2019). This research provides information about problems that may arise with the application. Export and production quotas, state bans on production, heavy legal obligations in the customer-entrepreneur relationship, tax liabilities, legal barriers to virtual shopping, restricting access to social media accounts by the state may prevent the implementation of the idea of entrepreneurship (Kent, Sexton, & Vesper, 1982). The topics to be investigated by the entrepreneur are the applicable law rules applied by the state to the entrepreneur / business owner such as the enterprise, business or production center to be established during the implementation of the idea, the office or factory to be rented / purchased, the procurement of raw materials, distribution, taxes, workers' wages, and insurance. A detailed examination of these rules may affect entrepreneurship success and profitability.

Acceptance or Rejection of Applicability

The entrepreneur accepts or rejects the application of the idea after conducting the necessary research on legal procedures. This behavior does not prevent the idea from being implemented in different countries and regions. Acceptance or rejection behavior is communicated to the environment orally or in

writing by the entrepreneur. As a result of the information obtained after the necessary researches, the rejection of the applicability can be done by teamwork or individually. The idea of entrepreneurship can be included in a project. During the execution of a project, the decision should be explained to the individuals conducting the project (Lundmark, Krzeminska, & Shepherd, 2019).

Many immigration applications are made because the law does not allow or the tax obligations are heavy. These entrepreneurial migrations, called brain drain, also affect the economic development of countries. The fact that academicians, members of the press, and exporters do not receive adequate incentives and support are important obstacles in entrepreneurship for the country that emigrates.

Evaluation of Alternatives

When the legalistic entrepreneur identifies legal barriers to the implementation of the innovative idea, s/he abandons the implementation of the idea in that region and starts to look for different alternatives. Regions and countries that do not prevent the idea of entrepreneurship are investigated. When conducting this research, all previously investigated issues are re-conducted for the target country or region. This research can lead to labor, economic, and waste of time. For this reason, entrepreneurs can often afford to lose profits from the barriers of the law for market entry or future customers. However, the legalistic entrepreneur accepts this as a risk and prefers more time and material loss and achieves the right goals allowed by the law, rather than loss and waiting for future customers in the country's market where the law prevents it. According to legalistic entrepreneurship, the damages caused by legal barriers necessitate the evaluation of alternatives. Legal alternatives are therefore an opportunity. Illegal alternatives are risks that can cause financial weakness of the enterprise in the long term and will not turn into opportunities.

CONTRIBUTION OF LEGALISTIC ENTREPRENEURSHIP

Reliability/Trustworthiness

Reliability is the golden rule in legalistic entrepreneurship. The entrepreneur should feel safe when applying his / her creative ideas and know that his / her lawful behaviors will provide positive outputs (Hamilton, Papageorge, & Pande, 2019). Complying with the laws ensures an image that the entrepreneur is a trusted individual who obeys the rules. The business/ firm established by an entrepreneur who complies with the law is perceived as reliable by the stakeholders. This perception is important for financial institutions, customers, employees, and all stakeholders. The sustainability of the organization resulting from the idea of entrepreneurship is possible through the adoption of innovative ideas by employees and the development of new ideas by providing feedback by customers because of their belief that the entrepreneur is reliable (Martin-Rojas, Garcia-Morales, & Gonzalez-Alvarez, 2019). Reliability/ trustworthiness is important for making these contributions.

Public Relations and Legality Image

Public relations relate to the legality of the behavior of a private law person/entity. The enactment of laws by the state requires the application of rules that individuals and companies must comply with. The rules are applied for the protection of social order and the prevention of conflicts. The innovations brought

by the digital world enable individuals and companies to interact without physically meet them. Virtual interaction has made commercial life a fast and profitable area. Creative ideas can be realized in the virtual environment and the target audience can be created through social media. The virtual customer mass has become the target audience in which entrepreneurial ideas are realized regardless of country or region. Thanks to this rapid communication and interaction, obstacles of the laws of the country where the target customer is located can be experienced. This leads to significant problems in access and procurement to customers living in countries that apply the legal barrier to the idea of entrepreneurship.

The legalistic entrepreneur acquires a legal and reliable image by identifying these barriers in advance and acting in accordance with the laws to which the target group is subject. This gain is important for future customers. The image of legality also strengthens the entrepreneur's communication with the government and government agencies in the target market. An entrepreneur who respects the law and obeys the rules improves her/his relationship with the state/government. In this way, a publicly reliable/trustable profile regarding procedural transactions is achieved. Relations with the public sector may provide many benefits such as export incentives, ease of legal procedures, rapid public transactions, ease of obtaining permits, and tolerance in tax auditing.

The Paradox of Legalism

When a conflict arises between the laws of the country or region where the idea will be applied in legalistic entrepreneurship, the problem of applying the idea of entrepreneurship is called the paradox of legalism. This paradox can be experienced in the digital or cognitive world.

The Paradox of Legalism of the Digital World

The digital world provides applications that bring together businesses, consumers, manufacturers, service providers, states, organizations, and provide a fast and mutual interaction (Martin-Rojas, Garcia-Morales, & Gonzalez-Alvarez, 2019). Through the Internet, many transactions are carried out in a digital environment, and time is saved. E-mail, virtual shopping, virtual meetings, virtual applications, video conferences, virtual service, virtual order, unlimited transactions are among the innovations of the digital world. Time, economic and labor losses in commercial life have been eliminated thanks to digital innovations. However, this free environment may face legal obstacles.

Each country has different policies on internet access and virtual applications. Access to some social media or web pages may be blocked due to the legal practices of countries. The potential risk of a cyberattack, spam, prevention of disclosure of state secrets, prevention of theft of trade secrets, and prevention of religious and social protection can be enforced by law. Web pages that contradict national interests may be prohibited by the state to users within the country. These applications can prevent relationships such as entrepreneur-consumer, producer-consumer, exporter-supplier trying to meet in the free environment of the digital world. Thus, the environment of freedom can face the paradox of legalism.

The legalistic entrepreneur acts in the face of this paradox with the belief that acting in accordance with the law will bring potential benefits in the future. The time spent on the elimination of possible damages represents the expected benefit when it is spent on future customers on the legal ground. If there is an obligation to pay compensation in the laws of the state concerned for the elimination of damages, opening lawsuits and seeking rights are among the principles of legalistic entrepreneurship.

The Paradox of Legalism in Cognitive Context

The Paradox of Legalism emerges as a result of the conflict between the National and International Rules. An important paradox arises if the application of an entrepreneurial idea that complies with the national laws of the entrepreneur is not legal for another country. As a result of this paradox, if the entrepreneur cannot implement his creative idea in his own country and the laws of another country do not legally allow this idea to be implemented, then different countries and alternative ways are sought. If there is a situation in which the law does not allow the entrepreneur's own country or in any other country, then the idea of entrepreneurship is not applied.

In the cognitive context, the paradox of legalism is the conflict that arises about emotion, thought, and ideals under the influence of national, cultural, religious, and personal factors (Audretsch, Lehmann, & Seitz, 2019). When this conflict arises during the transformation of innovative ideas into action, the individual experiences a contradiction about whether or not the idea is put forward. The entrepreneur is obliged to choose between national and cultural factors and religious factors. As a result of this choice, the idea that it will be beneficial to comply with the law regardless of the circumstances, it causes the individual to ignore factors outside the law.

Characteristics of Legalistic Entrepreneur

Characteristics of legalistic entrepreneurs involve positive/active and negative/passive character features. Whether these features are positive or negative is due to the character's behavior pattern. Positive behaviors emerge when an individual makes it a life philosophy to obey the rules. On the other hand, the negative behavior pattern is based on the results of the illegal actions. Passive actions are preferred to avoid harmful situations caused by a violation of the rules (Table 1).

Table 1. Characteristics of legalistic entrepreneur

Positive/Active	Basic Source	Negative/Passive	Basic Source
Proactive	Laws	Anxiety	Ethical principles and laws
Creative	Laws	Fearful	Ethical principles and laws
Risk-taking	Laws		
Open to innovation	Laws		
Flexible	Laws		

The entrepreneur has the characteristics as proactive, creative, risk-taking, open to innovation, flexible (von Bloh, Broekel, Özgun, & Sternberg, 2019; Schenkel, Farmer, & Maslyn, 2019; Nambisan, Wright, & Feldman, 2019). Legalistic entrepreneurs have anxiety and fearful personality traits that depend on ethical principles and laws. In this type of entrepreneurship, the entrepreneur complies with the ethical rules on which the law is based. The entrepreneur believes that the consequences of non-compliance with the law can lead to entrepreneurial action, acquisition of potential customers, damage to the business, and employees. Besides, the entrepreneur is concerned about the possibility of violating the law as well as being rigorous in obeying the law and is afraid of the consequences of non-compliance. Fear

and anxiety are related to the limitations that may be imposed on the realization of entrepreneurial action, possible losses, customer losses, barriers to entry, financial losses, and inability to benefit from incentives. Besides, the entrepreneur is concerned about the possibility of violating the law and is afraid of the consequences of non-compliance with the law.

Commitment to Law

Commitment is the state of being dedicated (Lexico, 2019). The entrepreneur demonstrates the behavior of complying with the laws via commitment behavior. Commitment to the law is the first factor in the entrepreneur's decision to implement creative ideas. In legalistic entrepreneurship, the behavior of complying with rules is internalized and turned into an individual trait. Thus, entrepreneurial personality traits and entrepreneurial behavior are associated with legal elements. The creative idea, which is evaluated in the context of legal regulations at the cognitive stage during the emergence of the idea, is reshaped as a result of this comparison. Thus, a new innovative idea is created by evaluating the previously created idea with legal regulations. The renewed new idea resulting from the evaluation of legal elements is the result of "commitment".

Commitment to Ethical Principles

Ethics is the set of beliefs and ideals that guide the behavior of individuals and that are based on moral rules. Legalistic is the sum of rules of conduct constitute forth by the rules of ethical law in entrepreneurship. If the legislator does not foresee the application of a rule, customary law is applied. Customary law guides practitioners in the application of legal rules. For this reason, the ethical rules within the framework of some behavioral patterns accepted by the legal regulations are in the foreground for the entrepreneur. Religious, cultural, and social rules except these rules are not considered as the basis by the entrepreneur within the scope of ethical rules. Some ethical rules to be observed for national security reasons, not to attempt an illegal means to avoid financial damage to the country, no initiatives to reduce the value of the national currency in the international market are the samples of commitment to ethical principles (Baier-Fuentes, 2019).

Anxiety

Anxiety is the nervousness, worry, or unease of feelings on the individual about the consequences of an event. These feelings arise as a result of worrying and uncertain situations that arise in the implementation of the idea of the entrepreneur and compliance with the law. Anxiety may arise with the change of laws during the implementation of an entrepreneurial idea following the law, introducing legal restrictions in different countries, the possibility of an unlawful issue being missed during implementation. According to the legalistic entrepreneur, proactive behavior is an act of providing foreseeable problems to act following the law. Furthermore, the risk of non-compliance does not bring benefits in the context of entrepreneurship. Therefore, there is a high probability of experiencing anxiety in legalistic entrepreneurs.

Fear and Panic

Fear that failure to comply with the rules may result in the disadvantage of the entrepreneurship can significantly affect entrepreneurial behavior. Achieving success in entrepreneurship is related to the success of putting creative ideas into action. However, the implementation of the idea against the law despite legal obstacles is not a success, but a failure. Because the consequences of this situation are severe and require punishment. The entrepreneur may be subject to tax and criminal sanctions for these violations. In legalistic entrepreneurship, the desired result is behavior in accordance with legal elements. Therefore, the possibility of unlawful consequences creates fear and panic in the individual.

CONCLUSION AND RECOMMENDATIONS

Today, entrepreneurship is developed with an approach that is positively explained, focused on its outcomes, and ignores legal barriers. Although the free trade environment of the digital world brings convenience in many areas, trade policies and legal barriers of countries hinder entrepreneurs' mobility and entrepreneurial ideas. In the literature, many features such as flexibility, open-minded, influential, focused, willful, self-reflective, modest, charismatic, empathetic, proactive are attributed to entrepreneurship (Rehan, Block, & Fisch, 2019; Sexton, & Bowman-Upton, 1991; Shepherd, Wennberg, Suddaby, & Wiklund, 2019; Wiklund, 2019; Alsos, et al., 2019). None of these features include a commitment to ethical principles and laws (Anderson, Wennberg, & McMullen, 2019; Audretsch, Belitski, & Desai, 2019; Brush, Edelman, Manolova, & Welter, 2019; Chowdhury, Audretsch, & Belitski, 2019; Content, Frenken, & Jordaan, 2019; Estrin, Mickiewicz, Stephan, & Wright, 2019; Farias, Fernandez, Hjorth, & Holt, 2019; Fotopoulos, & Storey, 2019; He, Lu, & Qian, 2019; Sutter, Bruton, & Chen, 2019; Wiklund, Wright, & Zahra, 2019). For this reason, legalistic entrepreneurship brings a different flow to entrepreneurship and gives the idea that the entrepreneur has both emotions and has to follow the rules by living in society. In addition, the types of entrepreneurship in the literature, such as academic entrepreneurship, intrapreneurship, women's entrepreneurship, female entrepreneurship, virtual entrepreneurship, social entrepreneurship, corporate entrepreneurship, environmental entrepreneurship focus on the field of application of entrepreneurship (Gianiodis, Meek, & Chen, 2019; Hisrich, 1990; Hechavarria, Bullough, Brush, & Edelman, 2019; Minniti, 2010; Klamma, Spaniol, & Renzel, 2006; Özsungur, 2019c; Huda et al., 2019; Mair, Robinson, & Hockerts, 2019; Rawhouser, Cummings, & Newbert, 2019; Saebi, Foss, & Linder, 2019; Kreiser et al., 2019; Molina, & García-Morales, 2019; Allen, & Malin, 2008). However, legalistic entrepreneurship explains the application field of entrepreneurship as unlimited, including the digital field. Entrepreneurship is shaped to the extent that the individual characteristics of the entrepreneur are associated with creativity activities (Venkataraman, 2019). The entrepreneur's connection with the external environment, beliefs, and philosophy of life affects entrepreneurial behavior.

According to the results of this study, "legalistic entrepreneurship" is added to the literature as one of the types of entrepreneurship for the first time. The entrepreneurial model that emerges as a result of shaping entrepreneurial behaviors is the creative output of the individual. The process of legalistic entrepreneurship consists of the formation of the creative idea, evaluation of the applicability of the idea, research on the legality of the idea, acceptance or rejection of applicability, evaluation of alternatives. The main contributions of legalistic entrepreneurship are reliability/trustworthiness, public relations, and the image of legality.

In the digital and cognitive world, some conflicts may arise regarding the implementation of laws and the application of the idea of entrepreneurship. To minimize these conflicts, it is recommended that entrepreneurs conduct the necessary research in advance on the legal elements and act in accordance with the predetermined goals and objectives for the implementation of the idea. Strategies to be developed in this direction will increase the applicability of creative ideas. Besides, it is important to investigate the legal barriers in advance and to draw the path according to the results. In order to support e-commerce and entrepreneurial actions in the virtual environment, an international organization should be formed and the legal arrangements of the states should be harmonized with the decisions to be taken in this organization. Entrepreneurial actions of the creative stakeholders of the digital world will be possible through the policy development of the states by considering the legalistic entrepreneurship.

REFERENCES

Aidis, R., & Van Praag, M. (2007). Illegal entrepreneurship experience: Does it make a difference for business performance and motivation? *Journal of Business Venturing*, *22*(2), 283–310. doi:10.1016/j.jbusvent.2006.02.002

Allen, J. C., & Malin, S. (2008). Green entrepreneurship: A method for managing natural resources? *Society & Natural Resources*, *21*(9), 828–844. doi:10.1080/08941920701612917

Alsos, G. A., Clausen, T. H., Mauer, R., Read, S., & Sarasvathy, S. D. (2019). Effectual exchange: From entrepreneurship to the disciplines and beyond. *Small Business Economics*, 1–15. doi:10.100711187-019-00146-9

Anderson, B. S., Wennberg, K., & McMullen, J. S. (2019). Enhancing quantitative theory-testing entrepreneurship research. *Journal of Business Venturing*, *34*(5), 105928. doi:10.1016/j.jbusvent.2019.02.001

Audretsch, D. B., Belitski, M., & Desai, S. (2019). National business regulations and city entrepreneurship in Europe: A multilevel nested analysis. *Entrepreneurship Theory and Practice*, *43*(6), 1148–1165. doi:10.1177/1042258718774916

Audretsch, D. B., Lehmann, E. E., & Seitz, N. (2019). Amenities, subcultures, and entrepreneurship. *Small Business Economics*, 1–21.

Baier-Fuentes, H., Merigó, J. M., Amorós, J. E., & Gaviria-Marín, M. (2019). International entrepreneurship: A bibliometric overview. *The International Entrepreneurship and Management Journal*, *15*(2), 385–429. doi:10.100711365-017-0487-y

Bessant, J., & Tidd, J. (2007). *Innovation and entrepreneurship*. John Wiley & Sons.

Browder, R. E., Aldrich, H. E., & Bradley, S. W. (2019). The emergence of the maker movement: Implications for entrepreneurship research. *Journal of Business Venturing*, *34*(3), 459–476. doi:10.1016/j.jbusvent.2019.01.005

Brush, C., Edelman, L. F., Manolova, T., & Welter, F. (2019). A gendered look at entrepreneurship ecosystems. *Small Business Economics*, *53*(2), 393–408. doi:10.100711187-018-9992-9

Chowdhury, F., Audretsch, D. B., & Belitski, M. (2019). Institutions and entrepreneurship quality. *Entrepreneurship Theory and Practice*, *43*(1), 51–81. doi:10.1177/1042258718780431

Content, J., Frenken, K., & Jordaan, J. A. (2019). Does related variety foster regional entrepreneurship? Evidence from European regions. *Regional Studies*, 1–13. doi:10.1080/00343404.2019.1680827

Donckels, R., & Miettinen, A. (2019). *Entrepreneurship and SME research: on its way to the next millennium*. Routledge. doi:10.4324/9780429422720

Drobyazko, S., Hryhoruk, I., Pavlova, H., Volchanska, L., & Sergiychuk, S. (2019). Entrepreneurship innovation model for telecommunications enterprises. *Journal of Entrepreneurship Education*.

Estrin, S., Mickiewicz, T., Stephan, U., & Wright, M. (2019). Entrepreneurship in Emerging Markets. In *The Oxford Handbook of Management in Emerging Markets* (p. 457). Oxford University Press.

Evans, J. W., & Gabel, A. L. (2013). Legal competitive advantage and legal entrepreneurship: A preliminary international framework. *NCJ Int'l L. & Com. Reg.*, *39*, 333.

Farias, C., Fernandez, P., Hjorth, D., & Holt, R. (2019). *Organizational entrepreneurship, politics and the political*. Academic Press.

Fotopoulos, G., & Storey, D. J. (2019). Public policies to enhance regional entrepreneurship: Another programme failing to deliver? *Small Business Economics*, *53*(1), 189–209. doi:10.100711187-018-0021-9

Galindo-Martín, M. A., & Méndez-Picazo, M. T. (2020). Value Creation, Innovation, and Entrepreneurship: Feedback Effects. In Analyzing the Relationship Between Innovation, Value Creation, and Entrepreneurship (pp. 1-20). IGI Global.

Gianiodis, P. T., Meek, W. R., & Chen, W. (2019). Political climate and academic entrepreneurship: The case of strange bedfellows? *Journal of Business Venturing Insights*, *12*, e00135. doi:10.1016/j.jbvi.2019.e00135

Hamilton, B. H., Papageorge, N. W., & Pande, N. (2019). The right stuff? Personality and entrepreneurship. *Quantitative Economics*, *10*(2), 643–691. doi:10.3982/QE748

He, C., Lu, J., & Qian, H. (2019). Entrepreneurship in China. *Small Business Economics*, *52*(3), 563–572. doi:10.100711187-017-9972-5

Hechavarria, D., Bullough, A., Brush, C., & Edelman, L. (2019). High-Growth Women's Entrepreneurship: Fueling Social and Economic Development. *Journal of Small Business Management*, *57*(1), 5–13. doi:10.1111/jsbm.12503

Hellmann, T., & Thiele, V. (2019). Fostering Entrepreneurship: Promoting Founding or Funding? *Management Science*, *65*(6), 2502–2521. doi:10.1287/mnsc.2018.3074

Herrington, M., Kew, J., Kew, P., & Monitor, G. E. (2010). *Tracking entrepreneurship in South Africa: A GEM perspective*. Graduate School of Business, University of Cape Town.

Hisrich, R. D. (1990). Entrepreneurship/intrapreneurship. *The American Psychologist*, *45*(2), 209–222. doi:10.1037/0003-066X.45.2.209

Huda, M., Qodriah, S. L., Rismayadi, B., Hananto, A., Kardiyati, E. N., Ruskam, A., & Nasir, B. M. (2019). Towards Cooperative with Competitive Alliance: Insights into Performance Value in Social Entrepreneurship. In Creating Business Value and Competitive Advantage with Social Entrepreneurship (pp. 294-317). IGI Global.

Kent, C. A., Sexton, D. L., & Vesper, K. H. (1982). *Encyclopedia of entrepreneurship*. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.

Kidder, R. L. (1974). Formal litigation and professional insecurity: Legal entrepreneurship in South India. *Law & Society Review*, *9*(1), 11. doi:10.2307/3053020

Klamma, R., Spaniol, M., & Renzel, D. (2006). Virtual entrepreneurship Lab 2.0: Sharing entrepreneurial knowledge by non-linear story-telling. *Journal of Universal Knowledge Management*, *1*(3), 174–198.

Kreiser, P. M., Kuratko, D. F., Covin, J. G., Ireland, R. D., & Hornsby, J. S. (2019). Corporate entrepreneurship strategy: Extending our knowledge boundaries through configuration theory. *Small Business Economics*, 1–20. doi:10.100711187-019-00198-x

Kwapisz, A. (2019). Do government and legal barriers impede entrepreneurship in the US? An exploratory study of perceived vs. actual barriers. *Journal of Business Venturing Insights*, *11*(e00114), 1–12. doi:10.1016/j.jbvi.2019.e00114

Lexico. (2019). https://www.lexico.com/en/definition/commitment

Lounsbury, M., Cornelissen, J., Granqvist, N., & Grodal, S. (2019). Culture, innovation and entrepreneurship. *Innovation*, *21*(1), 1–12. doi:10.1080/14479338.2018.1537716

Lundmark, E., Krzeminska, A., & Shepherd, D. A. (2019). Images of entrepreneurship: Exploring root metaphors and expanding upon them. *Entrepreneurship Theory and Practice*, *43*(1), 138–170. doi:10.1177/1042258717734369

Mair, J., Robinson, J., & Hockerts, K. (Eds.). (2006). *Social entrepreneurship*. Palgrave Macmillan. doi:10.1057/9780230625655

Martin-Rojas, R., Garcia-Morales, V. J., & Gonzalez-Alvarez, N. (2019). Technological antecedents of entrepreneurship and its consequences for organizational performance. *Technological Forecasting and Social Change*, *147*, 22–35. doi:10.1016/j.techfore.2019.06.018

Martin-Rojas, R., Garcia-Morales, V. J., & Gonzalez-Alvarez, N. (2019). Technological antecedents of entrepreneurship and its consequences for organizational performance. *Technological Forecasting and Social Change*, *147*, 22–35. doi:10.1016/j.techfore.2019.06.018

Minniti, M. (2010). Female entrepreneurship and economic activity. *European Journal of Development Research*, *22*(3), 294–312. doi:10.1057/ejdr.2010.18

Mitra, J. (2019). *Entrepreneurship, innovation and regional development: an introduction*. Routledge. doi:10.4324/9781315543130

Molina, L. M., & García-Morales, V. J. (2019). Combined Influence of Absorptive Capacity and Corporate Entrepreneurship on Performance. *Sustainability*, *11*(11), 1–26.

Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy*, *48*(8), 103773. doi:10.1016/j.respol.2019.03.018

Özsungur, F. (2019a). *The effects of technology acceptance and use behaviour on women's entrepreneurship motivation factors*. Asia Pacific Journal of Innovation and Entrepreneurship.

Özsungur, F. (2019b). A research on women's entrepreneurship motivation: Sample of Adana Province. *Women's Studies International Forum*, *74*, 114–126. doi:10.1016/j.wsif.2019.03.006

Özsungur, F. (2019c). Ethical leadership, intrapreneurship, service innovation performance and work engagement in chambers of commerce and industry. *Journal of Human Behavior in the Social Environment*, *29*(8), 1–23. doi:10.1080/10911359.2019.1664359

Petticrew, M., & Roberts, H. (2008). *Systematic reviews in the social sciences: A practical guide*. John Wiley & Sons.

Rajagopalan, S., & Wagner, R. E. (2012). Legal entrepreneurship within a system of entangled political economy. *American Journal of Entrepreneurship*, *6*(1), 26–39.

Rawhouser, H., Cummings, M., & Newbert, S. L. (2019). Social impact measurement: Current approaches and future directions for social entrepreneurship research. *Entrepreneurship Theory and Practice*, *43*(1), 82–115. doi:10.1177/1042258717727718

Rehan, F., Block, J. H., & Fisch, C. (2019). Entrepreneurship in Islamic communities: How do Islamic values and Islamic practices influence entrepreneurship intentions? *Journal of Enterprising Communities: People and Places in the Global Economy*, *13*(5), 557–583. doi:10.1108/JEC-05-2019-0041

Rezaei, S., Goli, M., & Dana, L. P. (2014). Beyond legal entrepreneurship: The case of Austria. *International Journal of Entrepreneurship and Small Business*, *21*(2), 202–215. doi:10.1504/IJESB.2014.059473

Robinson, P., & Lowe, J. (2015). Literature reviews vs systematic reviews. *Australian and New Zealand Journal of Public Health*, *39*(2), 103–103. doi:10.1111/1753-6405.12393 PMID:25827181

Ryff, C. D. (2019). Entrepreneurship and eudaimonic well-being: Five venues for new science. *Journal of Business Venturing*, *34*(4), 646–663. doi:10.1016/j.jbusvent.2018.09.003 PMID:31105380

Saebi, T., Foss, N. J., & Linder, S. (2019). Social entrepreneurship research: Past achievements and future promises. *Journal of Management*, *45*(1), 70–95. doi:10.1177/0149206318793196

Schenkel, M. T., Farmer, S., & Maslyn, J. M. (2019). Process improvement in SMEs: The impact of harmonious passion for entrepreneurship, employee creative self-efficacy, and time spent innovating. *Journal of Small Business Strategy*, *29*(1), 64–77.

Sexton, D. L., & Bowman-Upton, N. B. (1991). *Entrepreneurship: Creativity and growth*. Macmillan.

Shepherd, D. A., Wennberg, K., Suddaby, R., & Wiklund, J. (2019). What are we explaining? A review and agenda on initiating, engaging, performing, and contextualizing entrepreneurship. *Journal of Management*, *45*(1), 159–196. doi:10.1177/0149206318799443

Shklar, J. N. (1986). *Legalism: Law, morals, and political trials*. Harvard University Press.

Sobel, R. S. (2008). Testing Baumol: Institutional quality and the productivity of entrepreneurship. *Journal of Business Venturing*, *23*(6), 641–655. doi:10.1016/j.jbusvent.2008.01.004

Sutter, C., Bruton, G. D., & Chen, J. (2019). Entrepreneurship as a solution to extreme poverty: A review and future research directions. *Journal of Business Venturing*, *34*(1), 197–214. doi:10.1016/j.jbusvent.2018.06.003

Uman, L. S., Chambers, C. T., McGrath, P. J., & Kisely, S. (2008). A systematic review of randomized controlled trials examining psychological interventions for needle-related procedural pain and distress in children and adolescents: An abbreviated Cochrane review. *Journal of Pediatric Psychology*, *33*(8), 842–854. doi:10.1093/jpepsy/jsn031 PMID:18387963

Venkataraman, S. (2019). The distinctive domain of entrepreneurship research. In *Seminal Ideas for the Next Twenty-Five Years of Advances* (pp. 5–20). Emerald Publishing Limited. doi:10.1108/S1074-754020190000021009

von Bloh, J., Broekel, T., Özgun, B., & Sternberg, R. (2019). New (s) data for entrepreneurship research? An innovative approach to use big data on media coverage. *Small Business Economics*, 1–22. doi:10.100711187-019-00209-x

Whitman, D. G. (2002). Legal entrepreneurship and institutional change. *Journal des Economistes et des Etudes Humaines*, *12*(2), 1–13. doi:10.2202/1145-6396.1061

Wiklund, J., Nikolaev, B., Shir, N., Foo, M. D., & Bradley, S. (2019). *Entrepreneurship and well-being: Past, present, and future*. Academic Press.

Wiklund, J., Wright, M., & Zahra, S. A. (2019). *Conquering relevance: Entrepreneurship research's grand challenge*. Academic Press.

Wiśniewski, J. B. (2012). On regime uncertainty and legal entrepreneurship. *The Independent Review, 17*(2), 253-256.

ADDITIONAL READING

Bygrave, W. D., & Hofer, C. W. (1992). Theorizing about entrepreneurship. *Entrepreneurship Theory and Practice*, *16*(2), 13–22. doi:10.1177/104225879201600203

Dollinger, M. (2008). *Entrepreneurship*. Marsh Publications.

Drucker, P. (2014). *Innovation and entrepreneurship*. Routledge. doi:10.4324/9781315747453

Evans, J. W., & Gabel, A. L. (2013). Legal competitive advantage and legal entrepreneurship: A preliminary international framework. *NCJ Int'l L. & Com. Reg.*, *39*, 333.

Hodgetts, R. M., & Kuratko, D. F. (2001). *Entrepreneurship: A contemporary approach*. South-Western/Thomson Learning.

Kidder, R. L. (1974). Formal litigation and professional insecurity: Legal entrepreneurship in South India. *Law & Society Review*, *9*(1), 11. doi:10.2307/3053020

Kirzner, I. M. (2015). *Competition and entrepreneurship*. University of Chicago press.

Özsungur, F. (2019). *The impact of ethical leadership on service innovation behavior*. Asia Pacific Journal of Innovation and Entrepreneurship. doi:10.1108/APJIE-12-2018-0073

Rezaei, S., Goli, M., & Dana, L. P. (2014). Beyond legal entrepreneurship: The case of Austria. *International Journal of Entrepreneurship and Small Business*, *21*(2), 202–215. doi:10.1504/IJESB.2014.059473

Ronstadt, R., & Robert, R. (1984). *Entrepreneurship: Text, cases and notes*. Lord Pub.

Shapero, A., & Sokol, L. (1982). The social dimensions of entrepreneurship. Encyclopedia of entrepreneurship, 72-90.

KEY TERMS AND DEFINITIONS

Entrepreneurship: The production of new products/providing new services, forming new service/product processes, researching, and entering new markets, ensuring organizational sustainability, creating new strategies and organizational forms, efficient use of resources.

Legalism: The principle of acting following the legal rules of a country or region and is a set of beliefs and behaviors that failure to comply with the rules may lead to negative consequences.

Legalistic Entrepreneur: An entrepreneur who realizes or shapes his/her entrepreneurial behavior considering the laws.

Legalistic Entrepreneurship: A result of internalizing the commitment of the entrepreneur to the law and making it a philosophy of life and adapting it to entrepreneurial action.

The Paradox of Legalism: A conflict arising between the laws of the country or region where the idea will be applied in legalistic entrepreneurship, the problem of applying the idea of entrepreneurship.

Section 2

An Innovative and Sustainable Perspective About ICTs and Technology

Chapter 9
Concept of Approach to Optimize ICT Management Practices: State of the Art

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ABSTRACT

The rapid evolution of information and communication technologies (ICT) has led to changes in business processes, namely in public services or in local administration. Currently, customer expectations are focused on an incremental modernization that may imply greater mobility, cost reduction, and response times. This chapter describes a multidisciplinary and integrative approach considering the specificity of the Portuguese local administration. The proposed approach assumes of continuous improvement within the scope of integrated and sustained governance, which is based on the alignment of ICT with business. Thus, it is recommended that the contributions of the approach are the optimization of practices established in the domains of sustainability, human capital, increased productivity, optimization of information security practices, and improvement of environmental quality, promoting alignment with Green IT.

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INTRODUCTION

In Local Administration (LA), some processes are framed by the applicable legal structure and the degrees of change allowed are few. Moreover, in public services in general and in local administration, budgetary considerations and permitted forms of resource acquisition limit change. Organizations feel the need to expand, improve their services and reduce response times to citizens, who are their customers. Addressing this need for improving the infrastructure of Information and Communication Technologies (ICT) is limited by investment capacity, which is conditioned by recession or low economic growth.

As a rule, these organizations are still confronted with the paradigm of large costs. When organizations intend to be on the forefront of innovation, following technological innovations, the costs are high because recent technology is expensive; on the other hand, if they fall lag behind the costs of technological recovery to maintain competitiveness with similar organizations, or with municipalities eventually better positioned technologically and with relevant services, are equally large.

The optimization approach must be sustained in the alignment of ICT with the business, aligning processes and quality of service with the organization's strategies, in an integrated and sustained governance process. Thus, a continuous process of optimization of practices is necessary to increase productivity, the release of human resources for other tasks of added-value, increased information security and the improvement of environmental quality, without this resulting in increased costs.

In a previous study, an assessment of the adoption (Landum, 2012) of cloud computing in the context of public and local administration to foster quality of service subject to low capital expenditures (CAPEX) and operating expenses (OPEX) was conducted. Among the factors considered in the study, focus on quality of service, compliance with legal guidelines, and Green IT appeared as drives to policy making and IT governance. Following that study, change ensued and led to a continuous process of optimization of ICT management practices. This chapter describes the approach taken in this continued process.

Following this introduction, relevant topics of a systematic review of the literature concerning ICT management are presented in section 2. The approach taken in optimizing the infrastructure and systems is described in section 3 and its application in the context of a public and local administration is discussed in section 4. In section 5, conclusions and final remarks will be drawn, identifying future work and highlighting best practices to further the alignment with Green IT.

ICT MANAGEMENT

Technology, pace of life and climate change in our present time change at previously unimaginable speeds.

In this way, it is necessary that ICT can provide powerful tools that help in each organization's strategies, by not degrading environmental sustainability, in alignment with Green IT, but that can simultaneously bring advantages that help improve and strengthen each organization.

The review of the literature presented here is supported by references and papers cited, whose research was based on key words according to the theme to be addressed, and based simultaneously on articles on the subject, which allow us to jointly treat the sustainability analysis.

Green IT

The definitions of Green Information Technology and Green Information Systems vary and have evolved through time. Interesting readings on the subject of Green IT can be found in (Liu, Wang, & Li, 2019) and (Raisinghani & Idemudia, 2019). In the scope of the work presented here, some ideas are noted.

In a systematic review of the literature (Asadi, Yadegaridehkordi, Nilashi, & Samad, 2019) where a total of 135 primary studies are reported to have been analyzed the temporal view of publications presented shows a declining number of conference articles in this subject and, interestingly enough, a rising number of journal publications. This suggests that the field has reached a level of maturity that enables deeper and more extensive approaches.

In (Boudreau, Chen, & Huber, 2008) one finds that the distinction of Green IT being mainly focused on energy efficiency and equipment utilization where Green IS referring to the design and implementation of information systems that contribute to sustainable business processes. A similar position is taken by (Carberry, Bharati, Levy, & Chaudhury, 2019) that consider that green information systems are information systems employed to transform organizations and society into more sustainable entities.

This distinction disappears in (Bose & Luo, 2011) in a study that proposes an integrative theoretical framework to assess the potential for change. With the understanding that Green IT is centered on three pillars, namely energy efficiency of IT, the eco-compatible management of the lifecycle of IT and IT as an enabler of green governance, these authors do not actually make the distinction between Green IT and Green IS. The required changes singled out for enabling a shift toward a Green IT were categorized as technology and behavioral, the latter including issues normally associated with Green IS.

Considering that achieving the highest return on IT assets is a balancing act (Bose & Luo, 2011), those authors identify as the primary forces that steer Green IT are cost reductions and compliance with laws and regulations. This view is shared by (Raisinghani & Idemudia, 2019) that consider that cost cutting is the largest factor of implementing Green IS practices.

Even allowing for the relevance of costs, (Boudreau, Chen, & Huber, 2008) did note that many companies embrace Green IS because "it is the right thing to do". The authors of the present work find that this ethical notion extended to that of environmental corporate social responsibility defined as "ecologically friendly actions and activities that may go beyond those required by law and the narrow financial interests of the firm" (Herath, Herath, & Dunn, 2019). In public local administration, responsibility in social and environmental issues is also present and is a key factor in policy decisions.

Green IT will be instrumental in drawing the approach, but also allows to contribute to the improvement of the carbon footprint, improvement of the environment, reduction of the number of products for recycling and cost reduction. With increasing energy costs there is (Bose & Luo, 2011) growing demand for solutions that reduce the need for energy in the IT area and drive a more efficient use of existing resources for organizations, notably in Public Administration (PA) and LA. Other authors (Guo, et al., 2020) corroborate this view, stressing that Green IT plays a key role in pursuing the global development goals.

The set of good practices that make up Green IT emanate from the concern of a global movement of organizations and individuals who want to preserve the environment by promoting socio-environmental responsibility. This movement focuses its ideals on "preserving the environment, the search for the reduction of environmental impacts based on sustainable practices and, in this particular case, interconnected with ICT" (Landum, 2012).

The finding that natural resources are not inexhaustible and that economic growth cannot be continued without considering the variable environment and society, opens ground to the search for new alterna-

tive solutions for the productive system, such as the concept of Sustainable Development, which aims to maintain the balance between economic growth, social equity and the natural (Coral, 2002) environment.

It should be noted that the relevance attributed by (Centobelli, Cerchione, & Esposito, 2020) to the fact that UN member states, in the work of agenda 2030 for Sustainable Development, have set out to provide a list of sustainable development targets so that a more sustainable future can be achieved, while also considering that the emission of greenhouse gases and CO_2 are now at the highest levels in history.

It is recalled that ICT encompasses the negativist impact on the environment not only by the amount of electricity consumed but also by the materials used in the design of their hardware, as exemplified in (Velte, Velte, & Elsenpeter, 2008), such as lead in the cathode ray tube and solder, arsenic in older cathode ray tubes, antimony trioxide used as flame retardant, polybrominated flame retardants in plastic casings, cables and circuit boards, selenium used as a power supply rectifier in circuit boards, cadmium in circuit boards and semiconductors, chromium used as corrosion protection in steel, cobalt in steel for structure and magnetism, and mercury in switches and the housing.

These are preponderant factors for the need for awareness-raising policies in organizations and in particular in the PA, so that they defend the environment more effectively, and for (Haley, 2017) the perspectives of sustainability transitions emphasize the need of the public sector to adapt policies towards technological innovation and to be redesigned institutionally.

The importance of this theme has led the PA to address the various scenarios concerned, but in the opinion that (Figueira, et al., 2018) the implementation of sustainability policies and practices in public administration have been adopted at different paces, depending on the country, the level of administration (e.g. local versus national/central) or the activities and objectives of each organization.

Through works already carried out, (Bose & Luo, 2011) identify the important gap that exists today in the research literature of Green IT, and which consists of the absence of a structure that can be used to help organizations to assess their potential to undertake Green IT initiatives and implement them by means modern technologies, such as virtualization.

The proposed approach is supported in the regulatory framework, composed of *International Organization for Standardization* (ISO) standards, including information security standards and in two *frameworks,* one in the area of services and one in the area of governance. In the design of an approach to optimize ICT management practices, the authors tried to incorporate both Green IT and Green IS strategies.

In the following section, a list of the rules chosen for the purpose of this approach will be presented.

Regulatory Framework

ISO/IEC 19770-1:2017 – Information technology – IT asset management – Part 1: IT Asset Management Systems – Requirements.

ISO/IEC 19770 handles asset management and defines a system of interactions, interrelated to establish policies, objectives, strategies, plans and activities, to maximize the performance and value of an asset portfolio according to organizational objectives during a specified period (see Table 1). IT Asset Management (ITAM) is a subdivision of asset management specifically designed to manage life cycles and total costs of IT assets, as well as the infrastructure they comprise.

Table 1. ISO / IEC 19770 standard - IT asset management

Standard	Description
ISO/IEC 19770-1:2017	Information technology — IT asset management Part 1: IT asset management systems - Requirements
ISO/IEC 19770-2:2015	Information technology — IT asset management Part 2: Software identification tag
ISO/IEC 19770-3:2016	Information technology — IT asset management Part 3: Entitlement schema
ISO/IEC 19770-4:2017	Information technology — IT asset management Part 4: Resource utilization measurement
ISO/IEC 19770-5:2015	Information technology — IT asset management Part 5: Overview and vocabulary

This standard is important for the construction of the model approach, namely in phase 1 - Problem Assessment and phase 2 - Study – and Planning, where an internal audit should be carried out to survey and manage IT assets.

ISO/IEC 19770-1:2017 is a specific extension of ISO 55001:2014, with some changes, and is not a specific application of this standard. ISO 55001:2014 should be used to manage physical assets in particular, but can also be applied to other asset types. This standard specifies requirements for it asset management that are additional to those specified in ISO 55001:2014.

It should be noted that compliance with ISO/IEC 19770-1:2017 does not imply compliance with ISO 55001:2014.

ISO/IEC 20000 - Information Technologies, Service Management System (SMS).

The international standard addresses process management by being aligned with the IT *Infrastructure Library* (ITIL) allowing organizations to be certified as IT Service Managers.

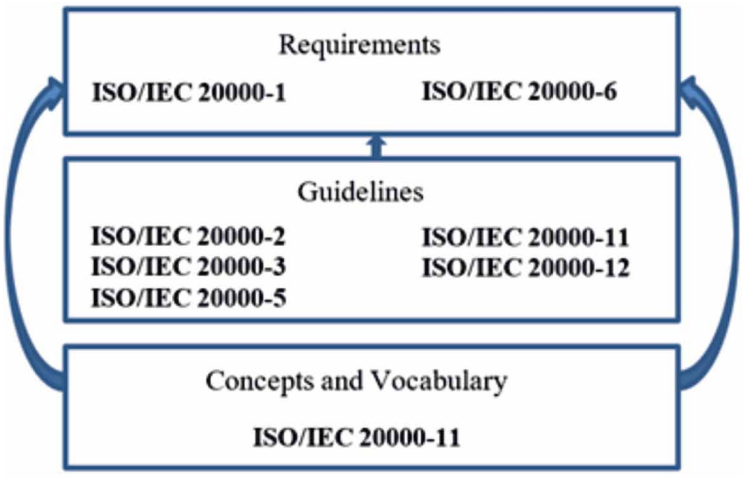
The requirements for the service provider, such as planning, establishing, implementing, operating, monitoring, monitoring, reviewing, maintaining and improving an SMS are specified. The requirements also include the design, transition, delivery and improvement of services in order to meet agreed service requirements.

An SMS, see Figure 1should direct and control the organization's service management activities to design, transition, deliver, manage and improve services, i.e. we are facing a *Plan, Do, Check, Act* (PDCA) cycle.

Figure 1. Management of information technology services

ISO/IEC 20000 is divided into three levels of information, Requirements, Guidelines and Concepts and Vocabulary, in a total of eight parts, as can be seen in Figure 2, their interconnections all linking to ISO/IEC.20000-1 Requirements.

Figure 2. Parts of ISO/IEC 20000



In a brief description of each of the eight parts of ISO/IEC.20000, it should be noted that, at the level of requirements, requirement 1 defining the requirements of the service management system and

requirement 6 defining the requirements for bodies providing auditing and certification of the service management system are found; at the level of the guidelines, one finds guideline 2 - Service Management System Application Guide, guideline 3 - ISO/IEC 20000 -1 Applicability Scope Definition Guide, guideline 5 - Example of a ISO/IEC Implementation Plan 20000 - 1, guideline 11 - Guide to the relationship between ISO/IEC 20000-1 and service management structures: ITIL and guideline 12 - Guidance on the relationship between ISO/IEC 20000-1 and service management structures: CMMI-SVC. Finally, in order to complete the presentation of ISO/IEC 20000, one can observe the level of Concepts and Vocabulary, in which the concept 10 - Concepts and Vocabulary is found.

Safety Techniques standards are presented and ISO/IEC 27013:2015 described as, according to (ISO/IEC 27013:2015, 2015), the relationship between information security management and service management being so narrow that many organizations already recognize the benefits of adopting the two international standards for these areas: ISO/IEC 27001 for information security management and ISO/IEC 20000-1 for service management.

ISO/IEC 27000 specifies an overview and vocabulary and aims to protect information assets, according to (ISO/IEC 27000:2018, 2018), through the definition, achievement, maintenance and effective improvement of information security, being essential to enable an organization to achieve its objectives and maintain and improve its compliance and legal image. These coordinated activities directing the implementation of appropriate controls and addressing unacceptable information security risks are generally known as d elements and information security management. ISO/IEC 27001 specifies the requirements for the establishment, implementation, maintenance and continuous improvement of one of the Information Security Management System (ISMS) (ISO/IEC 27001:2013, 2013) in the context of the organization. This standard also includes requirements for the assessment and treatment of information security risks, adapted to the needs of the organization. The requirements set out in this standard are generic and must apply to all organizations, regardless of type, size or nature. ISO/IEC 27002 standard specifies safety controls (ISO/IEC 27002:2013, 2013), provides guidelines for organizational information security standards and information security practices, including the selection, implementation and management of controls, taking into account the organization's information security risk environment(s). In what concerns ISO/IEC 27005, and according to (ISO/IEC 27005:2018, 2018) this does not provide any specific method for information security risks. It is up to the organization to define its approach to risk management, depending, for example, on the scope of a system of information security, context of risk management or industrial sector. ISO/IEC 27032 (ISO/IEC 27032:2012, 2012) addresses cybersecurity issues that focus on filling the gaps between different cybersecurity areas in cyberspace.

ISO/IEC 31000 - Risk Management - Principles and guidelines.

ISO/IEC 31000 (ISO/IEC 31000:2018, 2018) provides guidelines on the management of the risks faced by organizations. Applying these guidelines can be customized for any organization and context. This standard provides a common approach to managing any kind of risk and is not industry specific.

Whereas the development of an ISMS recommends, as a rule, the incorporation of a risk assessment, the use in the design of the ISO 31000 model is relevant.

IT governance is a part of the whole, that is, it is a part of organizational governance. ISO/IEC 38500 targets the IT governance of the organization, where ISO/IEC TS 38501 presents the IT governance implementation guide and ISO/IEC TR 38502 points to the framework. ISO/IEC 38500 (ISO/IEC 38500:2015, 2015) defines IT governance as a subset or domain of organizational governance or, in the

case of a corporation, corporate governance. This standard applies to all organizations. In ISO/IEC TS 38501 (ISO/IEC 38501:2015, 2015) one finds the technical specification developed to provide guidance on the implementation of IT governance in organizations, considering governance in the perspective of ensuring that the risks associated with IT usage are managed appropriately, as well as ensuring that the organization maximizes the value of its IT investments.

Finally, ISO/IEC TR 38502 (ISO/IEC 38502:2017, 2017) provides guidance on the nature and mechanisms of governance and management, and the relationships between them, in the context of IT in an organization, its objective being to provide information about a structure and model that can be used to establish the boundaries and relationships between governance and management of the current and future use of IT of an organization.

IT governance, as a subdomain of organizational governance, plays a leading role in managing an organization's entire IT. Therefore, its use in the context of this approach is important, being used in the various stages of the proposed approach.

In the organizational context, asset management plays a major role in the sense that it is a relevant theme, where each organization can mark its position depending on the assets it holds. ISO/IEC 55000 (ISO/IEC 55000:2014, 2014) provides an overview of asset management, its principles and terminology, and the expected benefits of adopting this management perspective. In ISO/IEC 55001 (ISO/IEC 55001:2014, 2014) asset management becomes a strategic advantage for organizations, contributing to the achievement of results. Finally, ISO/IEC 55002 (ISO/IEC 55002:2018, 2018) presents the guidelines for the implementation of ISO/IEC 55001.

OVERVIEW OF THE FRAMEWORKS

Two frameworks stand out that, albeit autonomously and independently, complement each other in the areas of services and of governance.

ITIL

This framework is presented in a set of books published by the UK Office of Government Commerce (OGC), which describe an integrated set of process-oriented best practices for managing IT services:

- **Service Strategy:** Portfolio Management, Demand Management, Financial Management;
- **Service Design:** Availability Management; Capacity Management; IT Service Continuity Management; Service Level Management, Information Security Management, Supplier Management, Service Catalog Management;
- **Service Transition:** Change Management, Service Asset & Configuration Management, Knowledge Management, Release &Deployment Management, Service Validation & Testing, Evaluation, Transition Planning & Support;
- **Service Operation:** Event Management, Incidence Management, Problem Management, Request Fulfillment, Access Management, Functions (Service Desk, Management, Technical Management, IT Operation Management, Application Management);
- **Continual Service Improvement:** Service Measurement, Service Reporting, Service Improvement.

Despite the structure and scope of the themes dealt with in the framework, each of the five books address a theme. The first book, Services Strategy, deals with various types of service strategy, such as business strategy, where one should try to align the business with ICT, or financial strategy, where one should try to align this strategy with ICT. The second book, Design of Services, will build upon the strategies and policies outlined in the previous step, and transform them into plans and architectural designs of technological services aligned with the strategy. The third book addresses the Transition of Services which, from the previously developed work, will deal with change management, such as planning, programming, building and testing new functionalities, user support management, knowledge management or change of planned projects into technological solutions. The theme of the fourth book is the Operation of the Services, which deals with incident management, with user support, event management, requisition management, access management, always with user support, so that you can resolve any incident or request with the speed and efficiency. Finally, in the fifth book the theme is Continuous Improvement of services, proposing a *roadmap* for self-assessment to evaluate whether the project is going according to the implemented strategy implemented and what was planned, for measurement of deviations and for planning future work prospects, in a continuous improvement strategy.

It is noted that, although all processes point to services and good practices of implementation of services, none of them address what the authors believe fundamental and that it is intended with the design of the approach presented here: what effective costs can be obtained or avoided with the implementation of the framework.

COBIT

Continuing with the study and evaluation of COBIT, it should be noted that this is a *framework* that functions in a supporting role, enabling the organization to obtain governance and management of information and corporate technologies, aimed at the entire organization in a more controlled way. This means that corporate governance is not only restricted to an organization's IT department, but surely includes it.

Concerning its positioning, COBIT is at a higher level with regard to IT Service Management, ITIL and the IT Services standard itself which is ISO/IEC 20000.

COBIT, maintained and updated by ISACA, is currently in the 2019 version, and its structure of governance and management objectives is grouped into five domains, integrating forty objectives. In turn, and according to COBIT (2019), governance objectives are grouped in the Evaluate, Direct and Monitor (EDM) domain, in which the governance body evaluates strategic options, directs high management in the strategic options chosen and monitors the scope of the strategy.

Management objectives are grouped into four domains, as can be seen in the Table 2.

Table 2. COBIT 2019, domains of management objectives

Domains	Description
Align, Plan and Organize (APO)	addresses the overall organization, strategy and supporting activities for I&T.
Build, Acquire and Implement (BAI)	treats the definition, acquisition and implementation of I&T solutions and their integration in business processes.
Deliver, Service and Support (DSS)	addresses the operational delivery and support of I&T services, including security.
Monitor, Evaluate and Assess (MEA)	addresses performance monitoring and conformance of I&T with internal performance targets, internal control objectives and external requirements.

According to the definition in the (COBIT, 2019) in order that information and technology contribute to the company's objectives, several governance and management objectives must be achieved. The basic concepts related to governance and management objectives are:

- A governance or management goal is always related to a process, which should have the identical or similar name to several related components of other types to help achieve the goal;
- A governance objective refers to a governance process, while a management objective refers to the management processes.

As ISACA states, "COBIT does not make or prescribe any IT-related decisions. It will not decide what the best IT strategy is, what the best architecture is, or how much IT can or should cost. Rather, COBIT defines all the components that describe which decisions should be taken, and how and by whom they should be taken" (COBIT, 2019).

In the scope of this chapter, the use of the COBIT framework may be addressed in order to optimize IT governance processes, but similarly to the note drawn in the analysis of the previous framework, the added value the authors pursue is to be able to quantify how much more or less would the option for the implementation of a particular technology or service cost, or, whether or not a particular option may be related to an increased or loss of productivity, issues that COBIT also does not address.

Finding that these two frameworks lack the intended functionalities to support the optimization of ICT management practices prompted the creation of a novel methodology, ICT management – optimization approach, described next.

ICT MANAGEMENT – OPTIMIZATION APPROACH

The approach created aims to optimize the practices established in the areas of human capital, increased productivity, enhanced information security, optimization of management times, also seeking, if possible, to reduce the amount of material to be recycled, cost reduction, such as energy, which in itself implies less emissions of carbon dioxide, contributing to a better layer of ozone, aligning with Green IT.

Figure 3. Schematic approach plan

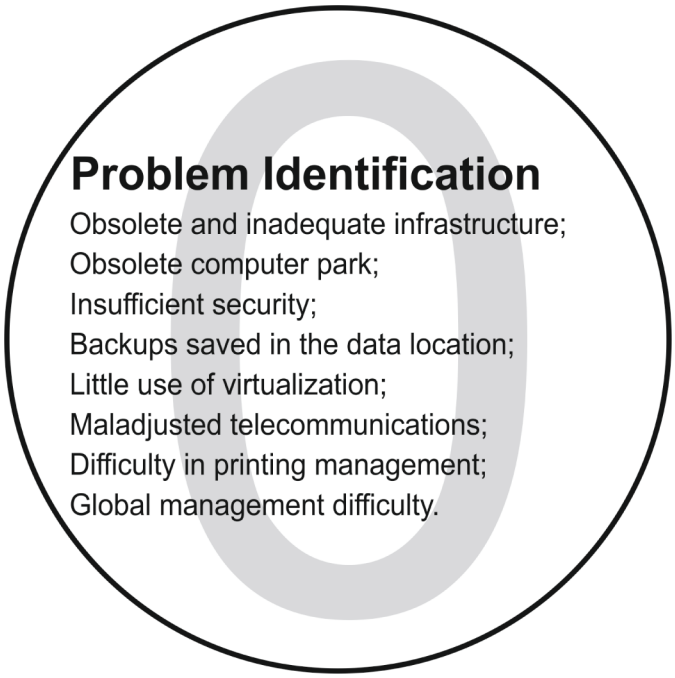
Approach

The approach includes the generality of the objectives and constraints identified in the municipality under study at the level of ICT. In this sense, to optimize ICT management practices, an approach was developed and validated in the municipality of Barreiro, Portugal, where there was the will and claim to be able to measure its feasibility and added value, in other municipalities of the country.

The standard, ISO /IEC 20000, will be important for building the model approach, to ensure that in all stages aligned with ITIL, such as phase 1 - Problem Assessment, phase 2 - Study and Planning, phase 3 - Project, phase 4 - Telecommunications and Printing, phase 6 - Innovation and phase 7 - Improvements in Citizen Services, that is, in all phases aligned with ITIL, and iso 31000, which refers to risk management, will be incorporated from phase 1 to phase 7.

In Figure 3, the phases of the approach are presented:

Figure 4. Phase 0, problem identification



Phase 0: Problem Identification
Phase 1: Evaluation and Continuous Improvement
Phase 2: Study and Planning
Phase 3: Project
Phase 4: Telecommunications and Print
Phase 5: Information Security
Phase 6: Innovation
Phase 7: Improved Citizen Services
Phase 8: Evaluation/ Opinion

Depending on the data collected in phase 8, evaluation and opinion, one can be on the verge of continuing to phase 1, and go through the entire cycle again, in an allusion to the cycle PDCA.

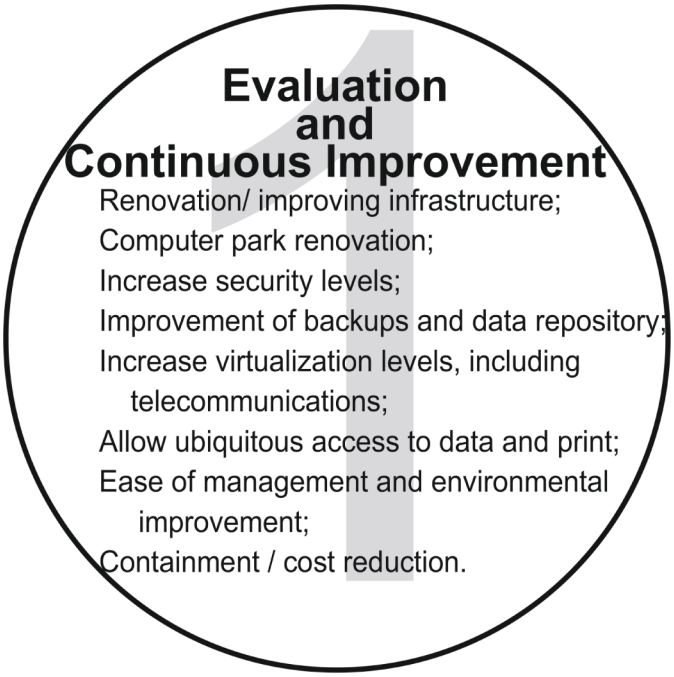
Phase 0 - Problem Identification

This process, exhaustive, complex and time consuming, will begin in the so-called Phase 0, with the Problem Identification, see Figure 4, where the entire structure and infrastructure will be audited.

The audit will be internal and will allow identifying the current state of IT, telecommunications, printing system and security, which empirically is believed to be in an unfit state and consonant to the needs and claims of the municipality. Probably the state of these elements will not allow future developments to be sought, in order to address issues such as increased productivity, reduction of management

and maintenance times, environmental improvement, and above all the reduction of response time to citizens, a focal point for any municipality or organization, preferably with cost containment.

Figure 5. Phase 1, continuous evaluation and improvement



Phase 0 will start with the use of an internal, exhaustive audit of all technological infrastructure and park, which allows the identification of problems and constraints, daily, throughout the municipality. This audit should include the survey of the current situation of all assets and liabilities at computer level, so that at the next stage improvement solutions can be evaluated and sought.

It is emphasized the importance of auditing safety, physical, logic issues, including technological assets, backups and human resources, where it is proposed that the audit be based on the controls of the international standard ISO/IEC 27002:2013, providing a quality and appropriate reference, with possibilities for measurement and comparison through its indicators.

It is also intended to analyze existing virtualization, telecommunications and printing status in order to be carried out in the later phase, correction and/or continuous improvement.

Phase 1 - Continuous Assessment and Improvement

Once Phase 0 has been completed, the problems and constraints are identified, will move to Phase 1, Evaluation and Continuous Improvement, see Figure 5, where we intend to evaluate, still succinctly, the renewal and improvement of technological infrastructure, the renewal of the computer park, the increase in security levels, preponderant for the operation of the municipality, without disturbance, which will involve a change of paradigm in the form of execution of backups and their possible replication to instal-

lations far from the municipality, in order to preserve the data, to the fullest, in the event of an accident or natural disaster or negligence.

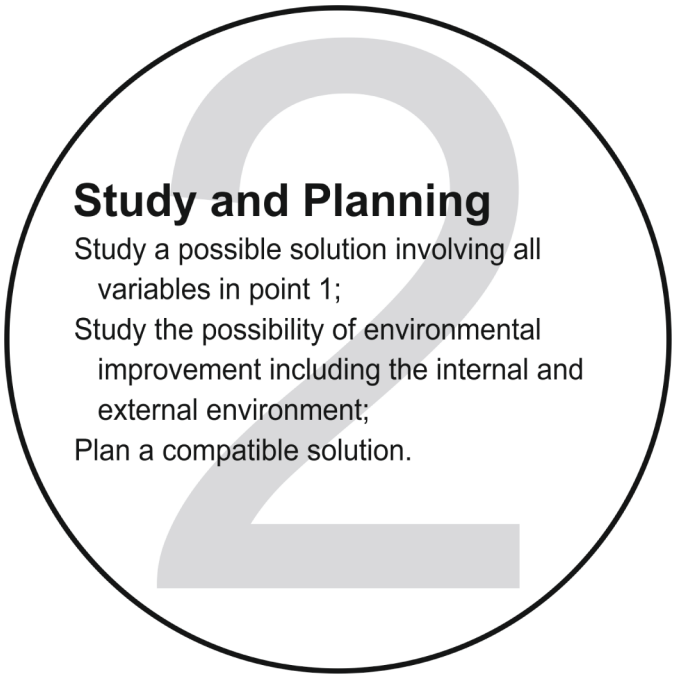
It is intended to evaluate the possibility of increasing virtualization, where telecommunications are also included, not only as a security measure, but also a way to reduce maintenance contract costs and enhancing internal *know-how* in maintenance and configuration tasks of the virtual plant. In the context of this evaluation phase, there is also the intention to ensure the ubiquity of access, among the various buildings, decentralized throughout the municipality, giving the data as to impressions in order to ensure greater mobility of people and daily autonomy.

Obviously, there are two tasks of this Phase 1, which close it, the evaluation of the ease of management and environmental improvement, always present throughout this project the environmental preservation and the use of technologies that allow this preservation, in an alignment with *Green IT,* and finally the equation of containment or even, in reducing costs, without compromising the project.

Phase 2 - Study and Planning

Once the needs for improvement and *upgrade* of the solution are assessed, we will be facing Phase 2 - study and planning, see Figure 6, based on the results of the study and planning carried out, upon which all the following phases will be supported, and where the need for change of strategies can bring unexpected costs to the organization or unforeseen results, despite being facing an iterative process up to phase 6 inclusive.

Figure 6. Phase 2, study and planning

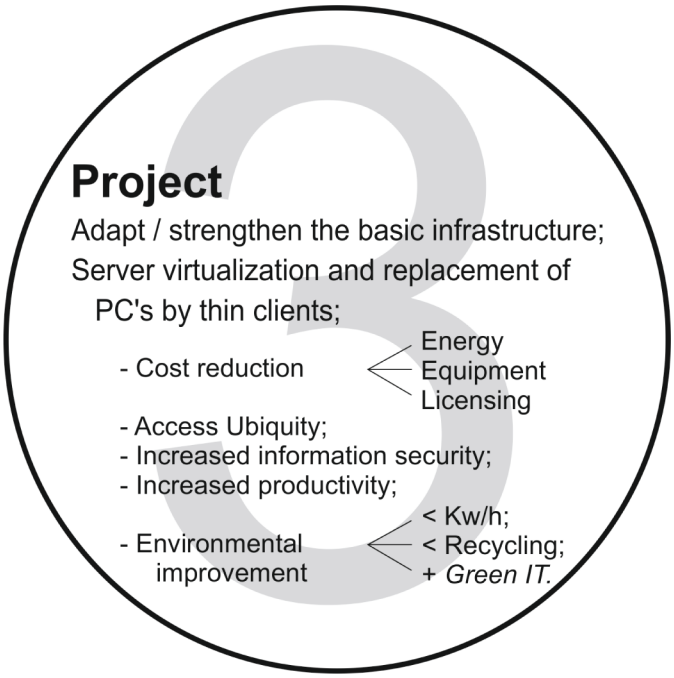


It is aimed that the approach allows for the involvement of all variables described in the previous phase, and that simultaneously includes the possibility of environmental improvement, encompassing both the internal environment and the external environment. Consequently, it is a goal to plan a solution that can be compatible and retro compatible with existing, leveraged, at ICT level, or hardware, and software, thereby minimizing the costs of the final solution.

Phase 3 - Project

After the evaluation and study and planning phases, it will enter Phase3, Project, see Figure 7, where the output of the previous phases will serve as input at this stage, in which the basic infrastructure is to be adapted and strengthened, to support the entire project. To this end, it is intended to create a data center that can accommodate the necessary active and passive equipment, from routing to connect to other buildings of the municipality and internet connection, switching core that allows the interconnection by fiber optics, itself, between some buildings and distribution that allows interconnection with the various network points in the building where the data center is located. This datacenter should also host the physical servers that allow the creation of Virtual Machines (VM), i.e. virtual machines, and storage units or storage units, which will host all data. All of these equipment's must be supported and connected to a UPS capable of holding the infrastructure for some time in the event of an energy failure.

Figure 7. Phase 3, project



In addition to server virtualization, with the creation of several VMs, in a distributed environment, the replacement of most PC's, in the end of life, by thin clients, small equipment that will connect to the servers, where after the cost/benefit assessment, taking into account the needs, you can opt for con-

nections by Remote Desktop Protocol (RDP), or connections to Virtual Desktop Infrastructure (VDI), where costs must be evaluated together with the benefits of the solution to be adopted.

Phase 4 - Telecommunications and Printing

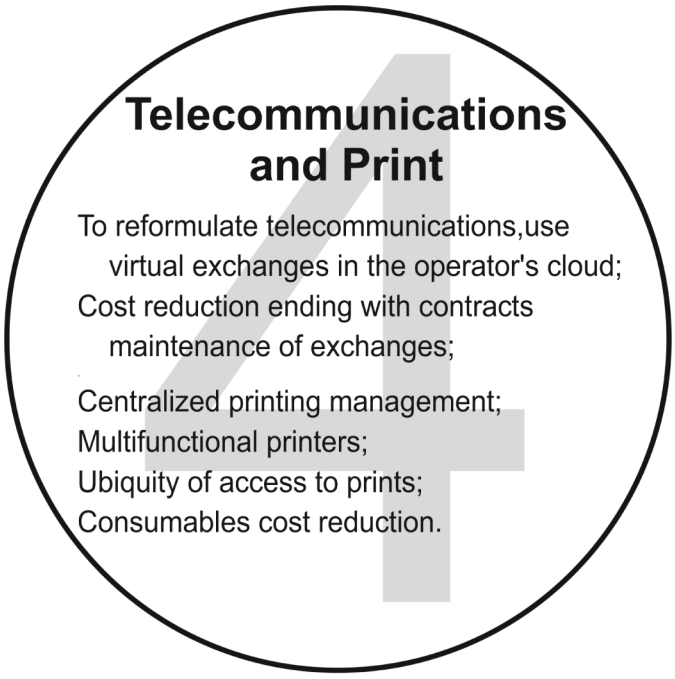
This phase encompasses two areas, which, although distinct, should be treated in an integrated way *per se*, Phase 4, Telecommunications and Printing, see Figure 8, because there is a need to group a set of features and valences, which allow in this context a set of added value for the organization.

Telecommunications

In particular, in telecommunications, the placement of telephone exchanges in old buildings, some deteriorated, with serious humidity problems, has been identified as problematic, due to constant malfunctions and subsequently the absence of telecommunications between buildings, with all the constraints and costs inherent.

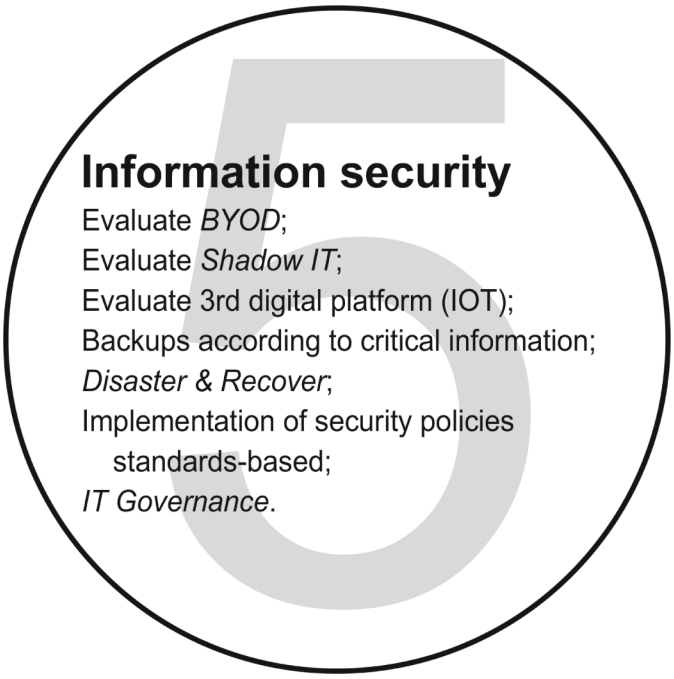
Telecommunications are supported through telephone exchanges, with one in each fiber optic connected building.

Figure 8. Telecommunications and print



The difficulty of technicians with valences in the programming of the plants and their daily management hinders daily work, so an integrative solution should be seen in the future and that allows facilitated management, without increased costs.

Figure 9. Information security



Printing

One of the concerns in the municipality under study is the problem of printing. The inherent costs of the equipment are high. Where desktop printers are predominantly a reality, and of a wide variety of different models, it is not possible to recover or reduce costs, as they are equipment without expression. In this situation, there are no scale economies in printing, because in the cost of each copy is inherent the high cost of consumables, such as the stock of cartridges. There is also a need for a large investment due to the number of different models, sometimes happening that cartridge *stocks* are renewed by the terminus of their shelf life, even if the corresponding printers have already been disposed of and information not propagated to stock management.

The ubiquity of access to impressions, in a safe way, is a possibility to be faced, allowing better productivity and improvement of processes in everyday life, from whom it prints and uses in different buildings.

Phase 5 - Information Security

Being one of the assets of the organization to be preserved, in particular in the LA, and in view of the entry into force of the General Data Protection Regulation (GDPR) it is necessary to protect even faster and more efficiently. For the National Cybersecurity Center (CNCS), information security is essentially based on three pillars and advances (Cybersecurity, 2017) that information security is an organized and structured process that preserves the confidentiality, integrity and availability of information.

Currently there are several phenomena, see Figure 9, which are difficult to control within each organization and the PA and the LA do not escape this rule.

The speed at which everything goes, the need for training and the heavy machine that sometimes costs to respond, lead to the cohabitation of one of these phenomena, Bring Your Own Device (BYOD), in which organizations eager to avoid costs, deluded by the increase of productivity, intending to maintain the satisfaction of its employees open their doors at security risks.

However all this may have other costs associated and not detected by those who are only focused on one strand, for (Brace, 2018) the dados and devices can be lost, stolen and corrupted. If these devices have access to the company's network, they run the risk of being hacked.

For (Brace, 2018) some associated risks they go through the risk of data security, privacy concept, legal issues, hidden costs, and compliance issues.

Another of the current phenomena is *Shadow* IT, which compared to BYOD, is of some relevance within organizations and in this case PA and LA, being heavy in procurement processes, confronted by the pressing needs of services and employees, end up indirectly instilling these practices in their employees, where sometimes control is scarce or almost nil, and may compromise the organization at various levels, including threatening their employees, including threatening its security.

The implementation of sensing technologies for monitoring and collecting city data through projects for Smart Cities based on Internet of Things (IOT), influence organizations, in this case very connected to LA, to occur once again in the need for redoubled care with information security, as these sensors are networked with the cent*er's dates.*

Following these concerns in (Meola, 2018) the concept is presented mentioning that connecting devices (other than computers and smartphones) to the Internet is presented. (Coelho, 2017) defines it as a system that connects computing devices, be they computers, machines, people, animals or objects, and under which they can communicate and transfer data without any human intervention.

For the (Szczepaniuk, Szczepaniuk, Rokicki, & Klepacki, 2019) authors, the implementation of IT in most areas of state activities, economic and social, generates many opportunities for automation of management processes and increases the efficiency and quality of the services performed, this being the part of project implementation; but the same authors note, the introduction of IT solutions in the public sector implies the need to provide security to the services provided. Therefore, public administration institution are implementing ISMS.

Phase 6 - Innovation

Innovation comes in phase 6, where we want to provide the citizens, case of LA or the customers of the organization, business case, more and better services, preferably innovative.

When addressing the theme innovation, integrated with ICT, we must consider, moreover according to the (Bason, 2016) author, the word innovates is widely used, when we approach transformation and strategy.

Transformation should be seen as a future perspective and seen as digital transformation, as such it will be necessary, that on the part of organizations and the PA, there is a concerted strategy so that collaboratively among several actors can implement a new mode of action, faster, and that responds to the needs and perspectives of citizens and citizens in general.

Figure 10. Innovation

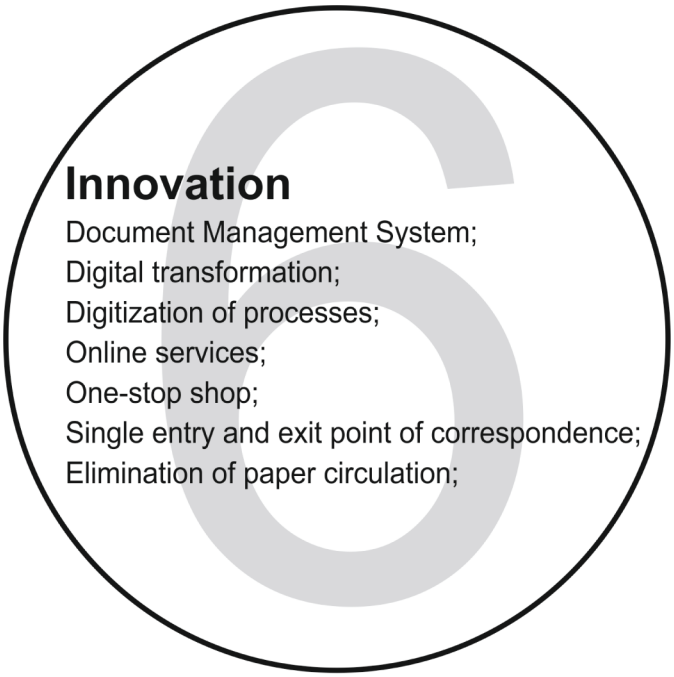


Figure 11. Improvement of citizen services

Figure 12. Evaluation and opinion

From the perspective of (Torfing, 2018), there is a growing interest in the question of how to stimulate innovation in the public sector, also mentioning that recent research points to collaboration between actors as a factor of superior innovation. In this sense, the public sector or other non-governmental organization consider in their daily agenda the incentive to innovation, by political, economic weight and quality of services. This statement is also corroborated by the (Arundel, Bloch, & Ferguson, 2019) authors, who recognize the fact that the economic weight of these entities leads to growing political interest to foster innovation in the public sector that may culminate in improvement and resource use efficiency, add quality in public services and be prepared to face a wide range of social challenges.

The reality is that there is a broader and more evolutionary perception that (Borins, 2006) innovation can contribute to the improvement of services and increased productivity in the services, however this perception leads to a growing press on organizations, namely the PA and LA, to be more innovative and swift in their responses to the citizen and preferably everything works from a click.

The proposed approach, Figure 10, aligns with the precepts described above, perceived as an added value to the organizations or PA that adopt it.

At this stage, it is proposed to transform the "analog" operating model, where the role predominates, with inherent costs, both paper, copying, storage, little fast, for a digital model, taking advantage of the technologies and inherent advantages, giving rise to digital transformation, in a faster and coexisting process with the wills and needs of citizens in general.

If it does not exist, a documental management system, unique, transversal to the entire organization, support of the entire digital transformation, where all documentation will give digital input.

Thus, monetize the digital process, and process digitization process is equated, allowing them to stop circulating and once again make the process faster, allowing, if desired, the submission of documenta-

tion facilitating life for those who need to communicate with the organization or municipality. These innovative processes, *per se*, in addition to being facilitators, also allow increased productivity, because waiting times and retention are almost nil.

Phase 7 - Improvement of Citizen Services

The Improvement of Citizen Services appears in phase 7 as a consequence of the previous phases and closely linked to the previous phase of innovation.

Following the process described in phase 6, it is possible to improve, monetize and make the entire service provided to the citizen faster, with better quality of information, see Figure 11, considering that it becomes all in the database, maintaining its confidentiality, integrity and availability, these being the three pillars of information security.

Due to the innovative process of digital transformation, it will be possible for this time to achieve faster processes, greater speed in the availability of information, speed and quality in service, taking into account that all information is digital not requiring it to arrive physically to the service desk.

With all computerized data it becomes possible to have a 360º knowledge of the user or munícipe, where it can proactively interact with it, facilitating life and avoiding further trips to the place of care, reducing waiting times in each interaction.

With the implementation of online services, it is possible to remove many users from face-to-face service, maintaining a quality service at a *distance* of a click, where everyone wins.

Phase 8 - Evaluation and Opinion

In view of the last phase of the proposed cycle, phase 8 – Evaluation and Opinion and after the entire infrastructure process, modernization of telecommunications and printing, improvement in information security, innovation with a focus on digital transformation culminating in the improvement of services to the citizen, it is important at this last stage to assess and know the opinion of citizens and users in general.

It is advocated that the services and users should be provided with new valences, new tools, innovative ways of communicating between organization or municipality and users or citizens, now being necessary to know and face reality, according to Figure 12, where the forms of action proposed in the approach are shaped.

The way it is recommended for an evaluation and collection of opinions to all actors involved, internal and external, will be through the preparation of opinion surveys. These surveys should be done regularly so that opinions can be learned so that they can rectify or improve some form of action or provision of information, since the proposed approach does not end up in phase 8, but rather intended to that is a process of endorsement and improvement continues, as if it were a Plan, Do, Check, Act (PDCA) process, in this case with the highest number of phases, but with identical genesis.

SOLUTIONS AND RECOMMENDATIONS

The PA currently operates taking advantage of ICT, the processes flow between the central, regional and local administration electronically, transpiring a greater speed, because the ease of sending, receiving

and handling of documents is much greater, there is a faster and streamlined processes, and greater ease in concerted actions among the various actors.

The approach to the technological component refers us to the optimization of numerous factors within the organization, whether it is the public or private sector, and where in the specific case "The Public Administration and in particular the Local Administration live delicate moments and the Chief Information *Officer* are required solutions of low *Capex*, but that do not score the main objective; increased productivity, leading to innovative, rapidly implementing, but low-cost solutions" (Landum, 2012).

The design of the proposed approach responds to both aspects, in order to enable technological improvement and cost containment, because it is multidisciplinary and integrative by enhancing the optimization of established practices.

The case study allowed the study to develop an exhaustive analysis of the state of the art in order to characterize a solution of low *Capex,* which simultaneously allows the reduction of *Opex,* given the framing and specificity of the organization under study. The second aspect of the use of the case study focuses on the possibility of validating the approach built to make the real added value of its use in an organizational context feasible.

The proposed approach also includes the definition of a set of weights, that is, the application of different weights to the various items to be evaluated, at each stage of the model, being validated based on the perception of each CIO and with defined weights, which will allow its implementation in the various municipalities of the country or organizations.

The advantage of the definition being made based on the perception of each CIO, in each municipality, is to allow in municipalities with different stages of development the model to function without problem.

FUTURE RESEARCH DIRECTIONS

Based on the validation of the approach, in a local administration organization, it is intended to optimize its use and subsequently propose its implementation to validate the effective cost reduction by calculating *return of investment* (ROI).

One of the contributions of this work is considered to focus on designing an approach to optimizing ICT management practices towards increased productivity, access ubiquity, reduction of management times and consequently cost reduction without ever bleaching information security.

In this sense, one of the lines of research to be developed is the validation of the weights defined in the approach in order to analyze the specificity of other study cases, in a real context.

The design of a tool that aggregates and supports all the information behind the approach may be another relevant line of investigation.

CONCLUSION

The importance of using international standards combined with the approach presented aims to enable the creation of conditions to implement and optimize practices in organizations, including in PA and LA.

It is also considered that the study of ITIL and COBIT frameworks constitute added value in the context of the problem in order to optimize the level of services and the underlying governance concerns in an organizational context in the face of a digital future.

However, the use of the ITIL framework does not provide the added value as you want, to be able to quantify how much more or less the option for implementing a particular technology or service, or whether or not a particular option may translate to an increase or loss of productivity, issues that ITIL does not address.

It should be noted that in the case of COBIT all objectives point to governance and management of corporate information and technologies, as well as good implementation practices. However, none of the objectives address the fundamental that is intended with the design of the present approach, what actual costs can be obtained or avoided by implementing the framework.

Green IT and IS considerations were translated into the ICT practices. Examples are making green choices in equipment acquisition and replacement or going paperless and thus diminishing the citizens need for commuting to obtain documents.

Currently and in view of the preoccupations mentioned above there is no approach that would address in an integrative and multidisciplinary way the problem of ICT management in PA.

The proposed approach is multidisciplinary and integrative in order to enable integrated ICT management, fostering sustainability and contribution to Green IT.

The advantages underlying the approach can be numerous, starting with the contribution made to the community, which becomes available a tool that will allow the optimization of ICT practices, with some sustainability and from which it will result in an increase in productivity in the organization. Access ubiquity, reduction in management times and an integrated backup policy that allows increased information security, as well as cost reduction stemming from the added value given through the proposed approach.

REFERENCES

Arundel, A., Bloch, C., & Ferguson, B. (2019). *Advancing innovation in the public sector: Aligning innovation measurement with policy goals.* Obtido em 14 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0048733318302956

Asadi, S., Yadegaridehkordi, E., Nilashi, M., & Samad, S. (2019). Green Information Technology Adoption: A Systematic Literature Review. *Journal of Soft Computing and Decision Support Systems*, *6*(3), 8–17.

Borins, S. (2006). *The Challenge of Innovating in Governement*. IBM Center for The Business of Governement.

Bose, R., & Luo, X. (2011). Integrative framework for assessing firms' potential to undertake Green IT initiatives via virtualization—A theoretical perspective. *The Journal of Strategic Information Systems*, *20*(1), 38–54. doi:10.1016/j.jsis.2011.01.003

Boudreau, M.-C., Chen, A., & Huber, M. (2008). Green IS: Building sustainable business practices. *Information systems: A global text*, 1-17.

Brace, J. (2018). *Bring Your Own Device (BYOD).* Obtido em 29 de janeiro de 2020, de https://static2.avg.com/20180418/web/o/pdfs/AVG-Biz-eBook-Bring-Your-Own-Device.pdf

Carberry, E. J., Bharati, P., Levy, D. L., & Chaudhury, A. (2019). Social movements as catalysts for corporate social innovation: Environmental activism and the adoption of green information systems. *Business \& Society, 58*(5), 1083-1127.

Centobelli, P., Cerchione, R., & Esposito, E. (2020). *Pursuing supply chain sustainable development goals through the adoption of green practices and enabling technologies: A cross-country analysis of LSPs.* Obtido em 15 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0040162519306341

Cibersegurança, C. N. (2017). *A Seguranaça da Informação - Informação ao Colaborador.* Obtido em 13 de fevereiro de 2020

COBIT. (2019). *COBIT 2019 Framework - Governance and Management Objectives.* Schaumburg, IL: ISACA.

Coelho, P. (2017). *Internet das Coisas, introdução prática*. FCA - Editora de Informática, Lda.

Coral, E. (2002). *Modelo de Planeamento Estratégico para a Sustentabilidade Empresarial.* Obtido em 12 de dezembro de 2019, de Tese de Doutoramento. Universidade Federal de Santa Catarina. Brasil: https://repositorio.ufsc.br/bitstream/handle/123456789/82705/189235.pdf?sequence=1&isAllowed=y

Figueira, I., Domingues, A., Caeiro, S., Painho, M., Antunes, P., Santos, R., . . . Ramos, T. (2018). *Sustainability policies and practices in public sector organisations: The case of the Portuguese Central Public Administration.* Obtido em 14 de janeiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0959652618322339#!

Guo, R., Lv, S., Liao, T., Xi, F., Zhang, J., Zuo, X., . . . Zhang, Y. (2020). *Classifying green technologies for sustainable innovation and investment.* Obtido em 15 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0921344919304860

Haley, B. (2017). *Designing the public sector to promote sustainability transitions: Institutional principles and a case study of ARPA-E.* Obtido em 14 de janeiro de 2020, de https://www.sciencedirect.com/science/article/pii/S2210422416300545

Herath, H. S., Herath, T. C., & Dunn, P. (2019). Profit-driven corporate social responsibility as a Bayesian real option in green computing. *Journal of Business Ethics*, *158*(2), 387–402. doi:10.100710551-017-3705-1

ISO/IEC 27000:2018. (2018). *Information technology — Security techniques — Information security management systems — Overview and vocabulary.* ISO/IEC.

ISO/IEC 27001:2013. (2013). *Information technology — Security techniques — Information security management systems — Requirements.* ISO/IEC.

ISO/IEC 27002:2013. (2013). *Information technology — Security techniques — Code of practice for information security controls.* ISO/IEC.

ISO/IEC 27005:2018. (2018). *Information technology — Security techniques — Information security risk management.* ISO/IEC.

ISO/IEC 27013:2015. (2015). *Information technology — Security techniques — Guidance on the integrated implementation of ISO/IEC 27001 and ISO/IEC 20000-1.* ISO/IEC.

ISO/IEC 27032:2012. (2012). *Information technology — Security techniques — Guidelines for cybersecurity.* ISO/IEC.

ISO/IEC 31000:2018. (2018). *Risk management — Guidelines.* ISO/IEC.

ISO/IEC 38500:2015. (2015). *Information technology — Governance of IT for the organization.* Obtido de ISO/IEC

ISO/IEC 38501:2015. (2015). *Information technology — Governance of IT — Implementation guide.* Obtido de ISO/IEC

ISO/IEC 38502:2017. (2017). *Information technology — Governance of IT — Framework and model.* Obtido de ISO/IEC

ISO/IEC 55000:2014. (2014). *Asset management — Overview, principles and terminology.* Obtido de ISO/IEC

ISO/IEC 55001:2014. (2014). *Improve asset management with ISO 55001.* ISO/IEC.

ISO/IEC 55002:2018. (2018). *Asset management — Management systems — Guidelines for the application of ISO 55001.* ISO/IEC.

ITIL. (2019). *ITIL Foundation ITIL* (4th ed.). AXELOS.

ItilPortugal. (2019). *Ciclo de vida Itil*. Obtido em 20 de 12 de 2019, de http://www.itilportugal.pt/ciclo-vida-itil/

Landum, M. (2012). *Cloud na Administração Local, estudo de caso.* Obtido em 10 de janeiro de 2020, de Tese de Mestrado. Escola Superior de Ciências Empresarias. IPS. Setúbal: https://comum.rcaap.pt/handle/10400.26/3999

Liu, Z., Wang, H., & Li, P. (2019). *The antecedents of green information system and impact on environmental performance.* Available at SSRN 3377034

Meola, A. (2018). *What is the Internet of Things? What IoT means and how it works*. Obtido em 2 de fevereiro de 2020

Panetta, K. (2016). *Gartner's Top 10 Security Predictions 2016*. Obtido em 12 de janeiro de 2020, de https://www.gartner.com/smarterwithgartner/top-10-security-predictions-2016/?cm_mmc=social-_-rm-_-gart-_-swg

Raisinghani, M. S., & Idemudia, E. C. (2019). Green information systems for sustainability. In Green Business: Concepts, Methodologies, Tools, and Applications (pp. 565-579). IGI Global. doi:10.4018/978-1-5225-7915-1.ch028

Szczepaniuk, E., Szczepaniuk, H., Rokicki, T., & Klepacki, B. (2019). *Information security assessment in public administration.* Obtido em 13 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0167404819302469

Torfing, J. (2018). Collaborative innovation in the public sector: the argument. *Public Management Review*, 1-11.

Velte, T., Velte, A., & Elsenpeter, R. (2008). *Green IT: reduce your information system's environmental impact while adding to the bottom line*. McGraw-Hill.

KEY TERMS AND DEFINITIONS

COBIT: Framework for the governance and management of information and technology, aimed at the whole enterprise, not limited to the IT department of an organization but certainly includes it.

Green IT: Practices in the domain of the use of Information and Communication Technologies in order to enhance sustainability.

Information and Communication Technologies: A technological resource set used to process information and ensure communication. When used in an integrated way it enhances information transmission and communication processes.

Information Systems: Is the organized set of components such as people, processes of collection and transmission of data and material resources, automated or manual. The interaction of components enhances the processing and dissemination of information.

International Standards: A set of technical standards establishing a quality management model for organizations in general, whatever their type or dimension, covering various areas within organizations.

ITIL: The most widely accepted IT service management framework. ITIL is a set of practices used by organizations to manage IT services.

Sustainability: Ability to sustain life on the planet, considering the five dimensions: individual, social, economic, technical, and environmental.

Chapter 10
Methodological Approach to Systematization of Business Continuity in Organizations

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ABSTRACT

The underlying concept of business continuity is that an organization must have the strategic and tactical capability to plan and respond to business incidents and interruptions, in order to continue business operations at an acceptable predefined level. This chapter proposed an approach to business continuity management in an organization through the definition and implementation of a set of four related phases. The authors integrate the main guidelines, based on the literature review and on good practices and concerns, referred to in the ISO standards and on ITIL, CMMI, and COBIT frameworks. This approach will allow organizations to address the most relevant activities for the development of a business continuity management program. By implementing each of the phase activities, the organization will have a systematic overview of the steps required for an optimized planning and response to business incidents and disruptions, supported by the strategy defined framed within their needs.

INTRODUCTION

The underlying concept of Business Continuity (BC) is that an organization must have the strategic and tactical capability, to plan and respond to business incidents and interruptions (Ramakrishnan & Viswanathan, 2011), in order to continue business operations, at an acceptable predefined level.

In the third section of this chapter, is proposed an Approach to Business Continuity Management (BCM) in an organization, through the definition and implementation of a set of related phases, integrat-

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ing the main guidelines, good practices and concerns, underlying the constraints of its management and the definition of the scope of each of the activities of the phases.

The methodology was based on the literature review on the theme and on the frameworks presented in the International Organization for Standardization (ISO) standards, in the field of Information and Communication Technologies (ICT). Also considered the good practices referred to in the Information Technology Infrastructure Library (ITIL), Control Objectives for Information and Related Technologies (COBIT) and Capability Maturity Model Integration (CMMI) frameworks about BC and on the service delivery guarantee by ICT.

The chapter presents, in the third section, a proposal for a Business Continuity Planning Approach in organizations, consisting of four phases, in order to be comprehensive in relation to the theme. The first phase aims to assess the impact to which the organization is exposed and encompasses (Understand the Organization, Administration Support, Risk Assessment, Business Impact Analysis and Business Continuity Teams). The second phase proposes the strategic analysis of BCM and of ICT. The third phase advises to consider Alternatives to Critical Functions in the characterization of the design and implementation of the Business Continuity Plan (BCP). The fourth phase proposes the BC training and the Testing and Maintenance activities of the BCP.

The main conclusions focus on the presentation of an Approach, being an instrument that will allow organizations to address the most relevant activities for the development of a BCM Program. By implementing each of the phase activities identified in the Approach, duly framed within their needs, the organization will have a systematic and, desirably, complete overview of the steps required for planning and responding to business incidents and disruptions. It is considered that the added value of the Approach focuses on the systematization of the procedures underlying the theme, to optimize the response to business incidents and interruptions, supported by the organization defined strategy.

The BC can be managed, so the management concepts of the BC and the role of the BCP in this context are presented. Naturally, as BCM is a process, it should have a methodology to support the design of the BC in the organization. The BCP concept and the authors' considerations on continuity planning are presented, with the objective of distinguishing the activities involved, in the areas of crisis management, Disaster Recovery (DR) and the BC.

BUSINESS CONTINUITY MANAGEMENT

Contingency planning and DR were, in the past, largely information technology-led responses to natural disasters and terrorism that affected businesses. Nowadays (Tangen & Austin, 2019), recognize that this needs to become a business-led process and encompass preparing for many forms of disruption, creating a discipline known as BCM.

Any incident has the potential to cause major disruption to the organization's operations and its ability to provide products and services. However, (Filho, 2016) states that implementing BCM before a disruption incident occurs, rather than waiting for something to happen, allows the organization to resume operations before unacceptable impact levels emerge.

Thus, BCM can prepare the organization to maintain the continuity of its services during a disaster by implementing a contingency plan (Syed & Syed, 2004).

As a starting point, (Hiles, 2011a) considers that it is useful to obtain a statement of support from the administration, stressing the importance of the BC project and that some of the benefits of BCM are:

- Risk identification and enhancing exposure reduction;
- Improved understanding of the business, by identifying its criticalities and dependencies;
- Improved operational resilience, by implementing risk reduction measures;
- Improved organizational resilience, by designating and training alternate people;
- Improved operational effectiveness, y business process improvements;
- Reduced downtime, by creating alternative processes and quick fix capabilities;
- Compliance with legal and regulatory requirements;
- Protection of assets, by risk management;
- Improved security;
- Demonstrable continuity capability, by providing competitive edge and marketing advantage.

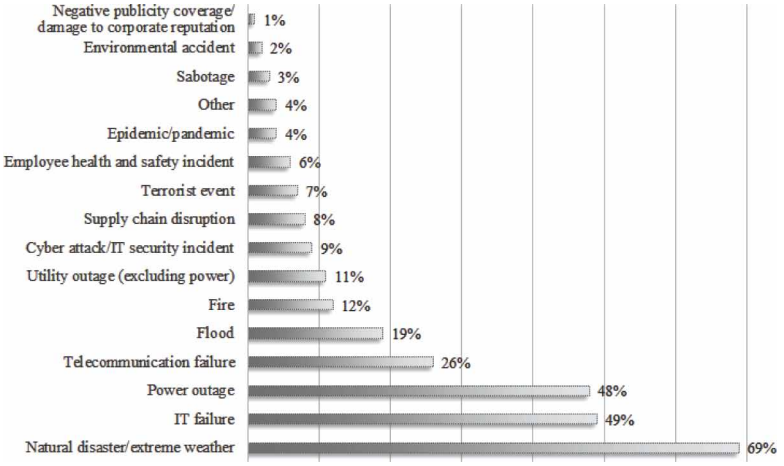
Thus, for (Hiles, 2007), the BC and its planning are the development of strategies, plans and actions to protect or determine alternative modes of operation for those functions that, if interrupted, could bring serious damage and even irreparable losses to Organizations.

The BC can be effective in dealing with either sudden interruption or gradual incidents. Activities are interrupted by a wide variety of incidents, many of which are difficult to predict or analyse. By focusing on the impact of the disruption rather than the cause, (Filho, 2016) states that the BC identifies the activities on which the organization depends and in determining what is needed to continue to meet its obligations.

Service Interruption and Disaster

In order to implement resilience and follow directives that encourage protection against disruptive incidents or events, Information Systems (IS) are increasingly prepared to resist failure. Any event that interrupts the business, whose origin is the loss of information, is classified as a disaster (Jardim & Serrano, 2007). Business protection comes from the ability to effectively recover from a disaster, with the least data loss and downtime possible (Carroll, 2011). Through Figure 1, it is possible to verify that most of the declared causes of disaster or business disruption, in 2015, are of power outage, IT failure and natural disaster or extreme weather.

Figure 1. Causes for BCP invocation by decision-makers and influencers, in 2015
Source: Adapted from (Balaouras, 2015)



Thus, considering the unpredictability of the causes with more occurrences presented in Figure 1, according to (Carroll, 2011), the most common recovery strategy to respond to disruptive events is data backup. The data protection methods to be implemented are governed by the following factors:

- *Recovery Point Objective* (RPO) refers to the previous point in time to which the organization wishes to recover the data following a disaster;
- *Recovery Time Objective* (RTO) refers to how much downtime an organization is willing to tolerate and varies for each system and data set;
- Availability;
- Budget.

Although the BCP does not prevent disasters from happening on its own, it will help to deal with the events by providing procedures for responding to situations created and triggered by them.

The BCM Lifecycle

In order for BCM to be controlled, assessed and continuously improved, it is important to incorporate it within a management system structure and disciplines, thus composing a BCM System (BCMS).

The BCM lifecycle comprises a number of elements, all of which need to be undertaken in order to implement business continuity management effectively (Cornish, 2011), even if not necessary to follow a particular order, there is a linkage between some of the elements. In organizations that have reached a higher maturity level, (Rössing, 2011) stresses that BC is an annual cycle following a lifecycle model.

The lifecycle represented in Figure 6, with the methodological approach components, identifies an ordered cycle path, similar to the one advocated in ISO 22301:2012. Nevertheless, many variables influence the decision to follow a specific order. If an organization accomplished an entire cycle of BCMS, an in the testing phase of the BCP, it encountered some improvements to be made in the BCP, then it can redesign and implement some part of the BCP.

In some cases, the reviewing of the BCP can evidenciate that, some disruption scenario, is not well addressed partially or entirely, creating the need to undertake the activities of a specific component of the methodology. In this case, for example, a review of the risk assessment may be necessary, therefore, the Business Impact Analysis (BIA) must also be reviewed, and probably, redefined. If there is already a BC Strategy defined, probably there is no need to redesign that strategy, and the BC Teams can decided to step through the alternatives to the critical functions.

The main rule is: if there is a change in the BC system, the BCMS must be able to rapidly adapt to that change, deciding the undertaking of the activities necessary to fulfil the objectives of the methodological components, following the BCM lifecycle defined, but with the flexibility to decide if the lifecycle must be restarted or resumed, in some component.

BCM Management

Disaster response situations are always atypical, requiring rapid decisions in an extremely dynamic and changeable environment, where countless information pass through, often confusing, incomplete or untrue, creating a complex challenge for those who are responsible in the organization.

Thus, it becomes necessary to create mechanisms to subsidize decision makers, with fast, updated and accurate information (National Research Council, 2009). Consequently, it is necessary to manage the BCM program in order to provide clear and unambiguous organizational directives and policies, appoint those responsible for implementing and executing the policies defined, and build the action plans for DR and BC (Jardim & Serrano, 2007). It is critical to the success of BCM that both employees and managers understand the need and significance of planning and managing continuity.

The organization should define, in a BC policy, the recovery objectives in a clear and realistic way, considering the scope and extent of implementation of the BCP. Critical deadlines for recovering vital business processes should be defined, taking into account various elements such as cost, as well as the types of disaster they intend to address.

The critical functions for the business, or those with the most impact, should be recovered as a priority (Vancoppenolle, 2007). With this in mind, it should be carried out an evaluation study and measurement of priorities in the order of recovery in the event of a disaster.

Rehearsal, training and coaching on the designed plans is essential to take place regularly and monitored by the leaders of the BC and DR teams, with due analysis of results and lessons learned. This data will be used to re-evaluate the plans designed and possible proposals for improvement. Similarly, (Jardim & Serrano, 2007) confirms that plans should be updated and revised periodically to ensure validity and effectiveness, inclusion of new technologies, infrastructure or resources, new processes and new participants.

Business Continuity Plan

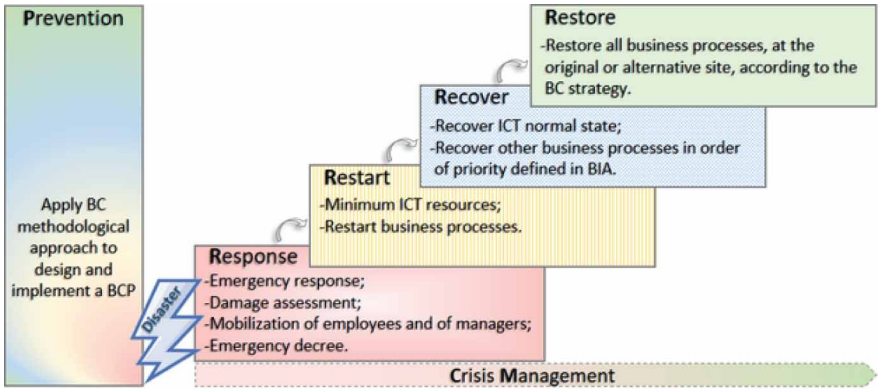
The ISO 22301:2012, defines BCP as documented procedures that guide organizations to respond, recover, resume, and restore to a pre-defined level of operation following disruption, noting that it typically covers resources, services and activities required to ensure the continuity of critical business functions.

Organizations must find solutions to ensure the integrity of information and prevent service interruptions, making BCM effective, avoiding serious consequences and severe interruptions to their business (Jardim & Serrano, 2007). Therefore, the planning for BCM prepares the organization to maintain the

continuity of its services, during the occurrence of a disaster, through the implementation of a contingency plan.

Planning must take into account the phases that characterize an interruption, so that it can act in its life spectrum, like presented in Figure 2.

Figure 2. Business interruption phases
Source: Adapted from (Guindani, 2008)



Thus, to be able to act in all phases, presented in Figure 2, it will be necessary to know the organization, its vital and priority business processes, recovery times and its ICT capability to recover and re-establish business functions.

The scenarios of unexpected situations or incidents (whether operational, disasters or crises) should be described in the BCP, which should contain, in a systematised declaration, the contingency actions to be carried out by the teams involved, in accordance with their roles in continuity.

The BCP is not a mere project, but a regular process of organizations as many other business processes the organization has structured (Trindade, 2008). Even in cases where the BCP is omissive, when the cost of risk is lower than the cost of treating the risk, the author states that if any anomaly occurs, it will not be a disaster: the organization is prepared because it is aware. A BCP does not necessarily need to have a high degree of complexity in the case of small companies (Russo & Reis, 2019a).

The plan should be simple, clear, unambiguous and comprehensive. (Hiles, 2011b) highlights that plans based on different risk scenarios (e.g. fire or mechanical failure) are generally not effective; it is not the cause of the disaster that matters, but the result.

ICT Standards, Models and Frameworks

In order to provide an overview, underlying the business continuity theme, it is listed some of the most relevant standards, models and frameworks in the ICT field, considered to be applicable to an organization that is designing a BCP.

ISO/IEC 27001:2013

The scope of standard ISO/IEC 27001:2013, Information technology - Security techniques -Information security management systems - Requirements (ISO/IEC 27001:2013, 2013), specifies the requirements for establishing, implementing, maintaining and continually improving an information security management system within the context of the organization. This standard also includes requirements for the assessment and treatment of information security risks tailored to the needs of the organization, requirements for implement security backup, software and system images. Defines controls to plan information security continuity, especially during crises or disasters.

Communication is another aspect of the standard (APCER, 2018), by identifying the communication requirements: what needs to be communicated, when, by whom, and the process used.

ISO/IEC 27031:2011

Standard ISO/IEC 27031:2011 - Information technology - Security techniques - Guidelines for information and communication technology readiness for business continuity, describes the concepts and principles of ICT readiness for business continuity and incorporates the cyclical PDCA approach. It provides a framework of methods and processes to identify and specify all aspects (such as performance criteria, design, and implementation) for improving an organization's ICT readiness to ensure business continuity.

It applies to any organization developing its ICT readiness for BC program (ISO/IEC 27031:2011, 2011), and requiring its ICT services/infrastructures to be ready to support business operations in the event of emerging events and incidents, and related disruptions, that could affect continuity (including security) of critical business functions.

The standard ISO/IEC 27031: 2011 includes and extends management practices and management of information security incident and planning of ICT readiness services. It supports ICT readiness for BC (ISO/IEC 27031:2011, 2011), by ensuring that ICT services are as resilient as appropriate and can be recovered to pre-determined levels within the timeframe required and agreed by the organization.

The availability of ICT according to (ISO/IEC 27031:2011, 2011) covers:

- Prepare the organization's ICTs against unpredictable events that could alter the risk environment and affect ICT and business continuity;
- Leverage and simplify resources between BC activities, disaster recovery, emergency response and ICT security incident management.

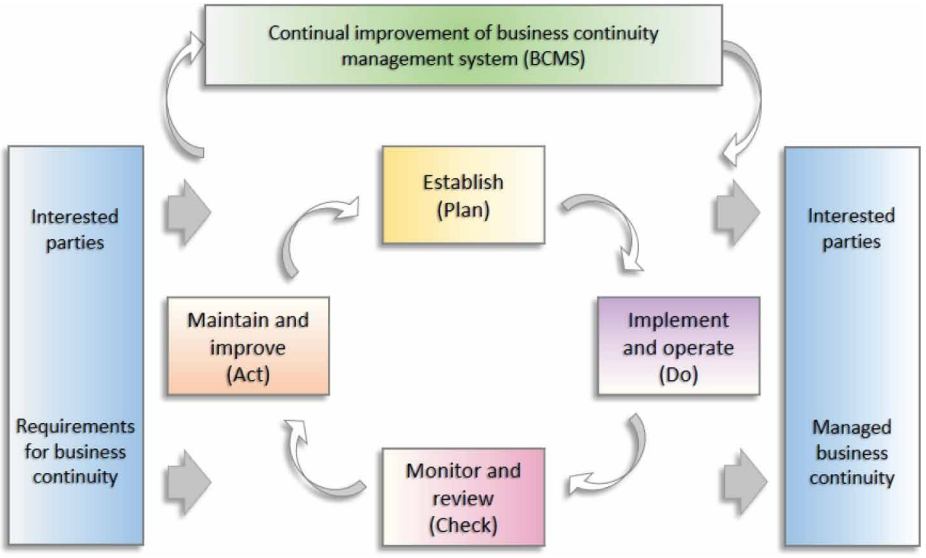
The readiness of ICTs should effectively reduce the impact (i.e. extent, duration and/or consequences) of information security incidents on the organization.

ISO 22301:2012

The standard ISO 22301:2012 - Societal security -- Business continuity management systems -- Requirements (ISO 22301:2012, 2012) specifies generic requirements, applicable to all organizations, to plan, establish, implement, operate, monitor, review, maintain and continuously improve a documented management system to protect, reduce the probability of occurrence, prepare for, respond to and recover from service interruption incidents as they arise.

This standard adopts the PDCA model for application to an organization's BCMS processes (ISO 22301:2012, 2012). Figure 3 illustrates how a BCMS considers stakeholders and BC requirements as inputs and, through necessary actions and processes, produces continuity results that meet the requirements.

Figure 3. PDCA model applied to BCMS processes
Source: Adapted from (ISO 22301:2012, 2012)



In accordance with the Plan phase of the model presented in Figure 3, the sub clause 8.4.4 Business Continuity Plans, indicates that the organization shall establish documented procedures for responding to a disruptive incident and how it will continue or recover its activities within a predefined timeframe (ISO 22301:2012, 2012), as well as what BCP should contain.

Recovery is referred to in sub clause 8.4.5 emphasizing that the organization shall have documented procedures to restore and return business activities from the temporary measures adopted to support normal business requirements after an incident. In sub clause 8.5, the (ISO 22301:2012, 2012) states that the organization shall have, exercise and test the BC procedures to ensure that they are consistent with its business continuity objectives.

ISO 22313:2012

Standard ISO 22313:2012 - Societal Security - Business Continuity Management Systems - Guidelines, provides guidance based on good international practice for planning, establishing, implementing, operating, monitoring, reviewing, maintaining and continually improving a documented management system that enables organizations to prepare for, respond to and recover from disruptive incidents when they arise.

It is the intent of the standard to allow an organization to design a BMCS that is appropriate to its needs and meets the requirements of its interested parties. The standard is generic and applicable to all types and sizes of organizations that wish to (ISO 22313:2012): establish, implement, maintain and improve a BMCS and ensure compliance with the organization's BC policy.

ITIL V4

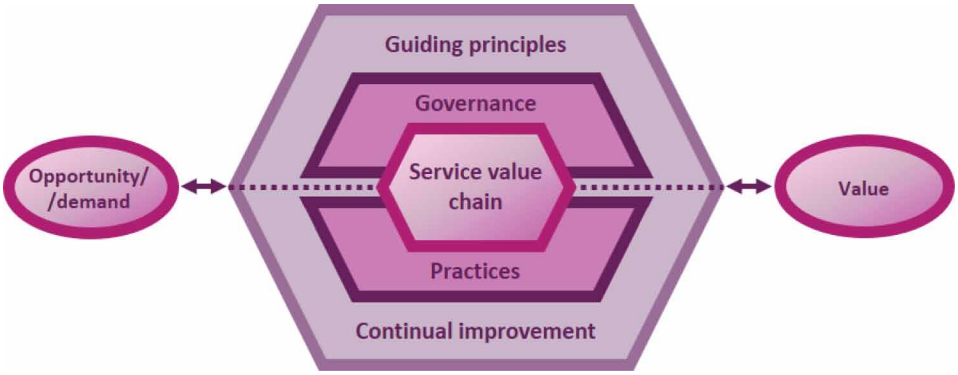
ITIL is an ICT Service Management framework that seeks to align ICT services with business needs. ITIL aims to provide a framework to manage and deliver different services. ITIL practices help to achieve good quality of service and overcome difficulties (ITIL® Em Portugal, 2018) that can arise in the development of ICT systems.

ITIL enables organizations to define and implement repetitive and documented processes, describing processes, procedures, tasks and checklists applied to ICT Service Management. These resources allow organizations to integrate ICT with the organization's strategy (ITIL, 2019), delivering value and maintaining a minimum level of competence.

ITIL V4, the latest version of the ICT Service Management framework guarantees continuity (ITIL, 2019). The key components of the ITIL 4 framework are the Service Value System (SVS) and the four-dimensional model: Organizations and People, Information and Technology, Partners and Suppliers and, finally, Value Streams and Processes.

ITIL SVS describes how the various components and activities of the organization work together to facilitate the creation of value through services provided by ICT. These can be combined in a flexible way, which requires integration and coordination to keep the organization consistent. ITIL SVS facilitates this integration and coordination and provides strong, unified value-focused direction for the organization (ITIL, 2019), as shown in Figure 4.

Figure 4. ITIL service value system
Source: Adapted from (ITIL, 2019)



Although the new representation of service management, through the service value chain, presented in Figure 4, the concepts of ITIL V3 processes remain in ITIL 4 (ITIL, 2019), but known are now as management practices and fit into three different groups:

- **General management practices:** Group containing 14 management practices (e.g. project management, relationship management, strategy management and risk management);
- **Service management practices:** Group containing 17 management practices (e.g. business analysis, capacity and performance management, incident management, service continuity management, change control and problem management);

- **Technical management practices:** Group containing three management practices: deployment management, infrastructure and platform management, and software management and development.

COBIT

COBIT, developed by the Information Systems Audit and Control Association (ISACA), is a reference guide of good practices on the implementation of ICT Governance (ISACA, 2018), which shall be adapted to each organization.

COBIT 2019 is composed of 40 objectives in two key areas, Governance and Management, divided into 5 domains as shown in Figure 5.

Figure 5. COBIT 2019 core reference model of governance and management objectives
Source: Adapted from (ISACA, 2018)

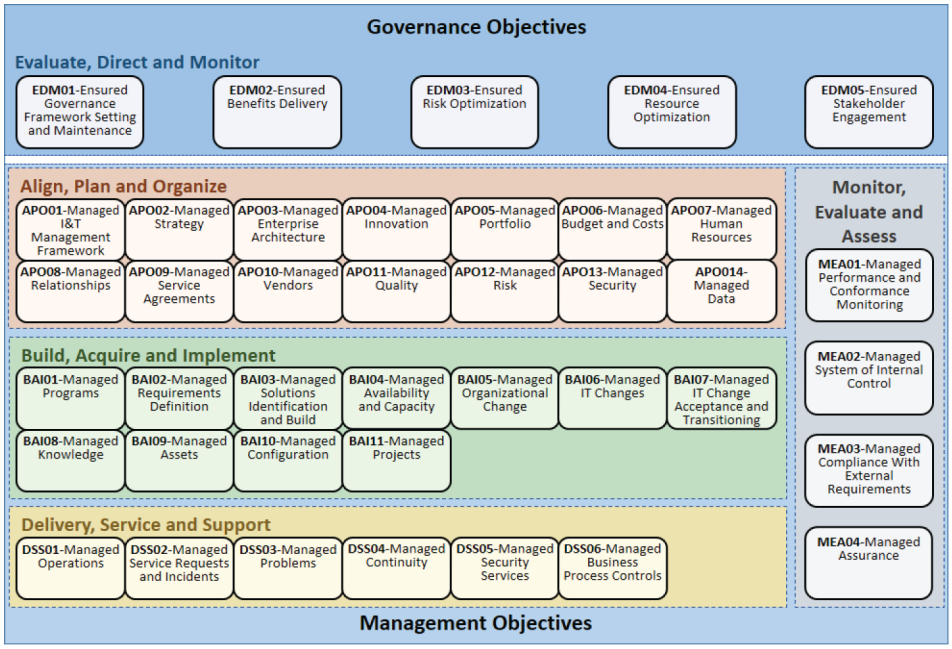


Figure 5 enables identification of five Governance objectives and the other thirty-five are Management objectives. Governance ensures that the needs, conditions and options of stakeholders are evaluated in order to determine balanced, agreed-on enterprise objectives; defining direction through prioritization and decision-making; and monitored performance and compliance against agreed-on direction and objectives (ISACA, 2018). Management plans, builds, runs and monitors activities in alignment with the direction set by the governance body, to achieve the enterprise objectives.

In COBIT 2019, to satisfy governance and management objectives, each enterprise needs to establish, tailor and sustain a governance system built from a number of seven components. (ISACA, 2018), that are:

- Processes, describing a set of practices and activities;
- Organizational structures are the key decision-making entities in an enterprise;
- Principles, policies and frameworks;
- Information produced and used by the enterprise;
- Culture, ethics and behaviour of individuals and of the enterprise;
- People, skills and competencies are required for good decisions, execution of corrective action and successful completion of all activities;
- Services, infrastructure and applications that provide the enterprise with the governance system for ICT processing.

One of the management objectives addressed in COBIT 2019 is "DSS04 - Managed Continuity", from the domain "Deliver, Service and Support" (ISACA, 2018). It is described as the establishment and maintenance of a plan to enable the business and IT organizations to respond to incidents and quickly adapt to disruptions. This will enable continued operations of critical business processes, required ICT services and maintain availability of resources, assets and information at a level acceptable to the enterprise.

The Management Objective DSS04 (ISACA, 2018) defines the activities and example metrics for each of the eight Management Practices:

- **DSS04.01:** Define the business continuity policy, objectives and scope;
- **DSS04.02:** Maintain business resilience;
- **DSS04.03:** Develop and implement a business continuity response;
- **DSS04.04:** Exercise, test and review the BCP and disaster response plan;
- **DSS04.05:** Review, maintain and improve the continuity plans;
- **DSS04.06:** Conduct continuity plan training;
- **DSS04.07:** Manage backup arrangements;
- **DSS04.08:** Conduct post-resumption review.

CMMI

CMMI is an integrated model for measuring the maturity and capability of an organization's processes, by a process improvement approach (CMMI Institute, 2019b). It is a set of global best practices that addresses productivity, performance, costs, and stakeholder satisfaction, driving business performance through building and benchmarking key capabilities.

The version CMMI 2.0 (CMMI Institute, 2019b), is organized in integrated sets of good practices that improve the performance and key capabilities of organizations, such as:

- CMMI Development improves an organization's capability to develop quality products and services that meet the needs of customers and end users;
- CMMI Services improves an organization's capability to efficiently and effectively deliver quality service offerings that meet market and customer needs;
- CMMI Supplier Management improves an organization's capability to identify and manage suppliers and vendors in a way that maximizes supply chain efficiency and reduces risk.

It should be noted that CMMI Services addresses several management issues in the Capability Area "Managing Business Resilience" (CMMI Institute, 2019c), which aims to anticipate and adapt to disruptions and opportunities, namely the practice areas of " Incident Resolution & Prevention", " Risk & Opportunity Management" and "Continuity".

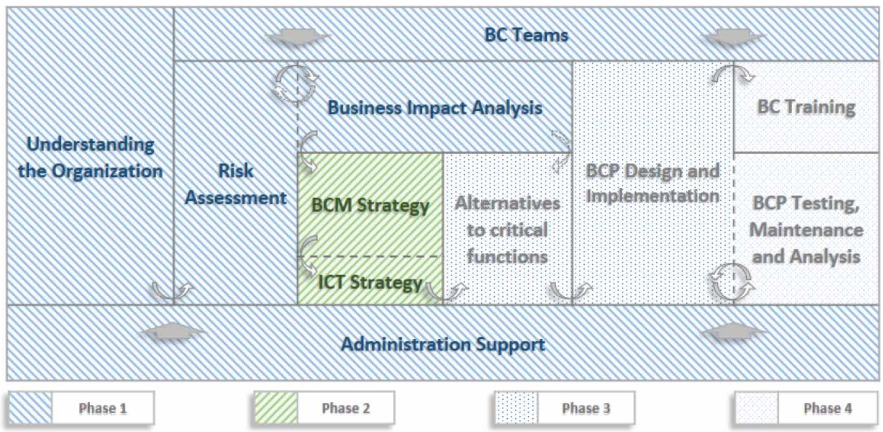
BUSINESS CONTINUITY MANAGEMENT METHODOLOGY

Like any other management system, BCM needs to be planned, implemented and improved continuously. During the planning phase in the implementation of BCM, it is defined what is expected to be achieved, and how. It is vital that BCM supports the objectives and goals of the organization and the needs of its stakeholders (Cornish, 2011). It should implement the main components of the BCM and include checks and controls to ensure that each component is implemented effectively. Ongoing exercise, maintenance, review and audit will provide the basis for the administration to ensure that BCM improves over time.

The management of the BCM programme enables the BC capability to be established (if necessary) and maintained in an appropriate manner to the size and complexity of the organization.

Figure 6 has been created to present the essential components and phases of the BCM methodology for designing a BCP.

Figure 6. BCM methodology components



Following each of the phases of the methodology presented in Figure 6, (Russo, 2019) aims to design a BCP, in its essence, complete and adapted to the organization.

The author (Cornish, 2011), states that the adoption of a BC methodology can be made by taking some steps. In the methodological approach presented in this chapter, some phases are identified, to create a gradual development of a solution that can be structured by different teams, segregated by knowledge or technical responsibility and properly framed in time.

The first phase aims at obtaining the support of the administration and the creation of the BC teams, which will remain active in all phases of the methodology. Once this stage is complete, it is necessary to understand the organization, its business processes and the relationship and flow of information

between them, providing information that allows them to prioritize their continuity and the urgency of the activities that are necessary to deliver them. This understanding derives from the risk assessment and the execution of a business impact analysis for the identified risks, which will allow preparing the context for the next phase and defining the requirements that will determine the selection of appropriate BCM strategies.

The second phase objective will determine the BC strategies that allow an appropriate response to be selected for each business process or activity. The selection made will be able to consider the resilience and countermeasures options already present in the organization or incorporate new options.

The third phase of the methodology focuses on the development and implementation of a BCM response, through the analysis of alternatives to critical functions, considering technological, human resources or outsourcing alternatives, alternative business processes or alternative workflows steps within a business process. Now the organization is ready to define a solid response to manage incidents and prepare continuity, implementing BCP that details the stages to be follow during and after an incident, in order to maintain or restore operations.

The last phase objective is to exercise, maintain, review and audit BCM and BCP solutions, which lead the organization to be able to demonstrate the extent to which its strategies and plans are complete, current and accurate and identify opportunities for improvement. Training in BC helps to understand gaps in readiness, aspects to improve in the response, technical and organizational capabilities within the BC teams and collaborators and to maintain the active continuity organizational culture.

In the context, (Brandt, 2015) presents the considerations for a successful BCP design, as well as the factors of success in its implementation:

- Management buy-in and support;
- Effective processes to evaluate and identify key business functions;
- Clearly stated targets;
- Properly trained BCP team members (according to the training programme);
- Clear and concise project plan;
- Clearly stated responsibilities;
- Clearly stated budget considerations.

The BCM methodology presented is therefore considered to encompass the concerns underlying the theme.

Understanding the Organization

The analysis of the operational environment of the company is one of the first steps to understanding the organization (Wan & Chan, 2008), through a systematic analysis of products or services, availability, activities and dependencies of the environment, other services and resources. This analysis includes the phases of identification and evaluation of business processes. In this sense, (Russo & Reis, 2019b) propose a decision process that emphasizes the need to know the professionals, the organization's departments and the legal framework, given the specificity of the organization's business.

Therefore, in order to develop the analysis, (Vancoppenolle, 2007) advises the identification of how the organization is integrated through three components:

- **Business Processes:** How products and services are delivered;
- **Participants:** Who participates in the execution of the business processes;
- **Infrastructure and Resources:** Used in the execution of business processes.

These components are interconnected (Vancoppenolle, 2007), integrated through information flows, allowing the organization to execute business operations.

Information availability is the process of keeping people and information connected and protecting the flow of information so vital to organizational survival (Smith & Shields, 2011), as it helps to protect profits, operations, customer base and reputation.

Only after analysing how the organization produces and delivers value, knowing its assets and relationships, will it be able to begin the risk assessment process defined in ISO 22301, which encompasses the global process of risk identification, analysis and assessment. However, to start this activity, it is necessary to obtain the support of the administration.

Administration Support

Management support is vital to the life cycle of any project. For an organization to succeed in developing and maintaining BC capability, (Cornish, 2011) advocates that a clear commitment from the administration and its support for the project is essential.

It is therefore considered that the commitment of top decision makers is fundamental to the success of a project with a BC scope.

It is advocated that the top management should be involved and committed with the BC in order to accept easily the changes and restructuring or improvements underlying the BCMS. Therefore, the allocation of human, technological or financial resources, as part of the reaffirmation and validation of BC decisions and solutions, to employees should be an assumed strategy.

Risk Assessment

Risk is commonly defined in dictionaries as “hazard; chance of loss” or “exposure to the chance of injury”. Thus, in reciprocal articulation with BIA, a Risk Assessment project must be created, which integrates activities of analysis of the most serious risks and which aims at the identification of risk mitigation measures, reducing the probability and/or impact of this risk if it occurs.

The associated risk is calculated considering the probability of occurrence and its potential impact: Risk = Probability x Impact. The value of a given risk will indicate the seriousness of the risk, and a risk assessment matrix shall be constructed, for example, as described by Annex E - Information security risk assessment approaches of ISO/IEC 27005:2018.

Thus, (Charters, 2011) proposes a set of practices for risk assessment and identifies five stages to reaching this objective:

- Understand the loss potentials and vulnerability to such losses;
- Evaluate risk analysis tools and techniques;
- Define a risk evaluation strategy;
- Select a process to evaluate risk;
- Establish risk avoidance measures to prevent or minimize the effect.

The appropriate reaction for each type of risk identified in the risk and impact assessment matrix, according to (Charters, 2011), should consider:

- **Accept the Risk:** It may be reasonable if the impact of a rare event is low and does not compromise the business, or risks that are beyond the organization's control;
- **Manage the Risk:** For frequent low impact risks, the strategy is to monitor and seek to reduce the risk;
- **Reduce the Risk:** For frequent potentially damaging events, by reengineering and monitor the hazardous procedure or, alternatively, by outsourcing the risk;
- **BC Planning:** Address low probability risks but whose potential impact is business failure.

Removing risk completely is unlikely (Charters, 2011), but if organizations concentrates the risk assessment only on core business processes, many may end up being victims of damaging impacts from risks that they had not identified or sought to control.

Business Impact Analysis

The Business Continuity Institute (BCI) advocates that the objective of risk assessment and control, in the context of BCM, is to determine the events that may adversely affect an organization, the damage that such events may cause, the timeframe necessary to restore normal operations and the controls that can be implemented to reduce the probability of impact (BCI, 2019). Therefore, BIA shall be configured as a process for identifying critical business functions and the losses and effects if those functions are not available, based on the Risk Assessment stage that feeds reciprocally the BIA stage. The application of BIA in the BCM program is mandatory, providing data collected directly from stakeholders in critical processes, presenting how those responsible perceive the risk, impacts and how these impacts could be controlled, reduced or avoided (Kosutic, 2019a). The effect of the disruption can be quantified through its financial impact (Wan & Chan, 2008), and/or strictly operational or legal or environmental impact.

BIA must conclude with the prioritization and classification of business functions based on the criticality of activities for the organization (Gorayeb, 2012), which can be classified as critical, essential, necessary and desirable functions. From the ICT point of view, (Trabula, 2010), states that the BIA should rigorously define critical IS by assigning a degree of priority of recovery and identifying the impact on the organization according to the time of unavailability. BIA can characterise IS in the following way:

- ICT that support the IS;
- IS vulnerabilities identification;
- Assigning the degree of priority for recovery;
- Identification of the impact on the organization in case of unavailability;
- Assigning the degree of criticality;
- Alternative procedures identification;
- Identification of interdependencies between IS;
- RPO identification;
- RTO identification.

Thus, (Gorayeb, 2012) advocates that the expected results of the BIA report may allow the identification of which components and equipment are crucial to sustain ICT systems or infrastructures. Also allows the recognition of dependencies and relationships between business processes, enabling the quantification of immediate financial and non-financial losses and in due time - justifying the investment in BC - the RTO and RPO and the basis for the development of the organization's recovery strategy and BC.

BC Teams

The classic BC plans divide operational activities into two: one deals with ongoing operations not affected by the disaster and the other deals with the consequences of the disaster and its recovery. An Emergency Management Team (EMT) should be created and will have its own high-level BCPs that are integrated with recovery action plans of the subordinated departments or business units.

Right after a disaster is declared, (Jardim & Serrano, 2007) state that the BCM Team or Disaster Recovery Team (DRT) should meet, assess the damage and the extent of the impact and decide on the appropriate recovery steps to implement, according to the impact of the disaster, taking into account their duties and tasks.

The role of EMT is to make business decisions, evaluate and make judgments on business priorities and to facilitate and support the BC manager (Hiles, 2011b).

An Emergency Operational Center (EOC), states (Hiles, 2011b), shall usually be created, which contains all the technical infrastructure and documentation needed to oversee the recovery effort.

The teams should preferably be made up of employees with an adequate level of professional technical qualification and knowledge of the organization's business, according to (Guindani, 2008). It is the responsibility of each member of the team to provide information when changes occur, ensuring that plans are always kept up to date (Guindani, 2008). It is a common obligation for members of these groups to report to the EOC as soon as they are notified of the occurrence of a problem.

BCM Strategy

The strategy of BCM, according to (O'Hehir, 2007), is to engage in a set of activities identified in the BCP definition, by the identification and protection of critical business processes and resources required to maintain an acceptable level of business, protecting those resources and preparing procedures to ensure the survival of the organization in times of business disruption.

At a higher level, (Kosutic, 2019b) considers the strategy as the definition of a plan taking into account the challenges and objectives of the company. In the BC Strategy activity, high-level solutions must be defined for the recovery of critical functions within the deadlines defined in BIA and preventive controls to reduce the exposure to risk related to disruptive events.

Determining BC strategies, according to (Gorayeb, 2012), involves choosing what procedures will be adopted to enable the organization to protect, sustain and recover its business and designing a set of work plans for BC that involves:

- Risk Management Plan;
- Crisis Management Plan (CMP);
- Disaster Recovery Plan (DRP);
- BCP.

The restart strategy is an important determinant of the costs, and the options, according to (Hiles, 2011b), are as follows:

- **Do Nothing:** Wait until a disaster happens and hope to acquire equipment and facilities at the time;
- **Bunker:** Limit risk to a level where management decides any further DRP is unnecessary, protecting only what is inside;
- **Continuous Processing:** Provide continuous "shadowing" or "mirroring" of the production operation at an alternative site with adequate capability and communications links to permit the production operation to be switched to the alternative site;
- **Distributed Processing:** Spread the risk around different locations, dedicate equipment for various types of production and, alternatively, replicate operations at different sites in order to gain even more resilience;
- **Alternative Site:** Consider a BCP that involves operation at an alternative site, with readiness of the standby equipment depending on the required recovery timeframe.

It is therefore considered that the strategy should be appropriate to the specificity of the business.

ICT Strategy

Organizations exist at a time when strategies are changing to incorporate rapid technological development (Smith & Shields, 2011) and need to be prepared to absorb the impact of any incident or event.

Therefore, Information Systems Planning (ISP) become crucial, states (Santos, 2018), for the development and implementation of effective strategic plans in organizations and the role of ICT is very relevant in both strategies. The author (Reis, 2001) considers that the definition of a BC strategy should be linked to the specificity of the organization interacting directly with the ISP in order to implement the strategies throughout the life cycle of the projects.

All organizations interested in leveraging their technology investments to obtain the maximum return and to ensure the availability of information in the ICT infrastructure, will refer to relevant standards and drivers as appropriate, and according to (Smith & Shields, 2011), should consider:

- Moving towards holistic information availability;
- Understanding the business information flow;
- How to determine business criticality and conduct risk assessments;
- Determining the right strategy for information availability;
- Recovery and availability options for ICT;
- Leveraging communications at time of test, disaster and within production environments;
- Future trends within information availability.

Some of the activities previously presented will be more detailed or specific versions, at the ICT level, than those presented in the first phase of the methodology, for example, the information flows may take into account the ICT infrastructure or the ISs involved.

Once BIA is complete and there is a good understanding of the applications and software to be protected that are critical, the next step is to bring together those with technical expertise and business

responsibility to work with the information flow model. The creation of an information flow model provides the organization with an overview of implemented technologies and topologies as well as communication aspects.

It is considered that the information flow of a company should be protected (Smith & Shields, 2011), taking into account what is financially prudent and meeting the organization's RTO and RPO needs and the synchronization of information between systems. From this activity comes the necessary information to understand which business functions need alternative solutions in order to ensure continuity.

Alternatives to Critical Functions

The unavailability of ICT infrastructure has always been the focus of traditional DR planning in ICT, which has focused mainly on replacement or change to an alternative infrastructure (Vancoppenolle, 2007). Executing the most critical business activities with limitations in infrastructure, business processes and personnel is one of the fundamental challenges of BCM.

For many organizations, the availability of critical systems and data is as important as the recovery capability. One aspect to take into account when defining the technological solution for data recovery is high availability (Carroll, 2011). The overall design should be resilient and capable of withstanding individual failures and must include areas such as power, environment, network infrastructure, system hardware and software.

Alternatives for the continuity of critical business processes should be considered, whether designing optional secondary flows, capable of fully or partially replacing a given process task, such as through the selection of substitute techniques or technologies.

An organization should have several operational approaches and should not rely on just one technology.

BCP Design and Implementation

In a simple and most basic, a BCP can be defined as an interactive process that is created to identify critical business functions (Nickolett, 2001), as well as a set of policies, processes, plans and procedures in order to ensure continuity of functions in the event of an unforeseen event.

From the ICT point of view, (Gorayeb, 2012) considers that designing the BCP is about gather detailed specification of infrastructure, systems and communication network. The BCP depends on the nature of the business, the intended investment and the choice of the best alternative proposed in terms of the risk protection measure cost and the benefit that this measure will bring when implemented in the organization.

The plan will address all phases of the disaster (Hiles, 2011b), where the initial emergency phase covers evacuation, incident escalation, damage assessment and limitation, disaster declaration, invocation of standby arrangements, recover of off-site of materials to standby sites, and staff redeployment.

The recovery phase covers the re-establishment of operations under standby arrangements in parallel with restoration of longer-term facilities (Hiles, 2011b). The plan should also consider the reset of standby facilities to the permanent base. In the recovery phase, different procedures, practices, equipment and software may be involved, and it is important to manage change and its audit trail to allow restoring, properly the business processes.

The design of the BCP is considered to be a documented product of all stages accomplished until this point. With the announced support of the administration and with the knowledge of the BC teams, a

complete understanding of the business processes and information flow permitted a comprehensive risk assessment activity, determining their impact on business. The important definition of the ICT strategy considering the BCM strategy drives the process of orchestrating a set of alternatives to critical functions, according to the organization capability. The implementation of the BCP designed is now the stage of creating the necessary organizational, financial and ICT conditions to deploy the plan.

BC Training

Awareness and training programmes are a response to the need to proceed appropriately (Hiles, 2011a), as their objectives are to create organizational awareness and improve the skills needed to develop, implement, maintain and execute the BCP.

Training plans should be specific, simple and complete, but at the same time meet the various training needs (Jardim & Serrano, 2007). Specific objectives should describe all critical activities that trainees must perform in the event of a disaster in order to be able to perform successfully all responsibilities when the plan is activated.

BCP Testing, Maintenance and Analysis

One of the oldest axioms in the field of DR or BC planning is that a plan that is not tested or maintained is of little value (Armit, 2011), or in some cases worse than no plan at all.

In the "BCP Testing, maintain and analysis" methodology component, the main directive is that the people involved in incident response should be exercised and critical function recovery solutions tested in realistic situations (Kosutic, 2019c), in order to find what does not work in the BCP.

(Guindani, 2008) refers that the tests/simulations performed will generate the evidence, making it possible to improve and/or correct the plans, validating the effectiveness of the recovery strategies adopted and the plans developed. The objective will be to raise awareness (Armit, 2011) and give the organization confidence that the approach and strategies adopted could be used in the event of a genuine incident.

A regular testing schedule will ensure that plans are updated, proven and maintained by those who need to use them (Armit, 2011). Thus, along time, tests should reflect changes in operation and improvements in recovery planning as defined in BC policy. It is necessary to have a change management process for BC that covers maintenance and revision changes to keep the plans up-to-date.

SOLUTIONS AND RECOMMENDATIONS

It is recommended that the organization separate the BCM Strategy from the ICT Strategy, in order to keep them more updatable and less coupled, although making efforts to keep them cohesive. Strategic BCM objectives can be defined regardless of the actual ICT implementation to be as less dependent on technological solutions, having the focus on what the organization wants and not how can it be done.

The stages of Risk Assessment and BIA are reciprocally communicating and with a similar language, but it is recommended that the teams keep separated when in discovery activities or brainstorming, in order to maintain a non-contaminated flow of inferred incoming inputs to the assessment of risks or to the analysis of its impact.

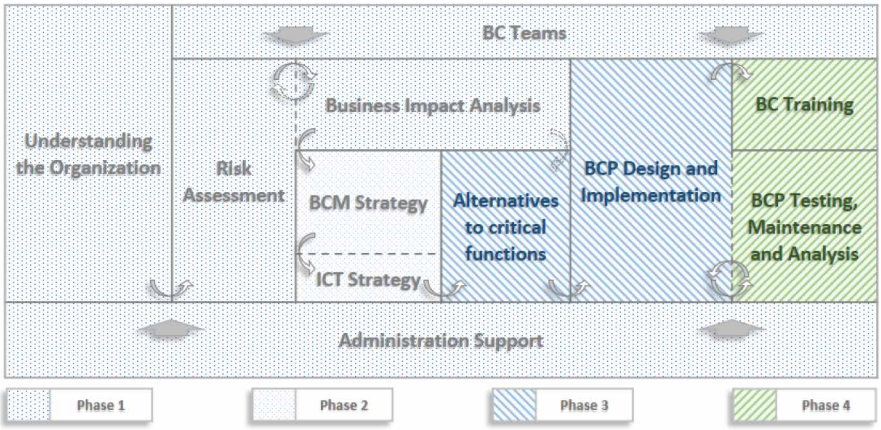
Analysing, reviewing, testing and maintaining of the BCP are important factors for keeping the plan alive. The support from the administration can be less visible after the successful first cycle of the methodology, but don´t let it fade out.

FUTURE RESEARCH DIRECTIONS

This chapter reflects on a methodological approach to the systematization of the BC on an organization, having in mind, specially, the implementation of the BCP. However, the work is not finish, and the organization needs to maintain the effectiveness of the BCP. Therefore, there is the need to optimize it along the BCP application. As Winston Churchill said, it is always wise to look ahead, but difficult to look further than you can see. The optimization of the BCP is an important set of activities, that where less revealed in the current chapter, but a future research direction. One of the important tasks to achieve is to establish the training guidelines and design the BCP testing.

Figure 7 represents the focus on the components of phase three and four, as the ones that most contributes to the optimization of the BCP. The approach represented in this chapter follows a workflow along the BIA and BCM Strategy, although the optimization can go directly from BIA to the definition of alternatives to critical function, when there is no need to redefine the BCM Strategy.

Figure 7. Optimization of BCM implementation



For future work, it is intended to apply the methodology to a small organization, with no BC awareness and register the difficulties, constraints, suggestions and improvements to be made.

CONCLUSION

The literature has reviewed on the area of BC and on what the most commonly used standards and good practices advocate. In this way, the state of the art in the domain of the BC was characterized, in order to

systematize the information in the domain of knowledge, with added value for the scientific community, as well as for the users researching in this type of problem.

It is concluded that the proposed methodology contains indicative guidelines in order to allow DR and BC in organizations. It is considered that the standards and good practices have considerations or requirements that can enhance the BC in an organization.

The proposed methodology aims to provide organizations with a tool to consider the processes and considerations for the inclusion of the systematic BCM in the organization, in order to maintain the segregation of the phases, and to allow for the assignment of specific BC teams, with technical capability and knowledge directed towards the thematic of each of the phases.

This work is intended to encourage the adoption of concrete strategies and procedures for business continuity in organizations, thus closing the gap between established organizational practices and the good practices recommended by international standards and drivers of good practices.

REFERENCES

APCER. (2018, november 16). *A nova versão da ISO/IEC 27001:2013*. Retrieved from Apcer - Associação Portuguesa de Certificação: https://www.apcergroup.com/brasil/index.php/pt/artigos-apcer/661/a-nova-versao-da-iso-iec-27001-2013

Armit, T. (2011). BC plan testing. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Balaouras, S. (2015). The State of Business Continuity Preparedness. *Disaster Recovery Journal*.

BCI. (2019, May 5). *GPG Lite 2018 Edition.* Retrieved from Business Continuity Institute: https://www.thebci.org/resource/gpg-lite-2018-edition.html

Brandt, J. (2015). *Business Continuity and Disaster Recovery Planning*. Tulsa: Stinnett & Associates LLC.

Carroll, T. (2011). Planning to Recover Your Data: More Options. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Charters, I. (2011). Risk evaluation and control: practical guidelines for risk assessment. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

CMMI Institute. (2019b, February 2). *Introducing CMMI V2.0*. Retrieved from CMMI Institute: https://cmmiinstitute.com/cmmi

CMMI Institute. (2019c, February 18). *General Info On CMMI V2.0*. Retrieved from CMMI Institute, an ISACA Enterprise: https://cmmiinstitute.zendesk.com/hc/en-us/sections/115003724087-General-Info-on-CMMI-V2-0

Cornish, M. (2011). Business Continuity Management Methodology. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Filho, H. P. (2016). Como as organizações podem sobreviver às catástrofes e desastres? *Revista Banas Qualidade*, 30-35.

Gorayeb, D. (2012). *Gestão de Continuidade de Negócios aplicada no ensino presencial mediado por recursos tecnológicos* (Master's Thesis). São Paulo.

Guindani, A. (2008). *Gestão da Continuidade dos Negócios*. Integração.

Hiles, A. (2007). An introduction to business continuity planning. In A. Hiles (Ed.), *The Definitive Handbook of Business Continuity Planning* (2nd ed.). John Wiley & Sons, Ltd.

Hiles, A. (2011a). Awareness and training. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Hiles, A. (2011b). Developing and implementing the written plan. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

ISACA. (2018). *COBIT 2019 Framework - Governance and Management Objectives.* Schaumburg, IL: ISACA.

ISO 22301:2012. (2012). *Societal security - Business continuity management systems - Requirements.* Switzerland: ISO.

ISO 22313:2012. (2012). *Societal security - Business continuity management systems - Guidance.* ISO.

ISO/IEC 27001:2013. (2013). *Information technology - Security techniques - Information security management systems - Requirements.* ISO/IEC.

ISO/IEC 27031:2011. (2011). *Information technology - Security techniques - Guidelines for information and communication technology readiness for business continuity.* ISO/IEC.

ITIL. (2019). *ITIL Foundation ITIL 4 Edition.* London: AXELOS. ITIL® Em Portugal. http://www.itilportugal.pt/itil-o-que-e/

Jardim, N., & Serrano, A. (2007). *Disaster Recovery - Um Paradigma na Gestão da Continuidade*. FCA - Editora de Informática.

Kosutic, D. (2019a, january 14). *Como implementar a análise de impacto no negócio (business impact analysis – BIA) de acordo com a ISO 22301*. Retrieved from Advisera Expert Solutions: https://advisera.com/27001academy/pt-br/knowledgebase/como-implementar-a-analise-de-impacto-no-negocio-business-impact-analysis-bia-de-acordo-com-a-iso-22301/

Kosutic, D. (2019b, January 16). *A estratégia de continuidade de negócios pode ajudá-lo a economizar dinheiro?* Retrieved from Advisera Expert Solutions: https://advisera.com/27001academy/pt-br/blog/2010/12/16/a-estrategia-de-continuidade-de-negocios-pode-ajuda-lo-a-economizar-dinheiro/

Kosutic, D. (2019c, January 16). *Como realizar exercícios e testes de continuidade de negócio de acordo com a ISO 22301*. Retrieved from Advisera Expert Solutions: https://advisera.com/27001academy/pt-br/blog/2015/02/03/como-realizar-exercicios-e-testes-de-continuidade-de-negocio-de-acordo-com-iso-22301/

National Research Council. (2009). *Aplications of social network analysis for*. The National Academies Press.

Nickolett, C. (2001). *Business Continuity Planning White Paper.* Comprehensive Consulting Solutions, Inc.

O'Hehir, M. (2007). What is a business continuity planning (BCP) strategy? In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (2nd ed.). John Wiley & Sons, Ltd.

Ramakrishnan, R. K., & Viswanathan, S. (2011). The importance of Business Strategy in Business Continuity Planing. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Reis, L. (2001). *Planeamento de Sistemas de Informação e da Contingência e Recuperação* (Ph.D thesis). Braga: Universidade do Minho, Escola de Engenharia.

Rössing, R. v. (2011). BC audit. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Russo, N. (2019). *Guia de Apoio à Conceção de Plano de Continuidade de Negócio nas Organizações com Programas Informáticos de Faturação* (Master's thesis). Setúbal: Instituto Politécnico de Setúbal.

Russo, N., & Reis, L. (2019a). Análise da problemática subjacente à certificação de programas informáticos de faturação. CISTI'2019 - 14ª Conferência Ibérica de Sistemas e Tecnologias de Informação.

Russo, N., & Reis, L. (2019b). Caracterização da Faturação em Portugal: sob a perspetiva da certificação de programas informáticos de faturação. *Revista de Ciências da Computação, 14*.

Santos, V. (2018). *Criatividade em Sistemas de Informação*. FCA, Editora de Informática, Lda.

Smith, M., & Shields, P.-A. (2011). Strategies for Continuity and Availability for Information and Communications Technology (ICT). In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Syed, A., & Syed, A. (2004). *Business Continuity Planning Methodology*. Sentryx.

Tangen, S., & Austin, D. (2019, February 12). *Business continuity - ISO 22301 when things go seriously wrong*. Retrieved from International Organization for Standardization: https://www.iso.org/news/2012/06/Ref1602.html

Trabula, J. (2010). *Plano de Continuidade de serviços, no âmbito dos Sistemas de Informação da FAP.* Pedrouços: FAP.

Trindade, J. (2008). *Plano de Continuidade de Negócio da Sociedade Interbancária de Serviços (sibs) - Estudo de caso numa perspectiva de gestão de benefícios* (Master's Thesis). Lisbon: ISCTE.

Vancoppenolle, G. (2007). What are we planning for? In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (2nd ed.). John Wiley & Sons, Ltd.

Wan, S. H., & Chan, Y.-H. (2008). Adoption of business continuity planning processes in IT service management. *3rd IEEE/IFIP International Workshop on Business-driven IT Management*, 21-30. 10.1109/BDIM.2008.4540071

KEY TERMS AND DEFINITIONS

Business Continuity: Capability of the organization to continue delivery of products at acceptable predefined levels following disruptive incident (ISO 22301:2012, 2012).

Business Continuity Plan: Business continuity plans are made up of documented procedures. Organizations use these procedures to respond to disruptive incidents, to guide recovery efforts, to resume prioritized activities, and to restore operations to acceptable predefined levels. Business continuity plans usually identify the services, activities, and resources needed to ensure that prioritized business activities and functions could continue whenever disruptions occur (ISO 22301:2012, 2012).

Critical Functions: The business process or activities that can disrupt the organization capability to ensure the delivery of products.

Disaster Recovery: Is an organization's method of regaining access and functionality to its IT infrastructure, to continue the delivery of services that support business processes, after a disruptive incident.

Life Cycle: Is the sequence of phases that a project goes through from its initiation to its closure.

Risk Assessment: Overall process of risk identification, risk analysis and risk evaluation (ISO 22301:2012, 2012).

Service Delivery: Is the manner in which a corporation provides users access to IT services, which include applications, data storage and other business resources.

Chapter 11
Interactive TV as Part of Crossmedia Systems in Order to Enhance Informal Learning: The eiTV Case Study

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ABSTRACT

Crossmedia systems are becoming the trend due to technological advances, better interfaces design, and changes in user habits. Due to the use of different devices as part of the same crossmedia system, which allow supporting a multiplicity of contexts of use, useful when considering learning scenarios, new research opportunities and challenges have arisen in the design of these systems. This chapter addresses the effective design of crossmedia systems and interfaces with a particular emphasis on iTV, PC, and mobile devices, through the eiTV application, designed and developed to illustrate and explore this paradigm, based on cognitive and affective aspects that influence user experience. The eiTV application is capable to create, access, and share personalized informal learning environments (created as additional information to the video being watched), via iTV, PC, and mobile devices (the preferred or most adequate device in each context of use).

INTRODUCTION

Video is a very rich medium, in cognitive and affective terms, to convey information and support learning and entertainment and TV is a privileged way to watch it. In spite of being traditionally watched in a more experiential and passive cognitive mode, video may induce viewers to engage in more reflective modes, although not usually providing an adequate support for this mode (Prata & Chambel, 2011;

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Brame, 2015). When watching a TV program, at some point in time, the viewers may feel the need or will to know more about a specific issue that caught their attention. Traditional TV is not able to support this type of functionality, but iTV, by its nature, may allow the possibility to access and interact with information about the program and related issues, that may be available as indexed TV content and references to follow and search. In fact, the role that TV has been playing so far is changing. We are definitely in a moment of transition, a moment where "old media systems are dying, and new media systems are being born. The traditional 'spectatorial' culture is giving way to a participatory culture" (Jenkins, 2010; Kulowiec, 2018). The proliferation of new devices able to support human activities across a range of contextual settings (Segerståhl, 2008), just like it happens in 'real life', is one of the main motivations for media integration in what is designated as crossmedia. Simultaneously, global access to information and technology is changing the relationship between people and knowledge, and the trends in convergence, integration and co-existence of various media technologies is creating new opportunities for the globalization of learning and communicational practices. Crossmedia systems are particularly interesting in what concerns the opportunities they create in terms of communication, entertainment, learning, and other activities (Bates, 2003). In terms of learning support, these systems are particularly promising due to the emerging era of lifelong learning, as learning will take place in a wide variety of contexts and locations and informal learning will tend to become as important as formal learning (Bates, 2003), calling for flexible environments. However, there are aspects that affect the efficient use of crossmedia systems. Some of the proposed systems failed because too much effort was put into technical details, leaving behind crossmedia conceptual aspects such as interaction and service design based on: cognitive processes, usability, affectivity, user experience, contextualization, continuity, media affordances, or device characteristics (Prata & Chambel, 2011; Prata & Chambel, 2019). The handling of these dimensions is our main motivation. Our main concern is to focus on these conceptual aspects, to study and understand this emerging paradigm which success requires, not only technological solutions, but sustainable models and pedagogical solutions, where research has not been complete (Prata & Chambel, 2010; Segerståhl, 2008). So, it was expected that the eiTV application would be designed to illustrate our research, and also to allow us to propose a new and personalized technical solution for a new type of service. The name eiTV was chosen because it was considered that the 'e' brings a broader 'web perspective' to the interactive television (iTV) as it happens in our work. The eiTV crossmedia application, which comprises three devices (iTV, PC and mobile devices, namely, smartphone), provides users with the possibility to choose which topics, from a video being watched, they would want to know more about, with which level of detail, and later decide when and where to access those extra related web contents (also referred as informal learning environment, informal learning content or, in short, simply as web content) in a more reflective mode, and whom they would want to share them with (e.g. facebook contacts), having the adequate support from the application in the different access contexts. This is a personalized experience since the contents will be prepared based on the users immediate interests and their preferences expressed in their profiles, and may be accessed and edited through iTV, PC and mobile devices (smartphones). Important to refer that the web content is generated by the user, from scratch, and solely based on their choices. After being automatically generated by the user from any of the mentioned devices, the web content may be viewed and edited, also from any of the devices, and additional videos, pictures, sounds, GPS coordinates, etc, may be easily added to the web content. Nothing in the web content is suggested by default by the system. iTV was included in our system due to its potential as a privileged tool to watch video. PC was included due to the fact that many viewers started using it as a complement of the TV viewing and mobile devices were included due to three main

reasons. First, their important role as part of these type of ecosystems. Some interesting examples on how mobile devices can enhance the TV experience, in particular, are presented in (Crespo et al, 2018). Second, the majority of TV consumers watch TV contents in a multi-display environment and the preferred device to serve as a "companion screen" is the smartphone (Fraile et al, 2017). Third, due to the mobile devices (smartphones) characteristics, which allow the addition of functionalities to enhance mobility and flexibility to an environment. The conceptualization, prototyping and evaluation of the eiTV was the main goal of our work.

Section 'Background' includes a review of related work and concepts, section 'Fundamental Aspects for Crossmedia Design' describes the conceptual framework found relevant for the design of crossmedia systems in this context, section 'The eiTV Application Design' presents the design of the eiTV system, using an human-centered design approach and addressing the crossmedia design challenges, evaluated in section 'Evaluation'. Finally, the last sections present perspectives for future research and developments and the conclusions.

BACKGROUND

This section presents more relevant research studies, namely those where additional related indexed information was based on a TV context and those where iTV was used with other devices, namely, as part of crossmedia environments. A comparative discussion on these works vs. the eiTV application is also presented. Dimitrova et al. (2003) proposed two systems: MyInfo and InfoSip. Myinfo is a personal news application which extracts specific web content listed in the user profile and displays personalized TV news programs - weather, traffic, etc - on the TV and based on the web content. InfoSip is a movie information retrieval application which analyzes the movie content and gives audiences information (overlaid onscreen) on such things as "who's the actor?". Both systems were developed based on the belief that, while watching a program, the viewer may feel the need to know more about that story, so a content augmentation application could understand which story was on and provide appropriate, summarized and targeted information and also references, as for instance web links, for further exploration. Both applications offered a new direction for personalization research "where the source of the content is less important then the actual delivered information to the viewer" but both were limited considering that the 'extra information' available was previously categorized and limited to a small number of possibilities. As to our eiTV application, it also has an option with pre-defined categorized 'extra information'. However, viewers have the possibility to go much further considering that while watching the video, they may choose exactly in which topics they are interested in knowing more about, and almost everything that is said in the video is a possible choice. Nadamoto and Tanaka (2005) have developed a 'TV-style presentation' system capable of searching the web, extracting related web pages, automatically transforming the text and image based web content found into audio-visual TV and fusing it with normal broadcasted TV program contents. Miyamori and Tanaka (2005) have developed the opposite idea, i.e., a 'Web-browser-style presentation' system named Webified Video capable to automatically transform traditional TV content into web content and integrating the result with related information such as complementary Web content. Both systems addressed the need of extra and complementary content, however, that content was transformed in order to be integrated with the information source. In the Nadamoto and Tanaka (2005) system, the final result may become much too intrusive of the TV viewing experience since TV is the only device being actually used by viewers.

Contrary to eiTV, these two are not offering a personalized solution prepared to react to changes in viewers' cognition modes. Ma and Tanaka (2003) have developed the Webtelop, a 'Parallel presentation" system to present the TV program and web content simultaneously on the TV, enabling viewers to browse web content while watching the TV program. CoTV™ (2011) or coactive TV automatically presents, on a PC, web content related to the on-air program. It acts like a special web search engine that is continuously and automatically driven by the TV-viewing context (not driven by the viewers' actions). It also includes a portal with traditional iTV services, as for instance program guides, video-on-demand, etc. As to the Webtelop it is much too intrusive of the TV viewing experience and CoTV™ is distracting. Due to their characteristics, and contrary to eiTV, none of these two systems provided a personalized adequate answer to viewers needs while accommodating their changes in cognition modes. However, both addressed the need to provide viewers with extra content while watching a TV program and contributed with solutions to integrate web content with TV. TV2Web developed by Sumiya et al. (2004) is a crossmedia system, where a video and its closed captions were structured after being divided into units, such as segments, scenes. Units were then linked and displayed smoothly using zooming metaphors and providing a seamless user interface that could be moved between TV screens and Web pages. This approach was interesting since the final interface was developed with the smallest possible excerpts from the original video. In terms of contextualization, the use of small excerpts from the original video achieved good results. However, it was a limited crossmedia system considering the small number of devices involved and interaction possibilities. As to eiTV, we also used video excerpts from the original TV program in order to contextualize the web content. However, different approaches were tested (e.g. video running or paused). As to the number of devices involved, we have spanned our application across iTV, PC and mobile devices environments. A system proposed by Miyamori and Tanaka (2005) generates views of TV programs based on viewer's perspectives expressed in live web chats where they express their emotions about the TV programs. This work was an attempt to integrate TV and the web in a personalized way and taking into account important dimensions as the emotion and the sense of unity. In general terms, they defended the role of these two dimensions in the design process and the importance of personalizing the TV content, which are in accordance with our own belief and research. The crossmedia TAMALLE project (Pemberton & Fallahkhair, 2005) developed a 'dual device system' for informal language learning, based on iTV and mobile phones, supporting learners of English as a second language in their TV viewing, selecting what to access later on the mobile phone. This was an interesting crossmedia system capable to accommodate different cognitive modes and different contexts of use, especially, if considering the mobile phone possibilities. This work was important to our research due to the good results achieved by providing users with mobility in the use of the system thus being able to accommodate different cognitive modes and different contexts of use, especially, if considering the mobile phone possibilities. However, it is more limited in options and scope than eiTV, considering that the only output device was the mobile phone, only used as an output device, and thus functionalities in order to take the best advantage on the mobile phone characteristics were not considered. Obrist et al. (2010) developed a crossmedia "6 key navigation model" and its interface for an electronic program guide (EPG) running on the TV, PC and mobile phone. The different devices were not used in a complementary way. In fact, the intention was basically to test a similar interface, on three different devices, which was based solely on six specific keys. This study showed that it is important to have a reduced number of navigation keys. However, that does not mean that the interface which requires a lower number of keys will necessarily be the preferred one and the more effective. This indicates that a balanced solution between effectiveness and usability should be found. The authors also state that the concept

also shows its advantage in allowing crossmedia usage, namely, the navigation concept use on PCs and mobile devices. The results of this study support our decision of developing UI prototypes adapted to a reduced number of navigation keys. However, and contrary to this work, in eiTV the devices are supposed to work in a complementary way. Cronkite (Livinsgton et al, 2003) provides extra information to viewers of broadcast news. While viewers are watching a news story, they feel the need to know more about it, they press the "interest" button on their remote and the system provides them with extra information on the computer display. The extra information, with pointers to other related stories, is about the story that they are watching rather then specific topics of interest inside the story, which is somehow limited. To have the system working, both TV and PC need to be simultaneously on. The system is limited considering that the extra information is not stored for latter view (and that might be the viewers' preference). The paper clearly addresses the need of further similar research in this area which was exactly what we did but expanding the functionalities and without the limitations of Cronkites' system. Our application stores the related information for later use and iTV, PC and mobile devices are used, simultaneously, or not. Viewers may select very specific topics of interest inside a story instead of the whole story, and some specific functionalities, as asynchronous communication tools, were also contemplated as well as the inclusion of mobile devices due to their advantages in terms of mobility. Newstream, developed by Martin & Holtzman (2010) provides extra information about what is being watched and about related websites, using TV, PC and mobiles. Depending on the viewers needs, that extra information may be viewed immediately, stored for latter view or pushed to other device. All devices maintain awareness of each other and are able to: move interaction to the device that makes the most sense in a specific context, use several devices simultaneously and, use the mobile device as a remote to the TV and PC. What distinguishes eiTV from Newstream is the viewers' possibility to choose exactly which issues they are interest in knowing more about, the ability to generate that extra information which may be edited and complemented with the viewers' input (text, images, video, music), the fact that the system does not rely on social networks, in spite of having the possibility to share those extra contents with social networks contacts (if the viewer has them) and is not limited to a single genre, it was already implemented on two different genres: documentaries and film series. As to functionalities, in Newstream they are very different between devices. TV is used to watch videos and the mobile phone interface has five tabs: one that allows using it synchronized as a remote control for TV or PC, and four other tabs entirely focused on the community built around the video, and act independently of the TV interface. This allows viewers to interact with their social network, find new media, and browse different clips, all without affecting the content shown on the TV. As to eiTV, all the devices are prepared with the same basic features in spite of some devices specific features. HyperSoap (Dakss et al, 1998) explored interaction designs for the iTV paradigm, expecting a more passive audience, and allowing the indication of interest in topics to later explore, in a more reflective mode at the end of the TV program. This system explored the need to access further information about a program being watched, just like eiTV does. However, it only used iTV, not a crossmedia environment.

The 2BEON (Abreu, 2007) is an iTV application which supports the communication between viewers, allowing them to communicate textually, in real time, while watching a specific program. This application allows instant messaging on the iTV, which, as demonstrated, is important to give viewers a sense of presence. The application changed is name to WeOnTV and is being implemented with smartphones as "secondary input devices", thus becoming a crossmedia application soon to be distributed by one of the most popular Portuguese TV cable companies. This work shows the importance of the social presence by sharing information with viewer contacts about what they are watching on the TV. WebTV (www.

webtv.com) was a system which enabled users to access the Internet via a TV set while watching it. We are not in the presence of a crossmedia system but, through the TV, users can send and receive e-mail, use live chats, shop online and browse the Internet while also watching TV. Comparatively to 2BEON (Abreu, 2007), this chat is limited since it is the traditional one, not integrated with the TV content. However, it offers other functionalities typical from the web environment. Both systems showed the importance of socializing while watching TV. This socialization feature was contemplated in our work considering that viewers may share their extra content, asynchronously, with their contacts. Geerts et al. (2008), studied a system for sending and receiving enriched video fragments to and from a range of devices, in order to understand which program genres were preferred for talking while watching, talking about after watching and for sending to users with different devices. Their conclusions were important in the context of our research, since we needed to conceptualize and develop interfaces capable to accommodate the different characteristics of each program genre and devices.

Our new ImTV project (Magalhães, 2009) and the iDTV-HEALTH (Damásio, 2010) are recent Portuguese projects in cooperation with the UT Austin University, USA. Two of the ImTV main goals are to develop richer immersive environments and novel feedback mechanisms inferred from richer interactions with media and among viewers; and to improve viewers' experience by offering a personalized combination of the mainstream TV content together with online user generated content. As to the iDTV-HEALTH, it is an inclusive service to promote health and wellness via iTV. The project main goal is to evaluate the potential of digital interactive television to promote original services, formats and contents that can be relevant to support personal health care and wellness of individuals over 55 years of age. As crossmedia projects they will probably benefit from this research, in particular, ImTV. Most of these related works present TV-web approaches that allow access to versions of the same TV or Web content from different devices, in ways differently related to the TV content being watched, but with limited or too much focus on the personalization. We believe that the challenge should be to go further as we have done with the eiTV application.

Segerståhl (Segerståhl, 2008; Segerståhl, 2009) proposed the 'Polar Fitness System' a crossmedia fitness support system, which includes a wearable heart rate monitor and an interoperable web service. Along with the heart rate monitor, accessories such as a GPS receiver, a heart rate monitoring strap, and a USB dock for transferring data to the web are included. The wrist unit provides immediate information (during the exercise) on factors such as heart rate, calories, time and distance and tools for planning, monitoring and following-up fitness activities. After each exercise, the wrist unit provides feedback as well as a weekly summary with suggestions for the next week. The web service, that is supposed to be accessed through the PC, includes a training calendar and tools for creating long-term training programs as well as detailed exercise plans, and "information and instructions for heart-rate-based exercise. It also provides progress charts, graphs and summaries for analytic and long-term follow up, a place to document exercising and a long-term storage for exercise data" (Segerståhl, 2009). In sum, in order to access the complete information, users are supposed to access the web service. The crossmedia fitness system was an interesting contribution but did not achieve all its goals. As it was used, the system even changed the ways in which subjects trained, and in some cases even their main goals. For example, a participant found out how he could use the collected heart rate information in order to regulate his recovery times between weight lifting sets while training, meaning that the wrist unit by itself succeeded. However, the system was not perceived by all users as crossmedia, because the system was not presented as a whole unit. Since the wrist unit interface was not designed in a way that reminded the user that a web service was available, the contextualization failed. This work was an important contribution considering that

it helped showing the importance of presenting the system as a whole unit, something that needs to be understood by viewers since the first moment, thus making part of their conceptual image of the system. Another relevant dimension is contextualization which failed in the system and must be assured in order to keep viewers aware of contents amongst transitions. The NoTube project (Aroyo, 2012) is a second screen system. A second screen systems implies the use of TV as main source of information and the simultaneous use of other devices, e.g. smartphones, laptops, tablets, as companion, in order to allow viewers interaction with the TV content. The NoTube uses the web as a useful companion to the TV and had the vision of bringing Web and TV closer together via shared data models and content across multiple devices. The system exploits the richness of data on the Web in order to enhance the TV experience. Social web viewers' activities are analyzed to create continuously evolving user profiles and, based on that, the system is able to recommend interesting programs. In this system, TV is not bound to the device: the computer may be used as a TV and vice-versa, while the mobile device may be used as a remote control. The system includes a feature called N-Screen which was designed to help answer the question "What shall *we* watch?" independently of people location. Imagine a group of friends in different rooms: each one can drag and drop interesting programs to a specific friend in N-screen, or to the whole group, in order to show directly their preferences. When someone receives a new program from a friend in N-Screen, s/he can click on it to see more information about it (basically, it is a drag and drop of movie trailers). Once the N-Screen group has found something interesting to watch together, one of them can drag and drop it to the TV and it will play on the shared TV screen. The system was designed to be used in conjunction with an out-of-band communications channel (e.g. face to face chat, Skype, or IRC) for the direct negotiations. It was initially developed for tablets and laptops but runs on any device with a modern Web browser; from smartphones to tablets and desktop PCs. As to the second screen, it is used to choose and control, and then, when ready, play on a large screen. Concluding, users can share recommendations with friends via multiple personal devices in real time. And with the second screen "TV controls watching together-apart becomes a reality" (Aroyo, 2012). Important to mention that the NoTube is, in sum, a recommendation system that allows crossmedia sharing with friends and has several features. N-screen is described here, because it is the closest to our research. In fact, it addresses the social side of TV, the importance and the need of being connected and the importance of sharing contents. Applications should be flexible enough in order to accommodate these functionalities. Through N-screen, viewers find movie trailers of interest which they are able to share with friends in an easy way. However, this share functionality does not include any kind of personalization or adaptation to different cognitive modes, contrary to eiTV. The eiTV application is second screen. Both mobile and PC devices may be used to interact with the TV set: in order to show the same content that is being watched from the TV; show, previously generated, web contents related to what is being watched from the TV and show the video that was used to generate the web content that is being watched from the TV. In the era of the second screen, the American channel ABC has developed an iPad application, called 'My Generation Sync app for iPad', for its show 'My Generation'. The application, available for download on the web, installs a new app in the iPad. From there, the user may activate the synchronization mode and then freely interact directly with the TV program. The user may vote, answer quizzes and get real time results, comment the TV content, consult detailed information about the characters, go behind the scenes and discover details about the show, etc. It is one of the best applications of its kind and as stated by Guérin (2010), the slogan could not be more explicit: "Change the way you watch TV". It was advertised as an innovative application: one screen in your hands, one screen on the wall[1], and brings to TV watching the benefits of a second screen, to free the TV screen of extraneous info, while providing

more control to the viewers, as also explored in research projects. In conceptual terms, it is a very well designed, friendly and usable system. It addresses the social side of TV, the importance and the need of being connected and able to interact with the program as well as the need to know more about certain issues. However, the only way to access the system functionalities is through the use of two different devices simultaneously, which is limited in terms of flexibility. In fact, the viewers may change their cognition mode and prefer to see the extra information only through one device. The system could be more flexible to accommodate user preferences allowing both options: the use of a second screen or not, as it happens with our eiTV application.

FUNDAMENTAL ASPECTS FOR CROSSMEDIA DESIGN

This section describes the foundations of the design rationale of crossmedia services and interfaces (as the eiTV). An effective design takes cognitive and affective aspects into account in the use, and interaction, with different media. We will address the design of crossmedia environments taking into account design practices and guidelines in the integration of video in multimedia and hypermedia (Chambel & Guimarães, 2000; LiestØl, 1994) and the challenges and approaches to the combination of different media and devices.

Media and Cognition

Norman's view (Norman, 1993) defines two fundamental cognitive modes: the experiential mode allows us to perceive and react to events efficiently and without effort. It is the mode of the expert behavior, the mode of perception. The reflective mode is the one "of thought, of decision making". One may alternate between these two modes, depending on several kinds of internal and external factors, and both are important in human cognition, but require different technological support. Several communicational *media* may transmit the same information. However, the medium is not neutral. Due to its characteristics, it affects the way we interpret and use the message and its impact on us (Chambel & Guimarães, 2000; McLuhan, 1964). TV is usually watched in the experiential mode, in a more relaxed and passive way. However, when properly constructed and augmented, TV may turn into a powerful tool for reflection (Chambel & Guimarães, 2000; Norman, 1993), inducing and supporting a more active attitude without forcing a change in its experiential nature. As to PC and mobile devices they are usually watched in the reflective mode but, when properly augmented, they also may turn into a powerful tool for relaxation (Prata & Chambel, 2019). A good example of this type of use, is when users choose to watch films and series through the mobile device instead of using the TV set. A successful integration, in a crossmedia environments, should have each medium and device support what it is most suited for in each context of use, augmenting and complementing their capabilities (Prata & Chambel, 2011).

Crossmedia Interaction Challenges

The challenges of crossmedia interaction design were grouped by (Segerståhl, 2008) into three main areas: Heterogeneity: When several interaction devices and applications are part of a system, the user technological literacy needs to be higher. User expectations also vary in the presence of each different medium; Interoperability: Usually referred to as the system interconnectivity, is as relevant as the con-

ceptual architecture - it shows how each role is supported by each medium, and how functionalities are distributed; Consistency: The system may vary in terms of goals, devices and areas, increasing the risk of inconsistency. The quality of a crossmedia system interaction cannot be measured only by the quality of its parts it has to be measured as a whole. Following (Segerståhl, 2008) there are three essential factors in order to determine the success of an information system: how easily it was adopted, how well it was implemented and the level to which characteristics and functionalities of the system are used.

Crossmedia User Experience

As stated by (Segerståhl, 2008), user experience (UX) is a process that: Is influenced by different backgrounds, such as previous experience, social and cultural factors, contexts of use, etc; Is analyzed in several dimensions, such as emotional reactions and cognitive processes; Contributes to different cognitive effects, such as emotion, learning, or acceptance. Different challenges arise if considering a crossmedia UX. When multi-task and multi-technology environments are being used, interaction must be designed in order to accommodate these different contexts (Segerståhl, 2008). Goodhue and Thompson (1995) states that the 'task-technology fit model' is based on the belief that information technologies are used only if their functions support (fit) users' activities. Thus, it is fundamental to correctly identify the contextual needs that justify and characterize the use of different media and how the different media support human activity. Synergic use means using combinations of media in order to achieve a level of task support higher than it would be possible through the use of each one individually. In a crossmedia environment, the UX may be evaluated through how well it supports the synergic use of each medium and different kinds of affordances are needed. It is important to understand what makes the user pass the current medium boundaries in order to use other media as well. According to (Segerståhl & Oinas-Kukkonen, 2007), in a crossmedia context, the user experience may be classified as distributed or coherent: Distributed user experience leads to the isolated perception of medium and thus is one of the biggest barriers to the efficient use and adoption of crossmedia systems; Coherent user experience leads to the perception of a crossmedia system as a whole unity (Prata & Chambel, 2011).

Crossmedia Conceptual Model

A conceptual model is a critical part of the design process. The *system image*, how the software will look like and act, influences how the system is constructed and should be used (Norman, 2002). A mental image of a system is produced based on previous experiences and through concepts that come out when visualizing the system working (Jonassen &Henning, 1996). When well designed, systems show people what functions they do and how they do it, being capable of participating in the human construction on how the system works (Segerståhl, 2008). This is a very important aspect in crossmedia environments, since it involves several interaction scenarios and contexts.

Supporting Crossmedia Interaction

In a crossmedia system, user activity may be supported by a variable number of media that complement each other. The migration of tasks is supported via crossmedia usability and continuity, influencing on how well and smoothly users' skills and experiences are transferred across the different devices. As stated by (Florins & Vanderdonckt, 2004), users expect to reuse their interaction knowledge, user

experience, when switch medium. Thus, in spite of changing medium, a consistent interaction (in terms of terminology, graphics, etc) will obviously improve the usability of the system and help break barriers to the adoption of crossmedia systems. The consistent look and feel across media is an important requirement, even if it should not limit the goal of having each medium doing what it is most suited for and extending its characteristics (synergic use) (Nielsen, 1989). An effective crossmedia design requires the understanding of the devices involved (Prata & Chambel, 2011).

Understand Devices and Contexts of Use

According to Robertson et al. (Robertson et al, 1996), instead of try to create a taxonomy of devices, or media, the best approach is to study each particular situation, including device characteristics and cognitive and affective aspects associated to its use. A more detailed explanation about the motivations and attitudes in watching TV and a review of devices properties that influence crossmedia design options when TV is involved are presented.

Reasons and Ways of Watching TV

Goals of watching TV depend on the "time and context in which they are watching" it (Taylor & Harper, 2002). Previous research identified three levels of TV viewing (Taylor & Harper, 2002): Level one implies a low degree of viewer engagement and planning. Viewers main goal is to relax and watch something with minimum effort; Level two implies a medium to high level of viewer engagement. Viewers' goal is to watch periodic programs of interest; Level three implies a high level of viewer engagement. This type of viewing is normally solitaire and associated with programs of specific interest like documentaries. While watching a certain program, the viewer's goals may change, as a result of internal or external factors. Several studies have identified four possible levels of attention when watching TV, ranging from watching it as the only activity, and thus with a high level of attention, to using it only as a source of background noise and a form of companionship (Ali & Lamont, 2000).

The affective dimension of TV viewing may be supported by uses and gratifications theory. Previous research (Livaditi et al, 2003) states that traditional TV watching may be explained by this theory, which defends that consumers use media in order to satisfy four needs: *surveillance, personal identity, integration and social interaction*, and *diversion*. These needs may be categorized as ritualized and instrumental or cognitive: Ritualized use, the predominant in current TV viewing, implies a viewer more passive mode and using a medium as diversion and to pass the time; Instrumental or cognitive use implies a viewer more active mode and using a medium to seek information contents. Thus, in designing interactive applications we must consider that: Entertainment and communication applications (which cover ritualized needs) will be adopted easier by the mass audience; Informational and transactional applications (which cover instrumental and cognitive needs) should be designed in order to offer entertainment or communication elements as well (Prata & Chambel, 2011).

TV and Other Devices

When compared with the PC, the TV use: usually implies a broadcast transmission; viewers with the same speed connection; rare technical problems; a safer environment since hacking is not a risk on TV; expensive contents production; limited interaction via a remote control; limited customization; limited

vertical scrolling; only one window at a time; limited interface; implies a more heterogeneous public, wide audience and group interaction, a relaxed and comfortable position, less attention, concentration and instant interactivity, less specific goals, specific modes of interaction, less interactivity; a compelling interface is fundamental, and ease of use is not enough since entertainment or communication is also needed (Bates, 2003; Chorianopoulos & Spinellis, 2006; Dimitrova et al, 2003; Eronen, 2004; Prata, 2005; Prata & Chambel, 2011; Prata & Chambel, 2019). When compared with TV, mobile phone use: implies a simpler and easier interaction (scrolling, navigation through touch, simple images resizing, etc); smaller screen size; high mobility; functionalities not available through TV (GPS, SMS, etc) or very hard to use through TV (MP3 player, games, facebook, e-mail, etc); a less safer environment due to virus; more technical problems; different speed connections; more attention; more specific goals. In spite of maintaining some individual characteristics, as devices are converging, some of the mentioned distinguishing characteristics will become blurred over time. However, in terms of analysis and requirements recoils, it is important to remember that on mobile scenarios where the use of the mobile device or application is constantly based on mutational contexts, where users may be walking and passing through different places and environments, the recoil of requirements is a difficult task and needs a specific approach (Sá, 2009).

Designing Interfaces for Different Devices

To implement a crossmedia application, interfaces for different devices need to be developed. Thus, a detailed study on the existent design guidelines for each device should be conducted. Some guidelines are available for iTV as ITV (2018), Abreu (2007) iTV DOPs (Design Oriented Principles), Prata (2005) and Lamont (2003) design Guidelines. Many guidelines, rules, principles and tips are available for the PC environment. In is homepage, Nielsen has a link to 2397 usability guidelines which covers practically all usability possibilities (Nielsen, 2005). Some others may be found in Devaney (2017) and Enginess (2014). Other important orientations to follow are Shneiderman 8 rules of gold; Nielsen (1994) 10 heuristics and Norman (2002) 5 nuclear concepts on usability. As to mobile devices, for example, Brewster's (2002) set of guidelines to overcome the limited screen space, Kar et al. (2003) usability guidelines, Sánchez et al (2005) navigational hints to the construction of mobile web pages, usability guidelines for smartphone applications (Ahmad & Rextin, 2017), the use of mobile devices in crossmedia contexts (Hermansson et al, 2014), Apple (2020) guidelines for SmartPhones and the Interaction Design Foundation guidelines for mobile environments (ITF, 2020).

Concluding, in what concerns crossmedia design, we have a lot of research challenges: better understand the challenges to design effective ways of supporting synergic interactions considering, amongst others, user experience, the way people create mental images of a system and devices characteristics, considering the cognitive and affective aspects associated with their use.

THE eiTV APPLICATION DESIGN

The eiTV application case study is capable to generate, via iTV, PC and mobile devices (smartphones), personalized web contents, to be further accessed, anytime, anywhere, also from iTV, PC and mobile devices, depending on the scenario. It has been designed to illustrate and explore the underlying crossmedia paradigm, based on cognitive and affective aspects that influence user experience. Based

on previous versions evaluation (Prata et al, 2010; Prata & Chambel, 2011; Prata et al, 2012; Prata & Chambel, 2014), and additional research, eiTV was redesigned and extended, now, featuring broader possibilities, an improved interface usability due to the flexible and simplified navigational model, and new functionalities (Create, Search, Share, Profile, DF), as described later in this chapter.

eiTV Architecture

The eiTV application, which started as a group of separate modules, was changed to a unique portal aggregator of all the functionalities which may be accessed from any of the mentioned devices thus working as a true 'ecosystem of devices' in a client-server architecture. Through the portal we may: generate web contents; see, edit and share web contents, upload files, change profile, etc. If eiTV users generate a web content which they decide to share with friends, two things may happen: some friends also have the eiTV system and some do not. All will be able to access the web content by following a link. This means that everyone may receive web contents generated by eiTV, a characteristic that provides flexibility to the application. However, only those who have the eiTV application will be able to edit the web contents.

Flexible Navigational Model

As to the navigational model and the organization of the information, a previous linear model used, based on sequential screens was substituted by a menu style navigation which provides users much more control over their choices, considering that all the functionalities may be accessed at any moment, directly through the menu or through the chromatic keys. This model improves: the application interoperability since it shows people how it works (what functions it supports and how); the user experience which becomes more coherent considering that users easily perceive the system as a whole unit; the crossmedia interaction continuity through different devices and the interaction consistency considering that it becomes easier to reuse viewers interaction knowledge. Due to its flexibility this model is also more adapted to changes in cognition modes, levels of attention and technological literacy. As to the interfaces they are simpler, have a minimalist aesthetic and were designed based on each device characteristics and the guidelines referred to in the section 'Designing Interfaces for Different Devices'.

Extended eiTV Functionalities

The main eiTV features and functionalities are described next, and were organized as follows.

Create and Update

The Create central functionality allows users to watch videos and select topics of interest for further information. As in the previous version, the information available about the TV program differs in focus and scope (TV content and TV Meta-info). Both types of information were made available on the three proposed *levels of information*, from less to high informative: level 1 (topics) only implies the use of the *OK* button in order to select topics of interest; level 2 (summary) implies the immediate display of extra information as a brief summary about the topics (overlaid or embedded onscreen); level 3 (structured) implies the immediate display of extra information, namely a structured list of that topic main aspects or options that the user may choose from (overlaid or embedded onscreen). At any moment, the user is

able to change between levels of information: in the case of iTV, by pressing button 1, 2 or 3 or by using the directional buttons; in the case of PC through 1, 2, 3 buttons or the mouse and in the case of the mobile through the use of the touchscreen feature in order to choose the numbers onscreen. Thus, the eiTV navigation is adaptable to each device characteristics (thus providing the system with flexibility) and to users with different technological literacy. It was decided to maintain the 3 levels of information, with embedded and overlaid options on levels 2 and 3, since we saw from the previous prototypes, that they play an important role to accommodate viewers' changes in cognition modes, levels of attention, goals, needs and interaction preferences. As to the Create functionality, we present next the new features in the current eiTV version (including new updating and editing features) and the aspects covered in the creation that influence the contextualization when accessing the WebContent.

Topics Selection: Video Keeps on Playing?

For both information levels 2 and 3, which require a higher level of user attention, two options were implemented: The *video pausing* and the *video playing* in order to understand users' preferences on each context.

Creating Content From Videos on the PC and on the Mobile

The Create functionality is also available *through the PC and the mobile*. The difference is that on iTV, users' choose the program from the BOX or from a TV channel. On the PC or on the mobile, users have to choose a video that needs to be previously uploaded to the 'portal'. This feature, greatly increases the flexibility and consistency of eiTV.

WebContent: When I Watch the Same Video

If a user watches a specific program/video several times and, everytime decides to generate a web content, all will be stored in the 'portal' in a specific category named 'eiTV Webcontents'. Program/video names are organized by alphabetical order, program series and episode number. Bellow each program name, the web contents will appear organized from the most recently generated to the oldest. These web contents include information about their creation date and the device used to create it. It has a link to the web content. When several web contents were generated to the same program/video, a *merge* option is made available. These options were designed to provide flexibility, user control and to take advantage of users' previous knowledge and user experience. Note that in the previous version, the access to the web contents was made available only through the PC and mobile devices. In this version, and in spite the remote control navigational limitations, it was our belief that the web content should be available through the TV set as well. This option creates a true integration and ecosystem of devices thus providing the system with extra flexibility.

WebContent: My Input

Each web content is organized as follows. The left side menu contains all the topics selected by the user, presented by the order of selection in the TV program/video, to improve contextualization, but the user may choose to see them by alphabetical or logical (content dependent) order. Sub-categories of the topics

are presented in the top menu. What is new is that this web content is presented inside a 'portal' which also has all the other functionalities: Create, Search, Share, Profile and DF. The Search functionality also allows the upload of information to a specific web content. Thus, bellow the selected topics presented on the left side menu, there is the 'My input' place were all the manually uploaded information is stored (text, pictures, etc). This option was designed to take advantage of each device characteristics in order to provide flexibility.

WebContent: Editing

Each web content has the possibility to be edited. This edition ranges from *uploading* textual information (if through the TV set) or textual information and files (if through PC or mobile devices) to *delete* the web content, a topic of the web content, a category from a specific topic or even just a simple paragraph. This option was designed to provide users with flexibility, control, autonomy, consistent interaction and to take advantage of each device characteristics and user experience.

WebContent: Contextualizing Video or Image

Continuity and contextualization (see Figure 1) was supported via the use of three different options. Two of the proposed options rely on the use of some excerpts from the original video, namely the excerpts that were being watched in the moment of the topic selection. By default, when reaching the web content, viewers are positioned in the first chosen topic and the first thing that they see is the excerpt of the video that was being watched when the topic was selected (option 1 includes the video playing and option 2 includes the video paused); the third option rely on the presentation of a picture of the moment of the topic selection. With these three options, we expected to gain a better understanding of which one is the preferred option to help creating a smooth transition with a good contextualization.

Webcontent: Contextualizing Video Sound

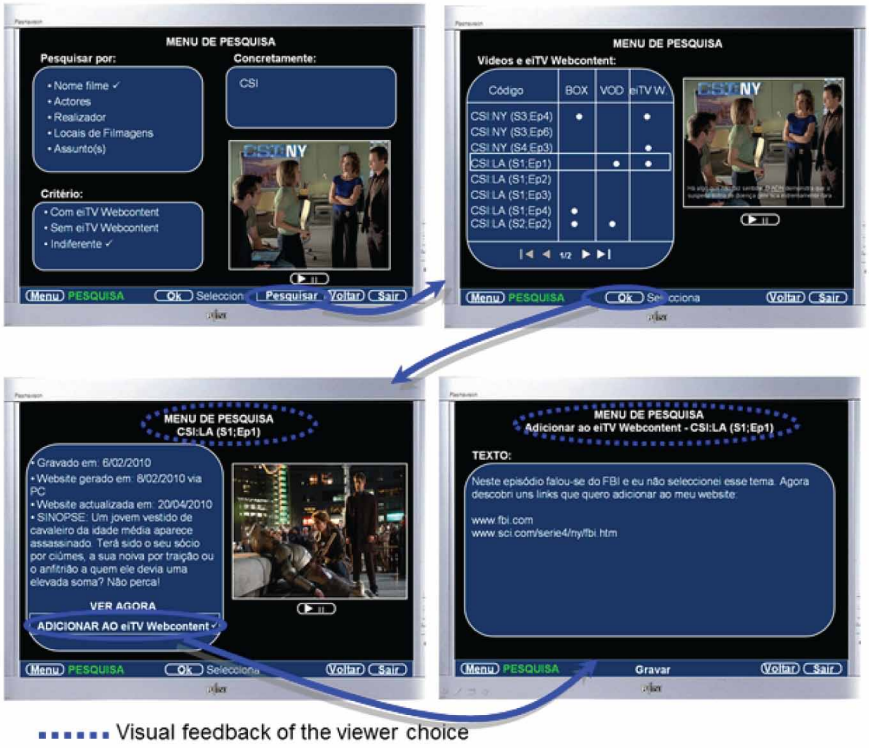
In what concerns the video excerpt selection, used on the web content with the continuity and contextualization purpose, two options were made available, and already tested: 1) to have the videos beginning at the selection time; 2) to begin in a previous position to include a consistent dialog and context. The preferred option was 2) thus this choice was adopted in this prototype.

Figure 1. Contextualization in crossmedia navigation

Search

The Search functionality is new. This functionality allows searching videos based on different criteria. Video criteria: title, actor name, etc; and system criteria: video with or without web content already generated. The found videos are presented in a table which let users know the video title, series, episode number, if the video is in the BOX, if the video is available through VOD and if a web content was already generated. By choosing one of these videos, users will be presented with the video synopsis and choose between watching the video, editing the web content (if there is one) or simply going back (Figure 2). With this functionality flexibility was improved.

Figure 2. Search functionality interface



User Profile

The User Profile functionality was extended to improve personalization: new is the option to upload users personal data from their social network; validate the input information; present clear and unequivocal error messages; consider all possibilities (forgot the PIN/Password, need to create a new account, etc). Considering that users do not like to input too much written information, the number of items to fill in were reduced to the minimum possible (name, sex, age, e-mails, mobile number, etc). The user profile information is used to personalize the web content, thus improving flexibility. As to the improvement, it will help users with less technological literacy.

DF

The DF (Devices Functionality) is new. While all the other functionalities allow the same actions on iTV, PCs and Mobile phones, the DF available options vary depending on the device being used. The DF functionality comprises the following options: Device Interface, Add GPS coordinates (only when accessed from mobile phone), Devices synchronization, Video, Photos and Other files.

- **Device Interface:** this option, available from all devices, allows to minimize the eiTV application to a small icon without exiting. This means that the users will have the usual device interface with the icon just to remember them that the application is open. The icon to use was chosen during the

low fidelity evaluation and users agreed that this approach is the more intuitive. This option allows flexibility, control and is prepared for users changes in cognition modes;

- **Add GPS Coordinates:** Only available from the mobile device, this option allows users to simply add GPS coordinates to web contents, or add some text annotation as extra input. This means that users are able to simply add GPS coordinates to their web contents without the need to have those coordinates associated to a video or a photo. This option allows flexibility, interoperability, adaptability, continuity, supports heterogeneity and provides users with a ubiquitous application;
- **Devices Synchronization:** This option allows synchronizing devices, in a second screen manner, in order to use them in a complementary way. An example is to use the TV to watch the video and the PC to access related web contents generated. This option provides flexibility, control, synergic use, interoperability, adaptability, continuity, transparency, is prepared for users changes in cognition modes and needs, supports heterogeneity and in terms of redundancy allows the use of devices in a complementary way;
- **Video:** This option allows to generate a video, or search one from the gallery. For that video, other options are also available (search related videos or photos by GPS coordinates when through mobile devices; add metadata to that video through written keywords and in order to classify the video; search related videos or photos by metadata and export the video to eiTV web content). These options allow flexibility, control, personalization, contextualization, continuity, are prepared for users changes in cognition modes (considering that the mentioned options were designed in order to support a more and less cognitive modes. As an example, when users decide to add a video to a web content they may simply export it to a generic place called 'MyInput' or to a very specific place within that web content) and take advantage on the previous experience, thus accommodating frequent users, and providing us with an ubiquitous application;
- **Photos:** This option allows to take a photo or search one from the gallery. In conceptual terms it works as the Video but having a photo as the departure point;
- **Other Files:** This option allows to make an audio file or search one from the gallery and export it to the eiTV. Also available to export SMS or MMS contents, when through the mobile phone. This option provides flexibility and personalization.

All these functionality options were designed in order to take the best advantage of each device characteristics.

Design Options Underlying the Whole Application

Consistency and Unity: All interfaces were designed to be consistent in terms of look and feel and navigational options in all the devices, to help the perception of the application as a unity independently of the device being used (coherent user experience). In particular, the same buttons are always used to the same actions and appear in the same place, making easier the navigation understanding across devices and helping to avoid errors. Users' are always aware that they may access their eiTV application through different devices because when they create webcontents they are notified. Some interfaces have that information onscreen, for instance, the profile and on the 'devices confirmation' interface. This is important in order to transmit a sense of unity of the application that should be conceptually understood as an 'ecosystem of devices'.

Share

The Share functionality changed. When viewers login, this functionality is not immediately available (thus it appears in a different and dimmed colour – restriction usability principle (Norman, 2002). This functionality will be activated only after users accessed the Create or Search functionalities. This makes sense considering that viewers could not share something that was not yet created or found. When available, the Share functionality, allows sharing the generated web content, or retrieved video (with or without web content), with their contacts. On this functionality flexibility and error prevention were improved.

The login feature (designed based on each device characteristics) was also adapted to the access from PCs and mobile devices in a uniform and consistent way. In a web interface to have just a PIN number (as it happens on TV) is not enough. Thus, in order to assure a secure access in a uniform and consistent way, when accessing the portal through these devices, the user will be asked to enter an e-mail and a PIN number/password.

- **Flexibility and efficiency of use:** Includes options to the more and the less experienced users and is flexible and adapted to changes in cognition modes, level of attention and users interests: 1) colours and numbers were used as shortcuts and the menu may be used or not in order to select options; 2) the interactivity was implemented to be available to the user - not imposed- with different levels of interaction. Besides changes in interests, and cognitive and attention levels, since the social context of video viewing varies - it may be an individual (normally when from mobile devices) or group experience (normally when from PC or TV), different individuals may have different needs at the same time. For these situations, for e.g., the interaction designed on the level 1 information (topics) does not interfere with the video viewing experience of those that are not using the application;
- **Aesthetical and minimalist design:** Screens were simplified: 1) the navigation instructions were erased from all screens and just kept on the first ones (the login feature). It was assumed that, after that first contact, users would be able to remember them, especially considering that a common and familiar navigational structure was adopted; 2) by having a minimum number of different elements onscreen (icons, active areas and redundant information) without compromising the application understanding; 3) the interface uses neutral colours (like white and grey) and blue, always with the same sans-serif font, a letter pitch of 18 and anti-aliasing treatment, for improved legibility.

A research conducted by Obrist et al. (2010) in order to develop an electronic program guide (EPG) running on the TV, PC and mobile phone showed that viewers prefer a *reduced number* of navigation keys and a unified User Interface (UI) with the same functionalities across devices. Thus it was decided to adopt this strategy. The interfaces were unified across devices and the number of navigation keys (buttons) was reduced to the minimum possible. The following keys were used: four arrow keys; four chromatic keys (only functional through iTV); numbers 1, 2 and 3; OK; Back; Quit; Menu and Play/Pause. Some design guidelines state that the interface should provide adequate support to more and less experienced users. Thus, this situation was considered in spite of augmenting a bit the number of keys. However, and in spite of having 16 possible keys, every task may be performed through 9 keys. The keys were carefully chosen in order to be as close as possible thus avoiding users need to look at the TV remote every time they need to interact through the TV.

- **Simplicity, Visibility and Feedback:** Itv users are used to simple commands and quick answers as, for instance, changing channel. This was taken into account in the design. Instead of dubious buttons the interface was designed with written buttons in order to provide a coherent user experience. Keeping users aware of their location due to visual clues, and having visual signs in order to let users' know that their actions were understood by the application, is very useful especially for less experienced users. This type of feedback, which assures continuity and consistent interaction, helps to prevent errors, understand the application and support users' change of mind, also providing them with increased control and flexibility;
- **User Control and Freedom:** Present the go back button, and the quit button, independently of users' location. However, for safety reasons and also in order to prevent errors, this button always needs a confirmation. These characteristic also help in accommodating users changes of interest, attention levels and in the prevention and recovery from errors;
- **Error Prevention:** To minimize the possibility of errors, several strategies were used, as for instance, eliminate error-prone conditions (ex: inactive buttons were dimed, some confirmation options were made available, etc). Anyway, a few error messages were also created in a way that they could be clearly understood.

Design Options Specific for Mobile Devices

In the mobile devices, the central functionalities of the eiTV system are present: Create, Search, Share, Profile and DF. These functionalities are available: at the 'departure point', which occurs while watching the video and generating the web content, and at the 'arrival point', when accessing/editing/etc. the generated web content. Although these functionalities allow (almost) the same actions as on iTV and PCs (remember that the DF functionality depends on the device being used), they were not provided exactly in the same way, considering the different devices characteristics. To briefly remind these central functionalities: Create allows users to watch videos and select topics of interest to create further information; the Search functionality searches videos based on different criteria and allows to watch them, and edit the associated generated web content if there is one; the Share functionality allows sharing the generated web content, or retrieved video, with user's contacts; the User Profile contains personal data in order to personalize the generated web contents and DF allows to synchronize devices, search and add videos, photos or other files to the webcontent and allows capturing these files (depending on the device being used) and add GPS coordinates (only when accessed from mobile phone).

In order to have each device doing what it is most suited for, contexts of use, device characteristics and cognitive and affective aspects associated to its use were studied. In what concerns to *specific mobile devices functionalities*, after this study, the following were made available:

1. **Great Flexibility and Mobility (use it Everywhere, Anytime, Anyway):** When using the TV, the scroll is not an option, but that does not happen when using the other devices; contrary to TV and PC, mobile devices may be used everywhere, even when users are standing up, mining that any extra time may be used (if waiting for a medical appointment, in a bus queue, while in the train, etc);
2. **Location-Based Search Using the GPS Functionality:** The search functionality allows users to search videos and images related to their current location. As an example, when near the liberty statue the user may use this functionality to search, from its own system and the internet, videos

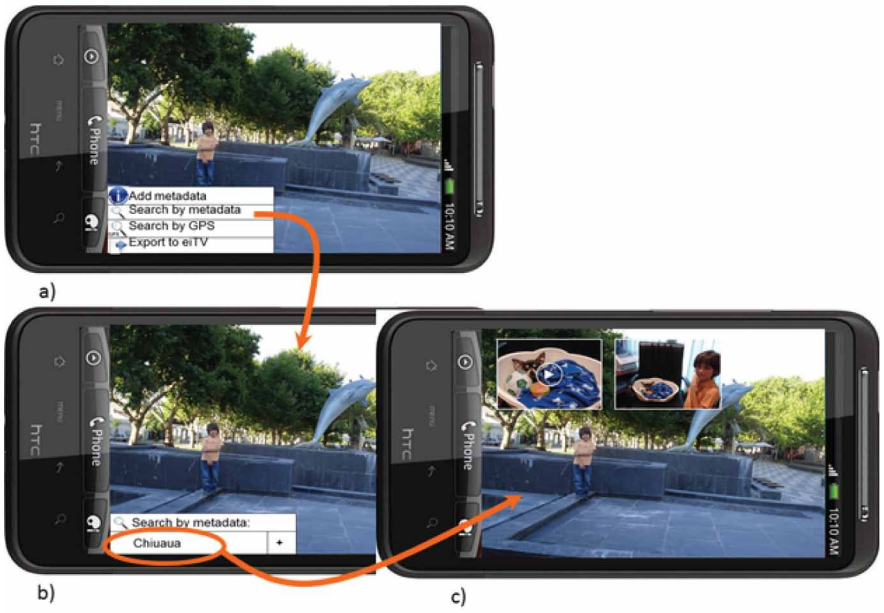
and images related to that specific spot (this type of video files need to be inserted when using iTV or PC). See Figure 3.

Figure 3. Search video and images from GPS coordinates

Video capture and location-based search: a) Options available at the DF functionality and 'Video' option being activated; b) Possibility to choose from a video gallery or to record a new video. The user choice was to record a new video; c) The user is choosing to search related videos and images by GPS coordinates; d) The two results – one video and one photo recorded in very close places - appear as thumbnails embedded in the video just recorded. A simple click on the video found allows to watch it.

3. **Content-Based Search:** This functionality allows users to take a photo or shoot a video and search based on the photo or video content. As suggested by Jesus (2009), in order to be more effective, the process is automatic and was complemented with the possibility of users providing their own metadata manually, something that users are very used to do through keywords (as for instance Instagram users). In order to illustrate this feature, Erro! A origem da referência não foi encontrada.4 presents the option of shooting a video and add metadata, in this case two words were added: son and chiuaua. Later, this video may be used for searching related content-based videos and images;
4. **Add immediately, or latter:** *Shot pictures or videos,* that may be *related,* to the video being watched, as additional information to the web content or, instead, really integrated as part of the web content. An example of use may be seen in Figures 3 c) and 4 a) where the option "export to eiTV" was made available.

Figure 4. Searching videos and photos by metadata. a) The user is choosing to search by metadata; b) The keyword 'chiuaua' was added to video and images search; c) The two results – one video and one photo recorded with chiuaua as keyword - appear as thumbnails embedded in the video used for the search.



EVALUATION

The prototypes were evaluated through low and high-fidelity prototypes. Due to space constraints only the last one is described. The UX evaluation methods and measures considered relevant for this specific case as a final evaluation were: observation, case studies, lab experiments, experience sampling method, questionnaires, interviews and focus groups (Prata & Chambel, 2019). An empirical evaluation via experimentation was performed with users that were asked to perform tasks that allowed using all the eiTV system functionalities (to assure consistency and get a coherent user experience), under our observation. They were asked to fill a questionnaire, were interviewed and participated on focus groups.

As to the evaluation group, it was composed of 38 participants: 8 experts, that were selected from the HCI and iTV academic research areas, 7 are university teachers, ranging from 34 to 60 years old, 3 female and 5 male, which have collaborated in previous usability evaluation phases (and which feedback is not included in the presented results) and 30 participants, ranging from 18 to 60 years old, which were grouped into 3 evaluation groups, namely:

Group 1: Composed of 10 students from the Information Systems Management Degree, ranging from 18 to 34 years old, 5 female and 5 male, with high technological literacy. Five of them already participated on the previous evaluation and 5 were new (meaning that they participated for the first time).

Group 2: Composed of 10 students from the Marketing Degree, ranging from 18 to 30 years old, 5 female and 5 male, with medium technological literacy. Five of them already participated on the previous evaluation and 5 were new.

Group 3: Composed of 10 persons from the general public, with a low scholar level ranging from 8th to 12th grades, ranging from 32 to 60 years old, 5 female and 5 male, with low technological literacy. Five of them already participated on previous evaluation and 5 were new.

The decision about using previous and new evaluators in all the literacy groups was based on the assumption that with the experienced ones we would get richer insights about the implemented improvements in terms of interfaces, functionalities, how easy it is to learn how to use the application, etc. These participants were important to maintain a conceptual idea of the whole application and allowing to ask for comparisons. With the new participants, it is possible to perceive the application first impact with all the functionalities already implemented in all the devices.

As to the participants technological literacy categorization, it was possible via the use of a questionnaire with questions as: do you use Internet? e-mail? Facebook? How many hours a day? From which devices? Do you have a smartphone? Which functionalities do you use on your smartphone? etc.

The evaluation process, which was carried out inside the school campus, from January to June 2016, started with a demonstration of the last tested high-fidelity prototype on a PC, in order to remind users and to create a sense of unity of the whole application. Then, users were asked to perform tasks that allowed using all the eiTV functionalities and all the devices. They have used the prototype in three different contextual scenarios, and devices, with transitions between them. Users started using the prototype, by generating a web content, through iTV at a simulated 'living room' environment at school. The web content was later accessed, and personalized, via PC and mobile (in the same 'living room'). Then, they used the PC to generate a second web content which was later, viewed and personalized via TV and mobile (at the simulated 'living room'). Finally, they used the mobile to generate the third web content while seated at the school bar. Then, they moved to the school backyard, they have created a video and searched related videos by GPS coordinates (*Location-based search using the GPS functionality)* which were added to the web content in order to personalize it. Then, they entered the school and used the mobile to take a picture, add the metadata manually, and add the picture to the web content. Next, they moved to the bar and, standing up at the end of the bar queue (similar to other public queues), they personalized the web content with their GPS coordinates. Finally, they moved to the library that, although surrounded by people, is a quiet place (context similar to a medical clinic waiting room) in order to view the final web content and use the Search functionality. Note that during the changes of context, the luminosity conditions, as well as the surround conditions (noise), changed when going from the building interior to the exterior, and vice versa. The interaction with the GUI high-fidelity prototype occurred, mainly, via the smartphone but also via PC and iTV. It is important to mention that the evaluation process took place in real contexts of use, one of the most important factors to consider when testing crossmedia applications.

The experiment was followed by a questionnaire to collect users' opinions. The questionnaire was constructed based on: the well-known USE questionnaire which allow to evaluate, usefulness, satisfaction and ease of use; the NASA TLX questionnaire which allow to evaluate cognitive overload; and questions related to usability heuristics. With the questionnaire we intended to enrich the empirical evaluation and the direct observation. This gave us the possibility to check that the answers given to the questionnaire were in accordance with the reactions, denoting levels of difficulty or satisfaction that we observed in the users' while using the system.

Table 1. Functionalities evaluation

Users Considered	Create	Search	Share	Profile	DF
Available features interesting	93%	87%	90%	63%	90%
Did some effort to use the functionality	17%	10%	13%	30%	7%
Functionality useful	100%	83%	93%	50%	97%
Most interesting functionality	73%				
Less interesting functionality				77%	
Most useful functionality	90%				
Less useful functionality				83%	
Easiest functionality		80%			
More difficult functionality	53%				

iTV Interface

The following results are presented in accordance with the type and order of the questions within the questionnaire.

The more used information levels were 1 (67%) and 2 (63%). In the majority of the cases, after using level 2, users did not select the topic because they were satisfied with the explanation. From previous evaluations, it was clear that the best design alternative presented to the information level was the one that only shows numbers over the one that also included words. Thus being it was the solution that was implemented and tested. On information levels 2 and 3, 80% of users prefer the video paused (both on embedded and overlay design). Between embedded and overlay design, 70% preferred embedded (a little less than on previous experiences). Like on previous evaluation, on all the other interfaces where video appears minimized, 73% of users said that they preferred the video playing. The argument was that if, while doing other things (like searching videos and sharing web contents), if something interesting comes up in the video, they would be aware of it. The OK button only needs subtitle on first screens (83%). On the other screens the Button alone is enough. Like on previous evaluations, the majority (80%) of the users, when using iTV, needed to look to the remote sometimes through all the evaluation process. However, and contrary to what happened on previous evaluations, the majority of users used the 1, 2 and 3 keys instead of using the directional keys plus the OK button. As to the chromatic keys, they were never the first choice but a small percentage have use them 17%. As can be seen from Table 1, all the available functionalities were considered interesting, easily performed without relevant effort (except in the case of profile, where 30% of users said that they did some effort to use the functionality. From the interview it was possible to see that these results were due to their resistance to fill questionnaires and not due to a bad design or lack of usability). Four functionalities were perceived as very useful (Create, Search, Share and DF), being 'Create' the most interesting (73%) and useful one (90%) but also the most difficult to use (53%). 'Search' was considered the easiest one (80%) and, also with no surprise, 'Profile' was considered the less interesting (77%) and less useful (83%). In relation to the Profile functionality, these results were already expected and corroborate to the idea that users do not like to fill in questionnaires. On the other hand, in spite of absolutely needed, the importance of this functionality in not visible to users.

From Table 2, and counting the values that correspond to 'Much' and 'Very much', it is possible to see that, in general, users considered the iTV interface: intuitive (90%=17%+73%), easy to use (80%), with a fluid navigation (77%), visually pleasant (87%), with easy to understand buttons (90%), adaptable to viewers' needs (93%), not intrusive (84%), works well with the use of a menu (100%), is well designed (90%) but however could be better (73% - here, the values 'Little', 'Average', 'much, and 'very much' were summed), specially, in terms of the iTV navigation velocity and web content video download time.

Table 2. iTV interface evaluation

	Nothing	Little	Average	Much	Very Much
Is Intuitive	0%	0%	10%	**17%**	**73%**
Is easy to use	0%	0%	20%	**27%**	**53%**
Has a fluid navigation	0%	10%	13%	**30%**	**47%**
Is visually pleasant	0%	0%	17%	**17%**	**70%**
Uses easy to understand keys	0%	0%	10%	**17%**	**73%**
Adapts to viewer needs (providing more or less information)	0%	0%	7%	**13%**	**80%**
Is not intrusive and does not distract from essential	0%	0%	27%	**27%**	**57%**
Works well with the use of a MENU-based system	0%	0%	0%	**7%**	**93%**
Could be better	27%	**50%**	**23%**	0%	0%
Is well designed	0%	0%	10%	**17%**	**73%**

In general terms Users adapted to the interface: difficulty 17% and easily 83%.

Table 3. PC interface evaluation

	Nothing	Little	Average	Much	Very Much
Is Intuitive	0%	0%	7%	**17%**	**77%**
Is easy to use	0%	0%	17%	**20%**	**63%**
Has a fluid navigation	0%	10%	7%	**13%**	**70%**
Is visually pleasant	0%	0%	10%	**17%**	**73%**
Uses easy to understand buttons	0%	0%	3%	**10%**	**87%**
Adapts to viewer needs (providing more or less information)	0%	0%	7%	**10%**	**83%**
Is not intrusive and does not distract from essential	0%	0%	13%	**27%**	**60%**
Works well with the use of a MENU-based system	0%	0%	0%	**7%**	**93%**
Could be better	90%	**10%**	0%	0%	0%
Is well designed	0%	0%	7%	**13%**	**80%**

Table 4. Mobile device interface evaluation

	Nothing	Little	Average	Much	Very Much
Is Intuitive	0%	0%	7%	**23%**	**70%**
Is easy to use	0%	0%	10%	**13%**	**77%**
Has a fluid navigation	0%	10%	13%	**17%**	**60%**
Is visually pleasant	0%	0%	17%	**17%**	**67%**
Uses easy to understand buttons	0%	7%	17%	**27%**	**50%**
Adapts to viewer needs (providing more or less information)	0%	0%	10%	**17%**	**73%**
Is not intrusive and does not distract from essential	0%	0%	13%	**20%**	**67%**
Works well with the use of a MENU-based system	0%	0%	17%	**33%**	**50%**
Could be better	0%	**40%**	**37%**	**17%**	**7%**
Is well designed	0%	3%	13%	**17%**	**67%**

Web Interface

From Table 3, and counting the values that correspond to 'Much' and 'Very much', it is possible to see that, in general, users considered the PC interface: intuitive (93%), easy to use (83%), with a fluid navigation (83%), visually pleasant (90%), with easy to understand buttons (97%), adaptable to viewers' needs (93%), not intrusive (87%), works well with the use of a menu (100%), is well designed (93%) but however could be better (10%). A curious fact was that, when compared to the iTV interface, all these values were slightly better. However, in relation to the iTV interface, 73% considered that the interface could be better while only 10% considered that it could be better through PC. These values were not a surprise considering that we were expecting that almost all users found the iTV interface more difficult to use considering that a remote is more difficult to use than a mouse. However, and in spite the considerable difference in what relates to this particular answer, in general, the results seem to indicate that we have achieved a considerable equilibrated iTV interface, especially considering that they also considered the PC interface well designed. From the interviews it was possible to perceive that, due to their experience of use and previous web navigation knowledge, they are less demanding in what relates to PC interfaces. As to iTV interfaces they are more demanding considering that they have less experience in its use (especially in crossmedia contexts) and the use of a remote is far way more difficult than a mouse.

In general terms users adapted to the interface: difficulty 13% and easily 87%.

It is important to mention that the intention of transmitting a sense of unity was achieved: 87% of the users referred that when they entered the 'portal' they immediately felt that they were inside of the same application, in spite using a different device. As to the contextualization designed proposal, the majority of the users (80%) preferred the video playing and 97% of the users considered that this type of visual contextualization (video or image) is needed.

Table 5. DF functionalities: levels of interest and difficulty (the percentages refer to the highest results: levels 4 and 5 of the 1-5 Likert scale used in the question related to the level of interest and to levels 1 and 2 of the 1-5 Likert scale in the question related to the level of difficulty)

Device Functionalities (DF) Options	Level of Interest (Some Interest + Interesting)	Level of Difficulty (Easy + Very Easy)
Add GPS coordinates to Myinput tab or specific webcontent (*)	97%	87%
Synchronize devices	100%	93%
Use videos (from the gallery or recorded at that moment) in order to:		
a) Add metadata	93%	93%
b) Search by metadata (content-based search)	96%	83%
c) Search by GPS (location-based search) (*)	100%	97%
d) Export to eiTV	100%	93%
Use pictures (from the gallery or taken at that moment) in order to:		
a) Add metadata	96%	90%
b) Search by metadata (content-based search)	90%	80%
c) Search by GPS (location-based search) (*)	100%	97%
d) Export to eiTV	100%	97%
Import other files to the eiTV, namely:		
a) Audio files	90%	87%
b) SMS	73%	83%
c) MMS	84%	90%

Mobile Device Interface

From Table 4, and counting the values that correspond to 'Much' and 'Very much', it is possible to see that, in general, users considered the mobile interface: intuitive (93%), easy to use (90%), with a fluid navigation (77%), visually pleasant (83%), with easy to understand buttons (77%), adaptable to viewers' needs (90%), not intrusive (87%), works well with the use of a menu (83%), is well designed (83%) but however could be better (100%). A curious fact was that, when compared to the iTV and PC interfaces, almost all these values were considerable similar. However, 100% of users considered that the interface could be better. In fact, while the specific mobile device functionalities work fine, and were perceived as very interesting, useful and usable, the problem seems to be when it comes to the creation of a webcontent while viewing a video. A mobile device has a small screen which complicates the process of using extra information with the video. More usable interface solutions need to be addressed, however without compromising the sense of unity that comes from the use of similar interfaces along devices.

In general terms users adapted to the interface: difficulty 27% and easily 73%.

eiTV Application in General

As to the level of interest on each of the functionality options, the results were a good surprise considering that five (out of thirteen) available options caught the attention of 100% of users, as may be seen in Table 5. Important to remember that some of the presented functionalities options are specific for mobile devices, namely, the ones that imply the use of GPS coordinates (they are identified in the table with bold and a '*' ahead).

In what refers to the eiTV in general and as a whole, users considered it: useful (100%); easy to use (77%); easy to learn (87%); 100% of the evaluators stated that they would like to have the application and 100% would recommend it to friends. Some usability problems were detected, as for instance: the lack of shortcuts to facilitate and speed the navigation process through bigger lists of selected topics at the Create functionality (one option could be to implement circular navigation). As to the mobile devices interface the menu solution was not perceived as very easy to use, as well as the option to create the web content.

Users That had Already Participated

In relation to the 15 users that already participated in the evaluation of the previous prototypes: 80% considered this version more intuitive, more flexible (93%), with more useful functionalities (100%), they liked the Search functionality (93%), they liked the DF functionality (100%) and they liked the use of an aggregator 'portal' (90%). These results were very encouraging, since they prove that our effort was worthwhile and our design approach succeeded. The questionnaires results corroborate, in general, what was observed and the interviews results. From the observation, we noticed that users had some difficulties at the beginning of usage. However, after some minutes they seamed very comfortable using the application, even the less technologically literate – somehow unexpected.

FUTURE RESEARCH DIRECTIONS

As to future work, we intend to explore technological advances (in terms of devices and also in general terms) in order to create new functionalities capable to better support users' needs, different cognitive modes and flexibility as for instance a functionality which allows having contents suggested by default by the system, a functionality that allows to interact with the system through voice commands and natural language, etc. A continuous improvement of the interfaces, so that in the future they may become easier to learn and use considering that, as stated by Abreu et al. (2019), the future of usability is based on the reduction of the effort of interaction between the user and the system. Another goal is to prepare the system to be adopted by specific groups of people, as for instance, people with visual impairments and older (senior) populations. In what refers to visual impaired viewers, some recent studies proposing new approaches for the creation of audiovisual translation techniques (Oliveira et al, 2017) will be considered, in order to improve and adapt our eiTV application. In what refers to the senior population and considering that the ageing of the population is an undeniable fact, faced by almost all countries, we also intent to contribute to their inclusion. There are several strategies, supported by governments and researchers, in order to improve senior's quality of live (Silva et al, 2017). The use of technology for many purposes, ranging from entertainment to health support, is one of these strategies. However, seniors have difficulties in daily tasks which increase when the tasks involve the use of any type of new

technologies, due to the fact that the use of these technologies require a higher cognitive, visual and motor capacity (Johnson & Finn, 2017). The only way to overcome this situation is to adopt new design and development strategies (Pinho, 2019) which we intend to follow in a near future.

CONCLUSION

In this chapter, the main goal was the conceptualization, prototyping and evaluation of crossmedia services and interfaces, through the eiTV application case study, following the directions identified on the conceptual framework. The application is capable of creating, from video (watched through iTV, PC or mobile device) crossmedia personalized web contents, or informal learning environments, as additional information, in order to give an answer to the learning opportunities created by the use of video. Low and high fidelity-prototypes with interaction proposals where designed, developed and evaluated. From those tests, it was possible to conclude that, in general, and amongst other things, the application was considered: usable, intuitive, useful, well designed, very interesting and important to have. Considering the evaluation results, it was possible to perceive what works best in terms of design choices and that the initial goals where achieved. As to future work, the prototypes are being redesigned, and will be re-evaluated, to accommodate the directions and suggestions raised in this evaluation and in our own insights. Other interaction proposals are being designed to improve, in particular, mobile devices interfaces. New functionalities are being considered to take the best advantage on the continuous technological advances in order to provide users with more flexible options to explore the information integration and navigation in crossmedia contexts.

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REFERENCES

Abreu, J. (2007). *Design de Serviços e Interfaces num Contexto de Televisão Interactiva* (Doctoral Thesis). Aveiro University.

Abreu, J., Santos, R., Silva, T., Marques, T., & Cardoso, B. (2019). Towards Proactivity Behaviours in Voice Assistants for the TV Ecosystem. *Proc. of JAUTI 2019 - VIII Conferência Iberoamericana sobre Aplicações e Usabilidade da TV Interativa*, 165-173.

Ahmad, N., Rextin, A., & Kulsoom, U. E. (2017). Perspectives on usability guidelines for smartphone applications: An empirical investigation and systematic literature review. *Information and Software Technology*, *94*, 130–149. doi:10.1016/j.infsof.2017.10.005

Ali, A., & Lamont, S. (2000). Interactive Television Programs: Current Challenges and Solutions. *Proceedings of the 8th Annual Usability Professional's Association Conference.*

APPLE. (2020). *Human Interface Guidelines*. Retrieved February 08, 2020 from https://developer.apple.com/design/human-interface-guidelines/

Bates, P. (2003). *T-Learning - Final Report. Report prepared for the European Community IST Programme*. PJB Associates. Retrieved April 20, 2010 from: http://www.pjb.co.uk/t-learning/contents.htm

Brame, C. J. (2015). *Effective educational videos*. Retrieved January 5, 2019 from http://cft.vanderbilt.edu/guides-sub-pages/effective-educational-videos/

Brewster, S. (2002). Overcoming the lack of screen space on mobile computers. *Personal and Ubiquitous Computing*, (6), 188-205.

Chambel, T., & Guimarães, N. (2000). Aprender com Vídeo em Hipermédia. *Sistemas de Informação, 12*, 85-98.

Chorianopoulos, K., & Spinellis, D. (2006). User Interface Evaluation of Interactive TV: A Media Studies Perspective. *Universal Access in the Information Society*, *5*(2), 2006. doi:10.100710209-006-0032-1

CoTV. (2011). Retrieved April 20, 2015 from http://www.teleshuttle.com/cotv/default.htm

Crespo, A., Encabo, I., Chacin, C., & Diaz, M. (2018). Mobile Devices, a Complement to Television. Case Studies. In M. Abásolo, J. Abreu, P. Almeida, & T. Silva (Eds.), *Applications and Usability of Interactive Television. JAUTI 2017. Communications in Computer and Information Science* (Vol. 813). Springer.

Dakss, S., Agamanolis, S., Bove, V., & Chalom, E. (1998). Hyperlinked Video. *Proceedings of SPIE Multimedia Systems and Applications*, 3528.

Damásio, M. (2010). iDTV-HEALTH: Inclusive services to promote health and wellness via digital interactive television. Presented at National CoLab Event 2010, Lisbon, Portugal.

Devaney, E. (2017). *8 Guidelines for Exceptional Web Design, Usability, and User Experience*. Retrieved February 8, 2018 from https://blog.hubspot.com/blog/tabid/6307/bid/30557/6-guidelines-for-exceptional-website-design-and-usability.aspx

Dimitrova, N., Zimmerman, J., Janevski, A., Agnihotri, L., Haas, N., & Bolle, R. (2003). Content Augmentation Aspects of Personalized Entertainment Experience. *Proceedings of the UM 2003, third Workshop on Personalization in Future TV*, 42-51.

Enginess. (2014). *The 6 Principles of Design, a la Donald Norman*. Retrieved October 5, 2017 from https://www.enginess.io/insights/6-principles-design-la-donald-norman

Eronen, L. (2004). *User Centered Design of New and Novel Products: Case Digital Television* (Doctoral thesis). Helsinki University of Technology.

Florins, M., & Vanderdonckt, J. (2004). Graceful Degradation of User Interfaces as a Design Method for Multiplatform Systems. *Proceedings of the IUI'04*. 10.1145/964442.964469

Fraile, I., Núñez, J., Malewski, S., Artigas, X., Fernandez, S., & Llobera, J. (2017) An end-to-end toolset for the creation and delivery of video-based multi-device content. *Proc of JAUTI 2017 - 6th Iberoamerican Conference on Applications and Usability for Interactive TV*, 154-161.

Geerts, D., Cesar, P., & Bulterman, D. (2008). The Implications of Program Genres for the Design of Social Television Systems. *Proceedings of uxTV'08*, 71-80. 10.1145/1453805.1453822

Goodhue, D., & Thompson, R. (1995). Task-Technology Fit and Individual Performance. *Management Information Systems Quarterly*, *19*(2), 213–236. doi:10.2307/249689

Guérin, L. (2010). *Transmedia, crossmedia, multimedia, plurimedia… What if we had to describe these notions to someone working in a completely different field?* Transmedia Lab. Retrieved April 20 2015 from: http://www.transmedialab.org/en/economics/transmedia-crossmedia-multimedia-plurimedia-et-si-nous-devions-expliquer-ces-notions-a-quelquun-qui-travaille-dans-un-domaine-dactivite-completement-eloigne-2/

Hermansson, C., Soderstrom, M., & Johansson, D. (2014). *Developing useful mobile applications in cross media platforms*. Conference: 3rd International Workshop on Frontiers in Innovative Mobile and Internet Services (FIMIS-2014), Birmingham, UK. 10.1109/IMIS.2014.59

ITF. (2020). *Designing for the Mobile Environment – Some Simple Guidelines*. Interaction Design Foundation. Retrieved February 8, 2020 from: https://www.interaction-design.org/literature/article/designing-for-the-mobile-environment-some-simple-guidelines

ITV. (2018). *Creative Guidelines: Content Delivery Requirements for Marketing Programme.* Retrieved February 8, 2018, from https://www.itv.com/_data/documents/pdf/itv_creative_guidelines_updated_oct2018.pdf

Jenkins, H. (2010). *Transmedia*. Retrieved on Dec. 10th, 2010 from: https://www.youtube.com/watch?v=bhGBfuyN5gg

Johnson, J., & Finn, K. (2017). *Designing User Interfaces for an Aging Population*. Retrieved January 23, 2019, from https://www.uxmatters.com/mt/archives/2017/04/designing-user-interfaces-for-an-aging-population.php

Jonassen, D., & Henning, P. (1996). Knowledge in the Head and Knowledge in the World. *Proceedings of the 1996 International Conference on Learning Sciences*, 433-438.

Kar, E. V. D., Maitland, C. F., Montalvo, U. W. D., & Bouwman, H. (2003). *Design guidelines for mobile information and entertainment services – based on the radio538 ringtunes i-mode service case study. In Proc. of ICEC*. ACM Press.

Kulowiec, G. (2018). *I've been thinking…It is time to revisit Jenkins' Participatory Culture*. Retrieved January 5, 2019 from https://medium.com/@gkulowiec/ive-been-thinking-it-is-time-to-revisit-jenkins-participatory-culture-d375ebd34e94

Lamont, S. (2003). An 8-Step Process for Creating Compelling Enhanced Television. *Proceedings of the EuroiTV2003 the 1st European Conference on Interactive Television: from Viewers to Actors?* 133-136.

Liestøl, G. (1994). Aesthetic and Rhetorical Aspects of Linking Video in Hypermedia. *Proceedings of ACM HT'*94.

Livaditi, J., Vassilopoulou, K., Lougos, C., & Chorianopoulos, C. (2003). Needs and gratifications for interactive TV applications: Implications for designers. *Proceedings of HICSS'03: the IEEE 36th Hawaii International Conference on System Sciences*.

Livingston, K., Dredze, M., Hammond, K., & Birnbaum, L. (2003). Beyond Broadcast. *Proceedings of ACM IUI'2003, The Seventh International Conference on Intelligent User Interfaces*, 260-262.

Ma, O., & Tanaka, K. (2003). Webtelop: Dynamic tv-content augmentation by using web pages. *Proceedings of ICME' 2003, IEEE International Conference on Multimedia & Expo*, 2, 173–176.

Magalhães, J. (2009). On-Demand Immersive-TV for Communities of Media Producers and Consumers, Project proposal, FCT UTAustin/Portugal Program on Future TV. Presented at National CoLab Event 2010, Lisbon, Portugal.

Martin, R., & Holtzman, H. (2010). Newstream. A Multi-Device, Cross-Medium, and Socially Aware Approach to News Content. Proceedings of the ACM EuroiTV 2010, 83-90.

McLuhan, M. (1964). *Understanding Media*. McGraw-Hill.

Miyamori, H., & Tanaka, K. (2005). Webified video: media conversion from tv programs to web content for cross-media information integration. In *Lecture Notes in Computer Science* (pp. 176–185). Springer-Verlag.

Nadamoto, A., & Tanaka, K. (2005). Complementing Your TV-Viewing by Web Content Automatically-Transformed into TV-program-type Content. Proceedings of the ACM Multimedia' 2005, 41-50. 10.1145/1101149.1101157

Nielsen, J. (1989). *Coordinating User Interfaces for Consistency. Neuauflage* (2002 ed.). The Morgan Kaufmann Series in Interactive Technologies.

Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

Nielsen, J. (2005). Website disponível em 14/12/2010 em: www.useit.com/papers/heuristics/heuristic_list.html

Norman, D. (1993). *Things that Make us Smart*. Addison Wesley Publishing Company.

Norman, D. (2002). *The Design of Everyday Things*. Basic Books.

Obrist, M., Moser, C., Tscheligi, M., & Alliez, D. (2010). Field evaluation of a Cross Platform 6 Key Navigation Model and a Unified User Interface Design. Proceedings of the ACM EuroiTV 2010, 141-144.

Oliveira, R., Abreu, J., & Almeida, M. (2017). Involving visually impaired viewers in the design of accessible solutions for audiovisual translation. *Proc. of JAUTI 2017 - 6th Iberoamerican Conference on Applications and Usability for Interactive TV*, 34-46.

Pemberton, L., & Fallahkhair, S. (2005). Design Issues for Dual Device Learning: interactive television and mobile phone. Proceedings of mLearn'2005.

Pinho, A. (2019). *Estudo de User Experience de uma interface tangível: O cubo personalizável SIX* (Master Thesis). University of Aveiro.

Prata, A. (2005). iTV Guidelines. In Encyclopedia of Multimedia Technology and Networking. Idea Group Inc.

Prata, A., & Chambel, T. (2011). Going Beyond iTV: Designing Flexible Video-Based Crossmedia Interactive Services as Informal Learning Contexts. *Proceedings of Euro iTV 2011 – 9th European Interactive TV Conference ACM Conference*, 65-74.

Prata, A., Chambel, T. (2014). Metodologia para avaliação de soluções crossmedia geradoras de ambientes personalizados de aprendizagem informal a partir de vídeo. *Actas do seminário entre a teoria e o conhecimento – Investigar práticas em contexto*.

Prata, A., & Chambel, T. (2019). Mobility in a Crossmedia Environment Capable of Generating Personalized Informal Learning Contents from iTV, PC and Mobile Devices. *Proc. of JAUTI 2019 – VIII Conferência Iberoamericana sobre Aplicações e Usabilidade da TV Interativa,* 59-71.

Prata, A., Chambel, T., & Guimarães, N. (2010). Generation of Crossmedia Dynamic Learning Contexts from iTV. *Proceedings of ACM EuroiTV 2010*, 91-100. 10.1145/1809777.1809798

Prata, A., Chambel, T., & Guimarães, N. (2012). Personalized Content Access in Interactive TV-Based Cross Media Environments. In TV Content Analysis Techniques and Applications. CRC-Press.

Robertson, S., Wharton, C., Ashworth, C., & Franzke, M. (1996). Dual Device User Interface Design: PDAs and Interactive Television. *Proceedings of ACM CHI 1996*, 79-86. 10.1145/238386.238408

Sánchez, J., Starostenko, O., Castillo, E., & González, M. (2005). Generation of usable interfaces for mobile devices. *Proc. of CLICH'05*, 348. 10.1145/1111360.1111408

Segerståhl, K. (2008). Utilization of Pervasive IT Compromised? Understanding the Adoption and Use of a Cross Media System. *Proceedings of MUM'2008*, 168-175.

Segerståhl, K. (2009). Crossmedia Systems Constructed around Human Activities: A Field Study and Implications for Design. Proc. of the Interact 2009, 354-367. doi:10.1007/978-3-642-03658-3_41

Segerståhl, K., & Oinas-Kukkonen, H. (2007). Distributed User Experience in Persuasive Technology Environments. In Lecture notes in Computer Science: Vol. 4744. *Persuasive 2007*. Springer-Verlag. doi:10.1007/978-3-540-77006-0_10

Silva, T., Reis, L., Hernández, C., & Caravau, H. (2017). Building informative audio-visual content automatically: a process to define the key aspects. *Proc. of JAUTI 2017 - 6th Iberoamerican Conference on Applications and Usability for Interactive TV*, 130-141.

Sumiya, K., Munisamy, M., & Tanaka, K. (2004). Tv2Web: generating and browsing web with multiple lod from video streams and their metadata. *Proceedings of ICKS2004*, 158-167. 10.1145/1013367.1013494

Taylor, A. and Harper, R. (2002). Switching On to Switch Off: An analysis of Routine TV Watching Habits and their Implications for Electronic Programme Design. *UsableiTV, 3*, 7-13.

ENDNOTE

[1] More information available at: https://www.youtube.com/watch?v=ZY6oJR38OoI

Chapter 12
Successful Practices in ICT Team Building in International Projects

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ABSTRACT

The purpose of the chapter is to address the importance of building the project team in order to contribute to maximize the number of project success histories in an international context. The design science research methodology allowed, based on the literature review on the thematic domain, to elaborate a reference framework in order to obtain the scientific validation of the work. The main conclusions focus on presenting the added value of the team building in the implementation and adaptation of software products. The need to define strategies when setting up the teams is emphasized, so that specialists are incorporated in the various domains, taking into account the specificity of the country in which the project will take place. Thus, the definition of team formation policies is considered a differentiating factor, in order to include the knowledge in the domains of the culture of the country, organizational culture and current legal and fiscal frameworks as well as the interpersonal relations component.

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INTRODUCTION

The use of Information and Communication Technologies (ICT) to support Information Systems (IS) and people management activities provide a competitive advantage and a contribution to the promotion of more sustainable and inclusive development models (Reis, Silveira, Carvalho, Mata, & Madeira, 2020) in the long term, enhancing innovative solutions.

The ICT sector has concerns in implementing green IT policies, actively contributing to the sustainability of the sector. Thus, it is important that when a project starts it has underlying sustainability policies replicable in different departments/projects thus reinforcing the importance for the organization and the relevance of the results achieved from a sustainability perspective.

Currently, the most common business processes, of organizations are supported by generic software pro-ducts (Silveira, 2006), such as Enterprise Resource Planning (ERP) or Enterprise Systems (ES). The implementation/customization/adaptation of these products sets important challenges to the teams. It is very important that the project team understands better what are the obstacles to ICT implementation and what initiatives are needed to overcome them (Gichoya, 2005). In this sense, the issue of setting up and managing international teams in the scope of parameterization/customization of generic software products is addressed.

Another issue to take into account and try to avoid, it is the failure of realizing expected IT-induced benefits has led to a growing number of senior executives to question the value of IT investments (Stewart, 2008). In practice, about 25% of the organizations felt it necessary to customize the software in order to support unique business processes, even though customization normally amounted to time and cost overruns (Sumner, 2018).

Based on a well-designed and accepted project plan by all, the authors (Smith, Bruyns, & Evans, 2011), believe that to improve the chances of success in a project, ICT project managers should have a positive but realistic degree of optimism. Although the project team should wait and be confronted with stress during the project, it must be carefully managed.

For (Luckmann, 2015) successful projects it is needed to effectively involve the project customers, and the key issue is in the proper involvement of international customers with different cultural backgrounds.

International projects, (Schibi & Lee, 2015), can be considered as the means by which organizations achieve objectives and meet customer needs. Successful project implementation is critical to the performance of an organization and overall profitability. It is therefore considered that the responsible person for the international team should have specific project management skills and the ability to integrate a solid culture of project management.

The process of recruiting and selecting members, (Ekwoaba, Ugochukwu, & Ufoma, 2015), for the establishment of a multidisciplinary team in the context of international projects is crucial to the success of the project. Thus, it is considered that the success of any organization or the efficiency in the provision of services depends on the process of recruiting quality and the workforce recruited for this purpose.

Integration can be considered, (Baiden, Price, & Dainty, 2006), as the fusion of different disciplines or organizations with different objectives, needs and cultures into a cohesive and mutually supported unit. Integrated approaches require individuals of various specialties to work together, to achieve common project objectives through information sharing. Thus, it is considered that a multidisciplinary team can constitute added value in the context of International Projects.

Devaluing the evaluation of barriers to effective implementation, monitoring and evaluation of international projects can condition the success of the project (Tengan & Aigbavboa, 2016). The training

of the institutions where the projects are implemented cannot be underestimated. It is not surprising that this variable has occurred as the most critical challenge of monitoring and evaluating projects in the specific context of the country. The authors, (Callistus & Clinton, 2018), emphasize the importance given to monitoring and evaluating the entire project implementation process to ensure the successful completion of projects.

In the context of international projects, (Prosci, 2020), it is considered that the change management process should be examined in a strong way. The stages and/or activities that a team develops should be permanently analyzed in order to assess the need for change. The team and/or project manager may need to implement change management procedures to drive individual transitions and ensure that the project meets the desired results. The change of the management process is therefore considered to be successful.

Communication between the members of a team is essential for its success. Members of the lower status of the virtual team are considered to influence the success of members with higher status, (Wadsworth & Blanchard, 2015). Strategies emerged then to document information and develop relationships in order to fill these gaps. In addition, virtual team members have developed techniques to reduce the ambiguity of virtual communications in order to positively influence team members.

The authors, (Powell, Piccoli, & Ives, 2004), advocate that virtual teams represent an organizational form that can revolutionize the workplace and provide organizations with unprecedented levels of flexibility and responsiveness. As the technological infrastructure needed to support virtual teams is now readily available, further research into the range of issues surrounding virtual teams is needed to enhance their performance.

Other authors' think that the most prominent among them are the knowledge and skills to select the right projects and the right project partners for international efforts, as well as the ability to select, develop, and support leaders for projects and programs who have the skills and flexibility to make cross-border collaboration successful (Freedman & Katz, 2007). But due to the competitive world some companies accept everything and, then, in the long term need to deal with the wrong projects and/or wrong partners.

To make the software more appealing the manufactures of the software's increasingly make efforts to adapt their product to the needs of the market. Like adapting their product appearance to aesthetic and historical value in which they are sold (Hau & Aparício, 2008), and the value of this is not the same in every country.

The motivation of the chapter focuses on the need and pertinence in systematizing knowledge in the domino (in the field) under study. Given the professional experience in managing teams in international ICT projects, it is considered that the establishment of the teams is fundamental to the success of the projects.

In view of the above (As indicated/referred above), the aim of the study, reported in this chapter, is to present successful practices when setting up teams to participate in international projects in the context of parameterization /customization of generic software products, in order to maximize the success of the teams.

This chapter is organized in six sections, where the problem is formulated, the methodology for conducting the study is presented, the state of the art is characterized, and successful practices to create the international teams are described, ending with the presentation of the conclusions and perspectives of future work in the field of this theme.

PROBLEM FORMULATION

The implementation of Information Systems and Technologies in International Projects is more and more frequent in this global world in which we live. The business dimension, namely in Portugal, is mainly made up of Micro-companies (PORDATA, 2019), whose number has been increasing, between 2013 and 2017, the number of Portuguese Micro-companies increased by 12.6% (Russo & Reis, 2019). In this sense, the demand for international markets it is of interest. The need to search for new markets in order to expand business makes companies, in this case Portuguese, to find a concerted way to look for new projects. The Portuguese market is an extremely small market when compared to other countries.

The implementation of generic software products, at an international level, lays a set of challenges and problems that must be considered in order to be successful. One of the challenges, among many others, is to have an efficient and effective project team prepared to deal with all the inherent variables in order to reduce risks. Thus, the challenge is how to define a project team that will consider all the variables of a project, that is the most prepared, and that will respond appropriately to the challenges that will arise.

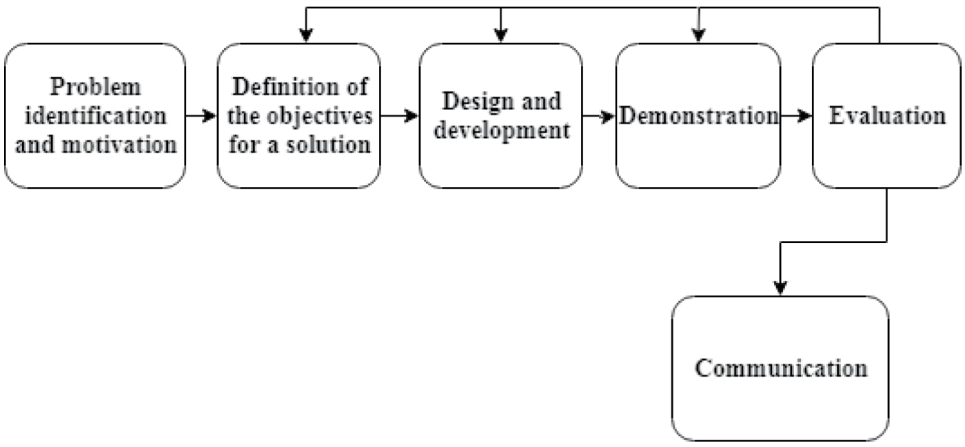
Maybe the communication should be the main aspect to be faced. The nature of international project teams needs an emphasis on communication, and an awareness of increased risks and new barriers to project performance (Barnwell, Nedrick, Rudolph, Sesay, & Wellen, 2014).

Thus, it is necessary to define a set of pertinent aspects that have a direct influence on the project, namely, to incorporate specialists from different fields, taking into account the specificity of the country in which the project will take place. Taking these aspects into account, we intend to create conditions to evaluate the set of collaborators that will allow us to form the most efficient and effective teams for each specific project.

METHODOLOGY

The Design Science Research (DSR) methodology is one of the research methods that has been established (Bianchi & Sousa, 2015) and has been adopted in the area of IS (Roquete, 2018) to solve organizational problems. Thus, the DSR methodology (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007) was selected as the theoretical basis to support the scientific validity of this work. As it is a research methodology indicated for research projects in technologies and IS, system architectures (Ferreira, Ferreira, Silva, & Carvalho, 2012), and parameterization/customization activity of generic software products, it ensures discipline, rigor and transparency.

Figure 1. Design science research steps
Source: Adapted from (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007)



The scheme of this methodology is shown in Figure 1 (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007). The DSR process (Table 1) includes six steps: problem identification and motivation, the definition of the objectives for a solution, design and development, demonstration, evaluation, and communication.

Table 1. Shows the application of the design science research methodology for the present work

Step	Description
1. Problem identification and motivation	The teams that perform the parameterization/customization of generic software products in international projects face challenges in terms of the organizational culture of the customer and of the country.
2. Definition of the objectives for a solution	To present an approach that is effective in defining and managing international teams in the scope of parameterization/customization of generic software products, including guidelines for their adoption.
3. Design and development	Conception of the approach whose development involves identifying the factors that influence the team's activity.
4. Demonstration	Demonstration of the effectiveness and suitability of the approach developed using professionals with experience in implementation.
5. Evaluation	Evaluation of the approach by applying it into real cases, with industry experts to assess its relevance and suitability.
6. Communication	Communication of the problem and its importance, the approach and its usefulness and novelty. Dissemination of the approach by professionals, team managers, customers and the publication of results in forums, conferences and magazines.

The DSR methodology allows, in this context, to identify the underlying problem in the evaluation of international project teams in order to create an approach that aggregates the inherent information to the theme and which practical application will be validated by professionals.

STATE OF THE ART

Generic software products support business processes of the organization and are characterized by high modularity and configurability. These products are developed for a comprehensive application domain, after which they must be adapted / configured/parameterized to the specific needs of each customer (Silveira, 2006).Thus, the implementation of ERP involves, on the one hand, changes in business processes and on the other hand adaptations in the software to support business processes (Holland & Light, 1999). The implementation/adaptation of these products raises important challenges for teams and customers.

In this sense, the teams that implement/adapt these products to customers with different needs, use strategies that allow them to identify the services that must be ensured in the application to be implemented/adapted and must take into account the organizational culture (Ahmad & Cuenca, 2013); (Alsanoosy, Spichkova, & Harland, 2018); (Alsanoosy, Spichkova, & Harland, 2019); (Huang & Palvia, 2001); (Sutcliffe, 2002), the application domain, the technologies and the methods used in the customer's organization. In this way, the domain of the application and the problem is studied to identify the common parts and the variable parts (Silveira & Vidal, 2002).

In (Mahmood, Khan, & Bokhari, 2019) problems and challenges are identified, assessing the degree of criticality of these problems and challenges faced by the teams during the implementation of the ERP.

A customization structure to assist in the evaluation of ERP implementation options is presented in (Parthasarathy & Daneva, 2014), suggesting that ERP customization involves:

- Understanding the different attributes of the ERP system customization and business process customization;
- Analyzing the possibilities of performing customization in the iteration mode;
- Selecting a type of customization that corresponds to the customer's options.

According to (Daneva, 2004), the set of experiences acquired in implementations / adaptations of ERP systems, are gathered in lessons and respective solutions. These lessons cover four groups of topics, namely:

- Organizational;
- Process infrastructure;
- Requirements reuse;
- Implementation / adaptation process.

Organizational matters refer to the team, stakeholder participation and knowledge generation; the process infrastructure refers to the design of the architecture, the tools and standards and procedures to be adopted; the requirements reuse topic seeks to answer the question of how to approach reuse and management safely, at the requirements level. The better those responsible for the process understand the reuse, the less adaptations will be required; the process topic focuses on the practices that a team can adopt to support the validation, verification and analysis of impact of change activities.

Goal-oriented requirements engineering, also makes a contribution in this area. Objectives are used as a useful conceptualization for obtaining, modeling and analyzing requirements, capturing alternatives and conflicts (Horkoff, et al., 2019).

The study showed that the duration (time to market), schedule adherence and handover quality improved with strengthening of a coherent product management role. Explanatory factors for this positive impact of product management have been explained and coined into guidelines towards successful product management (Ebert, 2007):

- Business objectives and responsibility;
- Mastering requirements;
- Managing risks and uncertainty;
- Leadership and teamwork.

The authors in (Niazi, et al., 2013) show the challenges frequently mentioned by project managers, namely: lack of cultural understanding in the team, lack of communication, time zone problems, lack of coordination, lack of knowledge transfer between teams, geographical distance, and lack of confidence. Also, (Jones, Cline, & Ryan, 2006) describes the importance of knowledge sharing during the implementation of ERP systems, showing that there is a link between the dimensions of culture and knowledge sharing. For (Daneva, 2004), any team generates and uses knowledge; the involved stakeholders interact, absorb information, transform it into knowledge and make decisions - as part of the process - basing knowledge on acquired experiences, built-in values, project objectives and business rules.

Team Constitution

A key aspect is the choice of the team. The author (DeMarco, 1997), states that it is necessary to choose the right people for the team, motivate them and keep them successful. Team members must have good knowledge in the field of application, information technology and the process. It is also considered important to consult domain experts in order to improve and validate the team's knowledge base (Hofmann & Lehner, 2001).

For (Daneva & Wieringa, 2008) consider ERP implementation projects as knowledge transfer initiatives. For organizations that supply ERP products, the team's knowledge and experience are transferred to the existing resources of the customers.

Innovation and creativity (at the technical and / or functional level) are also important factors to the success of generic software products. Thus, the participation of elements with capabilities in these areas is a differentiating factor.

Therefore, it is important that the consultant devotes time to explain to the organization the functionalities and processes embedded in the product. In fact, companies must take into account, from the beginning of the product implementation, what the impact that the redefinition of the processes and the introduction of the system will have on the structure, culture and strategy of the organization.

In the same way (Holland & Light, 1999) emphasize that to avoid problems a posteriori, managers before the starting of the project must question:

1. What is the current state of the systems of the company and how can they affect the transition to ERP?
2. Is there a clear definition of objectives?
3. What type of implementation is to be carried out?
4. Are there any plans for implementation?

Given the importance of this theme, a set of skills for good leadership are gathered below (Goleman & Boyatzis, 2002):

5. **Organizational awareness:** Leaders must be able to detect social networks and power relationships in the organization. They must know how to understand the existing political currents, as well as the guiding values and the unexpressed rules that govern people's relationships;
6. **Service spirit:** Leaders must know how to stimulate an emotional environment so that people who have direct contact with customers and suppliers properly build those relationships. They must also demonstrate availability, whenever necessary;
7. **Empathy:** Leaders must know how to deal with people from different backgrounds and cultures. They must be able to tune in to a wide range of emotional signals, which will allow them to capture the emotions felt by people and groups. They must, also, know how to listen carefully and understand the perspective of other people;
8. **Influence:** A leader must be able to find appealing themes suitable for each one of the interlocutors and be able to win people's support, building networks that support their initiatives;
9. **Inspirational leadership:** Leaders must generate resonance and encourage people to be involved;
10. **Change catalyst:** Leaders must know how to operate change, making it sufficiently appealing, even if they have to deal with eventual resistance;
11. **Conflict management:** Leaders must know how to resolve conflicts, attracting all parties and mobilizing them towards a common ideal;
12. **Collaborative and team spirit:** Leaders must know how to generate a collegial environment and must be seen as models of respect and collaboration with a view to strengthening relationships and cooperation.

Organizational Culture

The configuration and adaptation processes of generic software products are dominated by human, social and organizational factors. In effect, a set of actors with different knowledge and with different individual and organizational interests intervene.

According to (Kotonya & Sommerville, 1998), organizational culture has a marked influence on business processes. The projects must be adapted to the organizational culture, which requires a prior collection of elements before deciding the style of action. Also (Sutcliffe, 2002) refers that problems have been seen when ERP solutions are implemented in organizations with different cultures and different ways of working. As previously mentioned, for (Niazi, et al., 2013), the lack of cultural understanding in the team is one of the frequently reported challenges.

In fact, people are at the heart of the process, so aspects of a cultural nature sometimes cause resistance to change. The confrontation with change still causes fear of the unknown. This implies taking a very complex path during the implementation process. Thus, it becomes mandatory to understand whether the organization is prepared for technological transformation and whether the new practices are well accepted.

The need to overcome cultural conflicts is also reinforced, in addition to the necessary involvement of managers and support for project management teams.

In this sense, human needs must be present in the sustainability policy of organizations (Reis & Silveira, 2020) and in the organizational culture, in face of the Sustainable Development Goals (SDGs),

namely in SDG 8 - Gender Equality (UNDP, 2015), to promote equality between men and women and the reconciliation between professional activity and personal life.

Table 2. Good practices in successful knowledge projects

Good Practices	Introduction Cost	Benefits
Involve customers and users	Low	Better understanding of real needs
Identify and consult all sources	Low to moderate	Better coverage of requirements
Ensure the intervention of project managers and other elements	Moderate to high	Higher performance

Cultural Aspects of the Country

As culture plays an important role in the way individuals communicate and perform tasks, the activities of configuring and parameterizing generic software products in international projects can also be strongly influenced by the cultures of the stakeholders.

The works of (Alsanoosy, Spichkova, & Harland, 2018) show the influence of the national culture in the requirements gathering activities having identified several cultural aspects: deference to elderly people and to high authorities; autocratic decision-making; limited trust; belief in expertise; relationships; empathy with customers; letting the strongest win; gender segregation; dress code; using English for documentation.

In a larger study, (Alsanoosy, Spichkova, & Harland, 2019), presented 16 influencing aspects: decision-making approaches; deference; lack of trust; hierarchical structure; manager's influence; building relationships; safeguard workmate's jobs; communication context; team working; gender preference; letting the strongest win; recognition of uncertainty; avoid taking responsibility; face saving; gender segregation; language and accent.

Also, (Thew & Sutcliffe, 2018), refer to "socio-political" issues, such as people's emotions, values and feelings, which influence the requirements gathering process. These authors define values, such as personal attitudes or long-term beliefs that can influence the functional and non-functional requirements of stakeholders; motivations, such as psychological constructions related to personality traits that can be seen as long-term goals of the stakeholders; emotions, such as tips for stakeholder reactions due to value / motivation conflicts. For (Bohm, 2013), international projects related to ICT pose several challenges for project managers, namely the geographical distance of the teams, the different time zones, cultural differences and other aspects of diversity.

International Practices

We follow the perspective of (Callele, Wnuk, & Penzenstadler, 2017) to apply the best practices of Requirements Engineering, as it considers, that it is now a collection of best practices for pragmatic and result-focused critical thinking - applicable to any domain. Goal-oriented requirements engineering also brings a contribution to this area. Objectives are used as a useful conceptualization for obtaining, modeling and analyzing requirements, capturing alternatives and conflicts (Horkoff, et al., 2019). Considering the

perspective of (Hofmann & Lehner, 2001), successful projects have a balanced combination of knowledge, good practices, resources and process. Table 2 presents the best practices in the field of knowledge.

An activity that gains greater importance in this context is the analysis of the domain, with the participation of domain experts. Market analysis, with the participation of elements from the commercial area is also essential to ensure the commercial success of the product.

Indeed, lessons learned from practice, relating to organizational matters are:

- **Reduce barriers to cooperation:** Build diversify teams, analyze the customer's software development culture and level the customer's practices. Whenever possible, use known and proven practices and raise stakeholder awareness of activities that are critical to the success of the project;
- **Create successful partnerships:** Ensure that stakeholders collaborate on technical aspects and consultancies. Encourage consultants to take an active collaborative role. Attention should also be paid to technical issues and human interactions;
- **Effect knowledge transfer:** Transfer experience from consultants to customers and promote contacts between individuals with strong learning potential.

It should also be noted that teams must promote organizational maturity, culture and change, supported by qualified consultants, with proven track record in team management processes.

For (Pinkowska & Lent, 2011) the objective of the team management process it is to ensure the best possible efficiency of the complete project team and mainly to improve customer satisfaction. It also finds that team management has a significant impact on team performance and productivity.

The author (Davis, 1994) mentions, in his principles of software engineering, that good management is more important than good technology. Good management leads people to do their best. However, there is no right universal management style. Some styles are innate and others are learnt.

Team Evaluation

Currently the evaluation of teams in the context of international projects is of particular interest given their importance in the success of the projects. One of the main benchmarks for assessing project success is the "iron triangle", which consists of a joint assessment of the following three criteria (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007) (Bronte-Stewart, 2015): deadline; cost; and quality.

Nowadays it is more and more common, the existence of remote collaborators or virtual teams, who can enhance the team present at the site of the project (Pearlson, Saunders, & Galletta, 2019). These can have advantages (such as avoiding travel, decrease costs ...) and disadvantages (such as time differences, ...).

The constitution of an adequate team to the requirements of the projects and with an adequate size will facilitate the main problems that arise from human communication and the coordination costs associated with large teams. Cultural differences, interpersonal relations, leadership, technology and trust are factors that impact communication. The study concludes by stating that a strong presence of company culture may mitigate communication issues (Luckmann, 2015).

APPROACH TO TEAM BUILDING IN THE INTERNATIONAL PROJECTS

In this section, a team assessment approach is presented for the implementation / adaptation of generic software products in international project scenarios. The proposed approach for the evaluation of international project teams, can provide added value in the sense of being an aggregating vision of the various components that can contribute to the success of the team and consequently of the project.

Figure 2. Approach to team building in the international projects

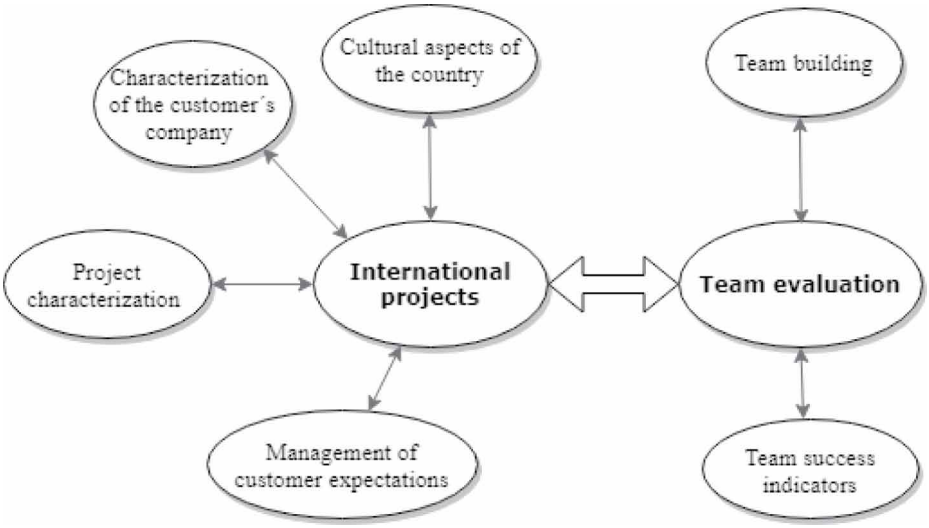


Figure 2 allows, in a graphic way, to show the different interactions of the approach.

Team assessment allows the definition of indicators that, over time, will provide added value to optimize best practices in international projects.

Description of the Approach

The scope of the approach presented here is always directed towards international projects. In this particular case, these are projects run by a Portuguese company in countries other than Portugal.

In this sense, firstly, it is considered that emphasis should be placed on two focuses:

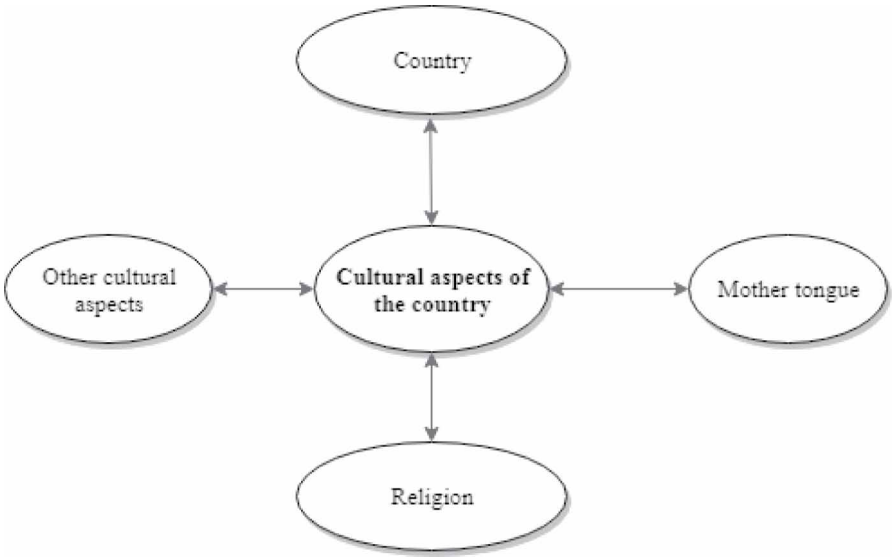
- **Customer:** Country other than Portugal;
- **Supplier:** Country Portugal.

Thus, it is necessary to highlight the characterization of the surrounding teams:

- **Customer:** Predominantly from the country other than Portugal;
- **Supplier:** Portuguese team or at least resident in Portugal.

The approach is presented, in terms of main points, listing the various items, as follows:

Figure 3. Cultural aspects of the country



1. **Cultural aspects of the country:** Country, language, religion; other cultural aspects;
2. **Characterization of customer company:** Type of internal organization, level of human resources;
3. **Characterization of the project:** Origin of the project; dimension; type of implementation, legal and fiscal aspects;
4. **Customer expectation management:** Initial, intermediate, final;
5. **Team evaluation:** Team building, success indicators.

Each component of the approach is described in detail below, in order to clarify its applicability and degree of coverage.

Cultural Aspects of the Country

Cultural aspects are important when taking an international approach. The most relevant aspects are as follows:

1. **Country/Language:** One of the most important aspects is the Country / Language. Usually the language used for communication is English. When the mother tongue is not English, it is necessary to identify the origin of the language, since communication will be more complicated. Pronunciation is also a factor that can further complicate communication when the mother tongue does not have the same origin as the English language (eg Thai);
2. **Religion:** Religion can influence in terms of customer availability, taking into account that certain festive days/seasons (e.g., Ramadan) could be different and especially habits (e.g., stops to pray);
3. **Posture:** Posture is linked to the way of being. The more formal or more casual way of dressing is related to the culture of the country and the organization of the culture. It is considered that the climate also influences (e.g., in very hot countries the casual dress is the most used). Another type

of factors that conditions it is the culture, like some cultures not accepting "No", as well as others, in which a smiling posture is the best way to captivate;

4. **In terms of Logistics/eating habits:** Some particularities must be taken into account. The location and facilities where the project team is housed and their distance from the workplace is an important point. With regard to the eating habits, the specificities of the context must be taken into account, namely the prohibition of drinking alcohol and spicy food (e.g., in Thailand and India the food is usually extremely spicy);
5. **Hours:** Working hours in general are not very different, however, there are different working hours from ours in some places (eg, in Qatar, working time is from 8 am to 2 pm, with virtually no breaks).

Figure 4. Characterization of the customer's company

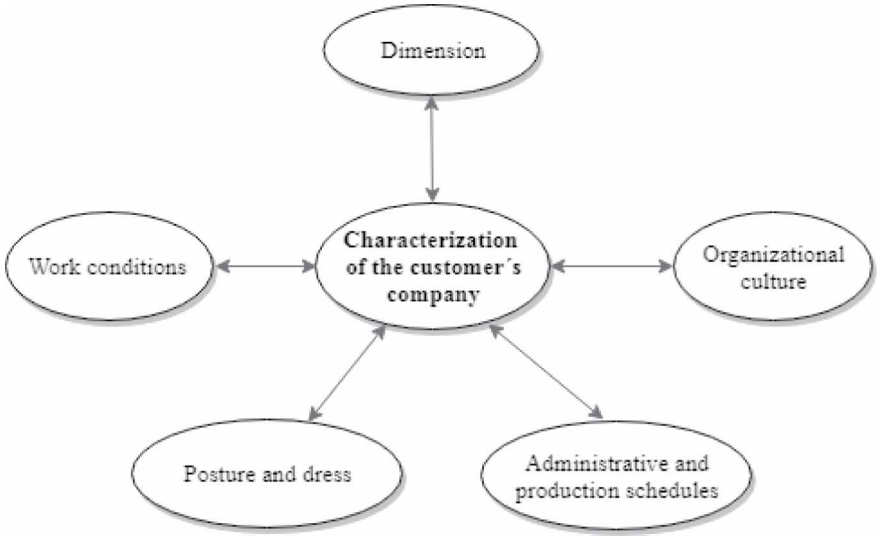


Figure 3 shows the cultural aspects of the country. The project team must have a broad knowledge of these aspects. However, throughout the project these aspects may fade or become stronger.

Customer Company Characterization

When characterizing the customer's company, the team that will implement the software modules must take into account:

1. **Dimension:** The size of the organization (small, medium, large) it is always a factor to take into account, as it influences the way the project and team management will be carried out. An organization with a small size, in theoretical terms, is easier to manage. A large organization causes the so-called normal problems (more hierarchy, more users, more computers, more processes, more performance, …);

2. **Organizational culture:** Refers to the culture of the own organization, as a rule, it is connected with the organization of the country, but it may not be so if the organization belongs to an international group. In addition, it is important to retain and take into account some aspects such as: if it is a family organization; if you have a well-defined organization chart; professional organization; existence of senior management; existence of few senior managers;
3. **Working Times:** The importance refers more to the administrative and production working hours. The administrative area can work on Saturdays, which normally does not happen in Europe (e.g., in Spain there are organizations that do not work on Friday afternoons). The production area, as a rule, has different schedules, being able to work 24 hours a day and through shifts, therefore it is necessary to know the normal and/or specific timetables;
4. **Posture:** Normally this is directly linked to the country, however, there are organizations that follow a different form, since they can be multinational organizations in which they follow the instructions of the headquarters;
5. **Working conditions:** In order to the team to be able to produce what is expected, the conditions that are available are very important (access to administrative and production facilities; adequate workroom with the main characteristics: internet access, projector, printer, among others…).

Figure 4 shows the aspects that characterize the company where the software will be implemented. This knowledge must be passed on to the team before the project starts.

The transfer of knowledge to the team that implements software in international projects is considered essential, as the organizational culture is sometimes very different from country to country.

Project Characterization

When an international approach to the implementation of generic software products starts, projects can come in 3 major ways:

1. Direct contact by the customer to the software supplier;
2. Contact of a salesperson belonging to the customer organization;
3. Contact through a local partner (consultant).

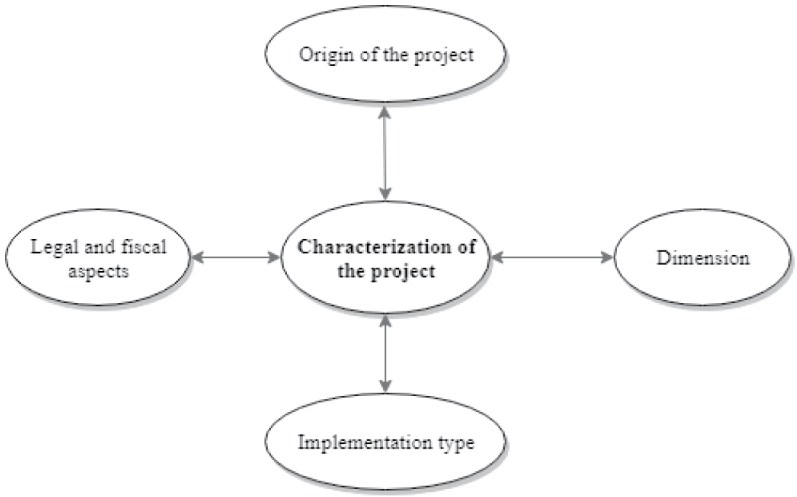
Each one has its own strengths and weaknesses. In general terms, the first way is the one that may have more risks, due to the customer's lack of knowledge and their involvement. In the second, the risk will be lower since here you may already have prior knowledge of the market in which the customer operates. Finally, the existence of a local partner may facilitate the implementation as it will have adequate knowledge of the customer, the market and the culture.

It should be noted here that the previous points are generic, and may in certain cases not be so compartmentalized and so rigid. An example would be that for a Portuguese organization to implement projects in Europe or Asia it is completely different. But even within Europe there are significant differences.

The size of the project is also a factor to take into account and we can consider the following:

1. Base
2. Normal
3. Complete

Figure 5. Synthesis of the aspects that characterize the project



In the Base segment, projects that involve the management of the main business processes can be included, namely: Commercial, Procurement, Stocks, and Production).

Projects in the Normal segment involve the Base processes as well as: Treasury, Accounting, Fixed assets and Human Resources.

Finally, projects of the complete segment involve all the processes of the Normal segment, plus adjacent processes, such as: Quality Control, Equipment Maintenance and Automation.

There are different types of implementation, of which we can characterize:

1. Standard;
2. Specific customization;
3. Specific customization and additional development;
4. The Standard type of implementation is the easiest and usually suitable for small organizations that want to have a turnkey management of their processes. Due to the author's extensive experience, there are very few projects in this area.

The second type of implementation, Specific customization, is very common in Portugal, since the processes are already inventoried and the software is prepared for a specific customization.

In international projects, the type of implementation Customization and additional development, is almost always the most used. Specific customization is always present and additional development is also due to the specificity of each country / organization.

In the implementation of international projects, the Legal and Fiscal aspects, in terms of Software Application, are always a very complicated and sometimes complex component. This complexity may vary, and this is directly related to:

1. Laws in effect in the country (which must be strictly enforced);
2. The level of integration that the project requires.

Figure 6. Management of customer expectations

In order to understand this complexity, laws vary from country to country. However, the differences between European countries are smaller, than the differences between European and Asian countries. In this regard, the Software Application will always have to be adapted to the reality of each country, which implies the survey of requirements. Thus, it is considered that there are some constraints (Russo & Reis, 2019) in the implementation of these requirements, which may be due to technical issues, interpretation of tax legislation or selection of norms or good practices in the area of Information and Communication Technologies.

This requirements survey is extremely important and must be carried out by specialized teams on the part of the organization and the customer.

The Software company team should have a full knowledge of the laws applied in the country, and if possible from other countries. This makes it easier to understand the laws of the customer's country. On the part of the customer's team, this must have high validity in the laws, but in addition, be aware of the legal practices used by the customer.

The level of integration may be lower, for example if only one Commercial module (Billing) is implemented. However, if we are talking about Administrative-Financial modules (Treasury, Accounting, Fixed Assets and Human Resources) then the complexity increases exponentially.

Figure 5 summarizes the aspects that go into the characterization of projects in the scope of the implementation/configuration/customization of generic software products.

Management of Customer's Expectations

Customer expectations demand good management, it is important to know the customer's perception right from the start. Thus, expectations can be:

- Initial expectations
- Intermediate expectations
- Final expectations

The main objective of expectation management is customer satisfaction. The customer's expectations when starting a project are always the best and high.

The big challenge is to manage expectations during the project. In all projects there are ups and downs, there are conflicts, there are processes that are easily implemented and others that, due to their complexity, are much more difficult. And it is in these complex processes that the customer's trust must be maintained.

The final expectations are successful if the customer uses the new application and it has even more success if they request additional features, which means that they are satisfied and believe in the software to manage their business.

Figure 6 illustrates customer expectations.

Thus, expectation management involves knowing the customer's realistic expectations and having the commitment and involvement of the end users. Therefore, it is important to manage expectations and resources appropriately, in a perspective of time, talent, and people.

Team Building

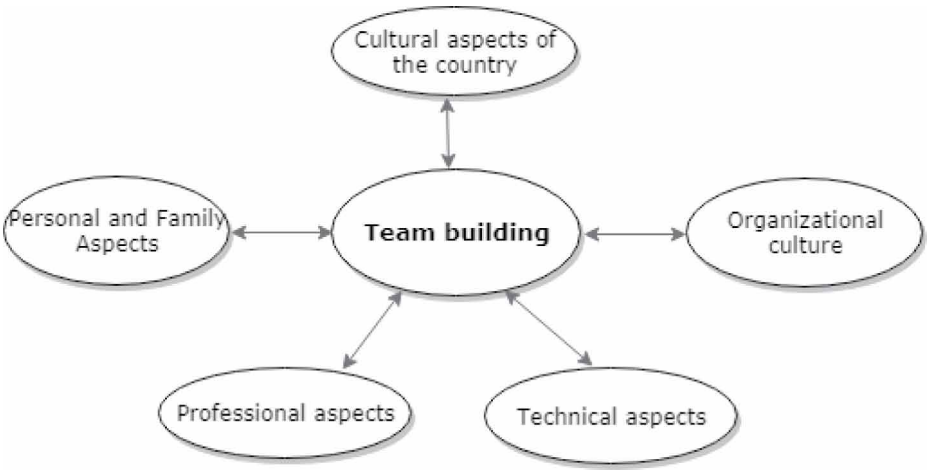
When assessing the teams, the constitution and success indicators are taken into account.

In the constitution of the project team, the adequacy of the collaborators is considered in the following aspects:

- Adaptation to the culture of the country;
- Adaptation to organizational culture;
- Technical suitability;
- Professional suitability;
- Personal and family suitability.

Figure 7 illustrates the aspects to consider when creating teams.

Figure 7. Aspects to consider in team building



The suitability to the Culture of the Country is measured by the team's capacity to adapt to the following aspects (classified as easy, medium, and difficult):

1. Language
2. Religion
3. Others (security, logistics, eating habits …)

The suitability to the Organizational Culture takes into account the following factors (classified by low, medium and difficult):

1. Dimension
2. Working hours
3. Work conditions
4. Qualification of human resources

In Technical suitability the following aspects are considered (with classification low, medium and high):

1. Technical capacity in the modules to be installed;
2. Technical ability to find solutions.

To analyze Professional Adequacy, classifications (low, medium and high) are used in the following aspects:

1. Leadership;
2. Team work;
3. Management of stressful moments;
4. Conflict management.

In Personal and Family suitability, the following aspects are considered through classification (low, medium and high):

1. Family availability for absences (country / continent, short / long term);
2. Physical and psychological capacity (health, vaccines).

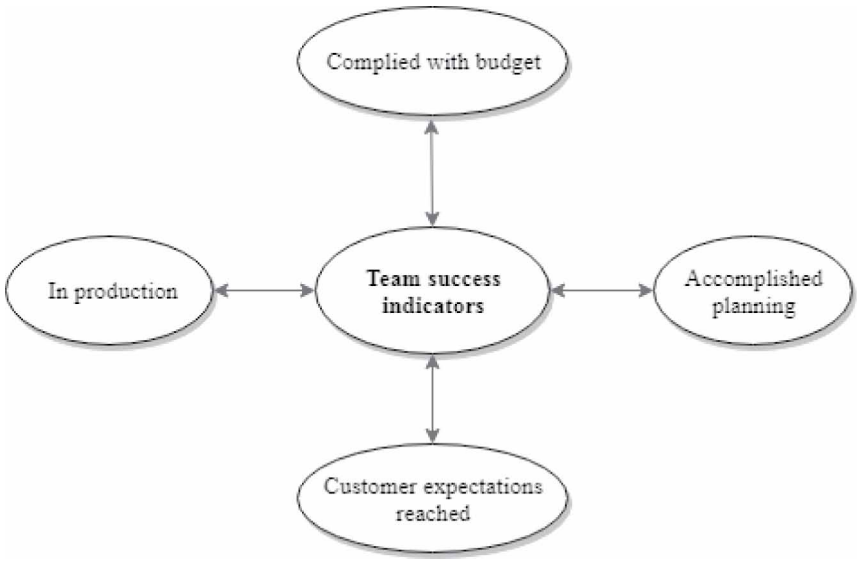
Team Evaluation - Indicators of Success

The success indicators in evaluating the teams are:

1. Did you meet the expected budget?: Yes or No (exceeded the budget);
2. Complied with planned planning?: Yes or No (delay in months);
3. Customer expectations reached?: Yes or No;
4. In production: Yes or No (if yes, date that/ what went into production).

Figure 8 shows the four success indicators used in the team assessment approach in international projects, within the scope of implementing generic software products.

Figure 8. Success indicators in team building



So, it is considered that the presented indicators allow to evaluate the success of the project and thus contribute to the optimization of the good practices established in the organization in this domain.

Team Evaluation - Metrics

The evaluation of the teams involves the multidisciplinary analysis of a set of skills, at the level of the problem domain and technical skills, the experience of the consultants, knowledge of culture and legal rules; finally and very important it is the involvement and commitment to the project of top decision makers.

In this sense, the factors to be used in the measurement are presented here:

- Country culture;
- Organizational culture;
- Technique;
- Professional,
- Personal and family:

Final Evaluation =x% A+y%B+k%C+v%D+w%E

The weightings (in percentage) of each factor are defined according to the complexity of the type of project / organization and country.

Table 3. Template for documenting the international team evaluation approach

1. Cultural aspects of the country	
1.1 Country	Name of the country
1.2 Language	Mother tongue + languages spoken in the organization
1.3 Religion	Majority religion + other
1.4 Other cultural aspects	All relevant aspects of the culture of the country are indicated, namely: Insurance, Logistics, Food habits, European style city, among others.
2. Characterization of customer company	
2.1 Dimension	Small, Medium, Large
2.2 Organizational culture	Indicate if it is a family organization; if you have a well-defined organization chart; professional organization; existence of senior management; existence of few senior managers.
2.3 Timetables	Indicate administrative and production times.
2.4 Posture and dress	Casual or Formal.
2.5 Working conditions	Indicate whether conditions are suitable for access to administrative and production facilities.
3. Characterization of the project	
3.1 How it came about	Local partner; direct contact by the customer; contact details of a salesperson belonging to the customer's organization.
3.2 Dimension	Base; Normal; Complete
3.3 Implementation type	Standard; Specific customization; Specific customization with further development.
3.4 Legal and tax framework	Legal and fiscal component: small or large
4. Management of customer's expectations	
4.1 Initial	Good, Difficult, Achieved
4.2 Intermediate	Good, Difficult, Achieved
4.3 Final	Good, Difficult, Achieved
5. Team evaluation – Constitution	
5.1 Adaptation to the culture of the country	Adaptability: Easy, Medium, Difficult
5.2 Adaptation to the organizational culture	Adaptability: Low, Medium, Difficult
5.3 Technical suitability	Technical capacity in the modules to be installed and in finding solutions: Low, Medium, High
5.4 Professional suitability	Leadership skills, team work, conflict management: Low, Medium, High
5.5 Personal and family suitability	Low, Medium, High
6. Team evaluation - Indicators of success	
6.1 Did you meet your budget?	Yes or no
6.2 Accomplished planned planning?	Yes or No (months late)
6.3 Customer expectations reached?	Yes or no
6.4 In Production?	Yes (year that went into production)

By adopting an organizational culture, practices and appropriated tools, the customer's organization teams gain the ability to better respond to the customer's needs, increase confidence in the applications they implemented and achieve business goals more quickly.

Template for Team Evaluation Approach

To facilitate the application of the approach, a template (Table 3) was elaborated with the factors that most influence the activity of international teams.

The presented template aims to make it possible to analyze the results and eventually improve the template and approach applied to different projects in different international contexts, in order to get more efficiency.

RESULTS

For the purpose of validating the approach presented, an implementation/adaptation experiment was carried out on two projects.

The experience consisted of applying the approach of two implementations on customers with different characteristics and from different countries, then comparing the achieved results.

The experiment comprised the following steps:

- Collection of pre-existing documentation;
- Choice of projects with different characteristics;
- Application of the template to the two implementations.
- Result assessment.

The followed validation method falls under the category of controlled methods (Zelkowitz & Wallace, 1998) and it was integrated in the "Evaluation" stage of the DSR methodology.

In order to validate the approach, teams were evaluated and their performance was applied using the template of the final evaluation to Project A. The results are shown in Table 4.

The weightings given take into account the specificity of the company in relation to the way the project went.

It was also possible to validate the metrics that are considered to contribute to the success of the project, applying the formula previously presented and taking into account the specificity of the country/organization/project:

Final Evaluation=15%A+20%B+20%C+25%D+20%E

In this analysis, and based on the obtained data, the team of this project is classified as having been highly successful.

In order to carry out the assessment of teams and their performance for case B, the template of the final assessment was also applied. The results are in Table 5.

Final Evaluation=15%A+20%B+20%C+30%D+15%E

Analyzing the documentation underlying Project B, it is considered that the team had a moderate success, and may also create conditions to improve this performance, given that it is recent.

Table 4. Project A implementation results

1. Cultural aspects of the country	
1.1 Country	Thailand
1.2 Language	Thai + English
1.3 Religion	Buddhism + Christianism
1.4 Other cultural aspects	Safe Acceptable logistics Different and spicy food Similar to European cities Friendliness, persistent The “No” must not be used
2. Customer company characterization	
2.1 Dimension	Medium
2.2 Organizational culture	Professional Organization Well-defined organization chart Existence of senior management
2.3 Timetables	Normal
2.4 Posture and dress	Casual
2.5 Working conditions	Good
3. Project characterization	
3.1 How it came about	Partner
3.2 Dimension	Large
3.3 Implementation type	Specific customization and additional development
3.4 Legal and tax framework	Large
4. Management of customer’s expectations	
4.1 Initial	Good
4.2 Intermediate	Difficult
4.3 Final	Achieved (the costumer continues to use the application)
5. Team evaluation – Constitution	
5.1 Adaptation to the country’s culture	Adaptability: . Country [medium] . Language [difficult] . Religion [medium] . Others [difficult]
5.2 Adaptation to the organizational culture	Adaptability: . Dimension [medium] . Working hours [medium] . Working conditions [easy] . Qualification of human resources [medium]
5.3 Technical suitability	Technical capacity in the modules to be installed [medium] Technical capacity to find solutions [medium]
5.4 Professional suitability	Leadership capacity [medium] Teamwork ability [medium] Ability to manage stressed moments [medium] Conflict management skills [medium]
5.5 Personal and family suitability	Family availability for absences (country / continent, short / prolonged) [high] Physical and psychological capacity (health, vaccines) [high]
6. Team evaluation - Indicators of success	
6.1 Did you meet your budget?	Yes
6.2 Accomplished planned planning?	No (3 months delay)
6.3 Customer expectations reached?	Yes
6.4 In Production	2019

Table 5. Project B implementation results

1. Cultural aspects of the country	
1.1 Country	Croatia
1.2 Language	Croatian + English
1.3 Religion	Christianism
1.4 Other cultural aspects	Safe Good logistics Food similar to Portuguese European city
2. Customer company characterization	
2.1 Dimension	Large
2.2 Organizational culture	Family organization Undefined organization chart Existence of few senior management
2.3 Timetables	Normal
2.4 Posture and dress	Formal / Casual
2.5 Working conditions	Good
3. Project characterization	
3.1 How it came about	Salesperson
3.2 Dimension	Medium
3.3 Implementation type	Specific customization
3.4 Legal and tax framework	Small
4. Management of customer's expectations	
4.1 Initial	Good
4.2 Intermediate	Normal
4.3 Final	Achieved (still requesting new functionalities)
5. Team evaluation – Constitution	
5.1 Adaptation to the culture of the country	Adaptability: . Country [easy] . Language [difficult] . Religion [easy] . Others [easy]
5.2 Adaptation to the organizational culture	Adaptability: . Dimension [medium] . Working hours [easy] . Working conditions [easy] . Qualification of human resources [easy]
5.3 Technical suitability	Technical capacity in modules to be installed [high] Technical capacity to find solutions [high]
5.4 Professional suitability	Leadership capacity [medium] Teamwork ability [medium] Ability to manage stressful moments [high] Conflict management skills [high]
5.5 Personal and family suitability	Family availability for absences (country / continent, short / prolonged) [medium] Physical and psychological capacity (health, vaccines) [medium]
6. Team evaluation - Indicators of success	
6.1 Did you meet your budget?	No (budget exceeded)
6.2 Accomplished planned planning?	No, (6 months delay)
6.3 Customer expectations reached?	Yes
6.4 In Production	2015

Finally, it is recommended to integrate a systematic measurement process in the approach of international teams, especially in order to manage the client's intermediate expectations.

CONCLUSION

This chapter presents an approach for evaluating international teams, within the scope of the implementation of generic software products, and a template to document its use supported by instantiation in two real projects. It is considered that the approach is an instrument to reduce complexity in the assessment of teams, in addition to allowing knowledge sharing.

In fact, the proposed approach includes a template to be filled out by the teams, where they report their experiences, which, in this way, will be more effectively transmitted. In this context, the transfer of knowledge between teams is promoted, becoming a strategic advantage in the implementation of generic software products in international projects.

It was also concluded that creating an additional field in the approach template, containing supplementary information, it is very useful to associate with the details of the team assessment, which is a good practice collected from the Adornments standard (Adolph & Bramble, 2003). In this context, the reuse of templates (Silveira, Faria, Aguiar, & Vidal, 2005) and specifications is advocated as an advantage for systematic documentation (Ovelheiro & Silveira, 2020) of artifacts, namely in the definition and management of international teams.

The success of the team assessment will imply the application of weights inherent to each case. It corroborates the conclusions of the empirical study by (Albert, Spang, & Balve, 2018), showing that the evaluation of the success of the project varies from company to company. In this sense, the result of the application of the metrics will be based on the change of the percentage of the weights in view of the specificity of the business / country / culture.

This investigation, in the scope of the management of international teams in the parameterization / customization of generic software products, in view of the literature review in this domain, and based on the organizational practices established, allowed to elaborate an approach that aggregates a set of Guide Lines and respective weightings that were subsequently validated in real cases, in order to assess their pertinence and suitability.

The main conclusion was the verification of the effectiveness of the approach, and a differentiating factor, in the definition of policies for the constitution of international teams, as it includes knowledge in the fields of the culture of the country, organizational, technical, professional culture, legal and fiscal frameworks, as well as the personal and family components.

The DSR methodology allowed, based on the literature reviewed on the field of the theme and the authors' previous experience, to develop an approach in order to obtain scientific validation of the work.

The application of the approach also made it possible to make the following considerations:

- Greater efficiency in the implementation of the project time, due to better preparation of the teams;
- Better management of customer expectations, as there was more time for monitoring;
- Better time management in order to listen to the customer and give motivation to acquire new solutions.

As perspectives for future work, the approach will continue to be applied to other projects with different characteristics, in order to assess the factors and their respective weights. Also, as future work perspective, it is considered pertinent to apply the Model for micro-SMEs by sector of activity, since the problems and characterization of the project may vary. It is also considered that it may be a value to be added to analyze the feasibility of grouping by sectors of activity in order to optimize the model.

REFERENCES

Adolph, S., & Bramble, P. (2003). *Patterns for Effective Use Cases*. Addison-WesleyPearson Education.

Ahmad, M., & Cuenca, R. (2013). Critical success factors for ERP impleme. *Robotics and Computer-integrated Manufacturing*, *29*(3), 104–111. doi:10.1016/j.rcim.2012.04.019

Albert, M., Spang, K., & Balve, P. (2018). Project success assessment – business and individual perspectives. *International Project Management Association Research Conference 2017, UTS ePRESS, Sydney: NSW*, 1-17. 10.5130/pmrp.ipmarc2017.5580

Alsanoosy, T., Spichkova, M., & Harland, J. (2018). Cultural Influences on Requirements Engineering Process in the Context of Saudi Arabia. In *13th International Conference on Evaluation of Novel Approaches to Software Engineering*. Funchal: Springer. 10.5220/0006770701590168

Alsanoosy, T., Spichkova, M., & Harland, J. (2019). Cultural influence on requirements engineering ac-tivities: A systematic literature review and analysis. *Requirements Engineering*, 1–24.

Baiden, A., Price, B., & Dainty, A. (2006). The extent of team integration within construction projects. *International Journal of Project Management, 24*, 13-26. Obtido de https://s3.amazonaws.com/academia.edu.documents/43431814/The_extent_of_team_integration_within_co20160306

Barnwell, D., Nedrick, S., Rudolph, E., Sesay, M., & Wellen, W. (2014). Leadership of International and Virtual Project Teams. *International Journal of Global Business*, *7*(2).

Bianchi, I., & Sousa, D. (2015). *Governança de TI em universidades públicas: Proposta de um modelo*. Obtido de CAPSI'2015: http://hdl.handle.net/1822/39467

Bohm, C. (2013). Cultural Flexibility in ICT Projects: A New Perspective on Managing Diversity in Project Teams. *Global Journal of Flexible Systems Managment*, *14*(2), 115–122. doi:10.100740171-013-0037-6

Bronte-Stewart, M. (2015). Beyond the Iron Triangle: Evaluating Aspects of Success and Failure using a Project Status Model. *Computing and Information Systems Journal, 19*, 19-36.

Callele, D., Wnuk, K., & Penzenstadler, B. (2017). New Frontiers for Requirements Engineering. *IEEE 25th International Requirements Engineering Conference, 1*, 184-193.

Callistus, T., & Clinton, A. (2018). The Role of Monitoring and Evaluation in Construction Project Management. *Intelligent Human Systems Integration*, 571-582. doi:10.1007/978-3-319-73888-8_89

Daneva, M. (2004). ERP Requirements Engineering Practice: Lessons Learned. *EEE Software*, *21*(2), 26–33. doi:10.1109/MS.2004.1270758

Daneva, M., & Wieringa, R. (2008). Cost estimation for cross-organizational ERP projects: research per-spectives. Software Quality Journal, 16(3), 459-481.

Davis, M. (1994). Fifteen Principles of Software Engineering. *IEEE Software*, *11*(6), 94–96, 101. doi:10.1109/52.329409

DeMarco, T. (1997). *The Deadline: A Novel About Project Management*. Academic Press.

Ebert, C. (2007, June). The impacts of software product management. *Journal of Systems and Software*, *80*(6), 850–861. doi:10.1016/j.jss.2006.09.017

Ekwoaba, J., Ugochukwu, I., & Ufoma, N. (2015). The Impact Of Recruitment And Selection Criteria On Organizational Performance. *Global Journal of Human Resource Management*, *3*(2), 22–33.

Ferreira, I., Ferreira, S., Silva, C., & Carvalho, J. (2012). *Dilemas iniciais na investigação em TSI design science e design research, uma clarificação de conceitos*. Conferência Ibérica de Sistemas y Tecnologias de Informação.

Freedman, S., & Katz, L. (2007). Critical success factors for international projects. *PM World Today, 9*(10), 1-8.

Gichoya, D. (2005). Factors affecting the successful implementation of ICT projects in government. *The Electronic*. *Journal of E-Government*, *3*(4), 175–184.

Goleman, D., & Boyatzis, R. M. (2002). *Os Novos Líderes: A Inteligência Emocio-nal nas Organizações*. Gradiva-Publicações, Lda.

Hau, E., & Aparício, M. (2008). Software internationalization and localization in web based ERP. *Proceedings of the 26th annual ACM international conference on Design of communication*. 10.1145/1456536.1456570

Hofmann, F., & Lehner, F. (2001). Requirements Engineering as a Success Factor in Software Projects. *IEEE Software*, *18*(4), 58–66. doi:10.1109/MS.2001.936219

Holland, C., & Light, B. (1999). Success Factors Model for ERP Implementation. *IEEE Software*, *16*(3), 30–36. doi:10.1109/52.765784

Horkoff, J., Aydemir, F., Cardoso, E., Tong Li, A. M., Mylopoulos, J., & Giorgini, P. (2019). Goal-oriented requirements engineering: An extended systematic mapping study. *Requirements Engineering*, *24*(2), 133–160. doi:10.100700766-017-0280-z PMID:31231153

Huang, Z., & Palvia, P. (2001). ERP Implementation Issues in Advanced and Developing Countries. *Business Process Management Journal*, *7*(3), 276–284. doi:10.1108/14637150110392773

Jones, C., Cline, M., & Ryan, S. (2006). Exploring Knowledge Sharing in ERP Implementation: An organizational Culture Framework. *Decision Support Systems*, *41*(2), 411–434. doi:10.1016/j.dss.2004.06.017

Kotonya, G., & Sommerville, I. (1998). *Requirements Engineering: Processes and Techniques*. John Wiley & Sons Ltd.

Luckmann, P. (2015). Towards identifying success factors for cross-cultural project customer engagement: A literature review. *Procedia Computer Science*, *64*, 324–333. doi:10.1016/j.procs.2015.08.496

Mahmood, F., Khan, A., & Bokhari, R. (2019). ERP issues and challenges: A research synthesis. *Kybernetes*, *49*(3), 629–659. doi:10.1108/K-12-2018-0699

Niazi, M., Mahmood, S., Alshayeb, M., Riaz, M., Faisal, K., & Cerpa, N. (2013). Challenges of Project Management in Global Software Development: Initial Results. *Science and Information Conference*.

Ovelheiro, B., & Silveira, C. (2020). *SOFTDIGITAL – Contributo para a Transformação Digital. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Instituto Politécnico da Bragança.

Papke-Shields, K., Beise, C., & Quan, J. (2010). Do project managers practice what they preach, and does it matter to project success? *International Journal of Project Management*, *28*(7), 650–662. doi:10.1016/j.ijproman.2009.11.002

Parthasarathy, S., & Daneva, M. (2014). Customer requirements based ERP customization using AHP technique. *Business Process Management Journal*, *20*(5), 730–751. doi:10.1108/BPMJ-04-2013-0044

Pearlson, K., Saunders, C., & Galletta, D. (2019). *Managing and Using Information Systems: A Strategic Approach*. Wiley.

Peffers, K., Tuunanen, T., Rothenberger, M., & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems, 24*(3), 45-78.

Pinkowska, M., & Lent, B. (2011). Evaluation of Scientific and Practice Approaches to Soft Skills Requirements in the ICT Project Management. IBIMA Business Review, 10.

PORDATA. (2019). *Empresas e Pessoal*. PORDATA - Base de Dados Portugal Contemporâneo: https://www.pordata.pt/Tema/Portugal/Empresas+e+Pessoal-4

Powell, A., Piccoli, G., & Ives, B. (2004). Virtual teams: a review of current literature and directions for future research. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*. doi:10.1145/968464.968467

Prosci. (2020). *Change Management Process*. Obtido de Virtual Instructor-Led Change Management Program available now!: https://www.prosci.com/resources/articles/change-management-process

Reis, L., & Silveira, C. (2020). *Sustentabilidade Multidimensional em Sistemas de Informação. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Instituto Politécnico de Bragança.

Reis, L., Silveira, C., Carvalho, L., Mata, C., & Madeira, R. (2020). Design de Protótipo para Pessoa sem-abrigo - Contributos de Sustentabilidade. In *IV International Forum on Management.* Universidade Aberta.

Roquete, M. (2018). *Modelo de maturidade para apoio à implementação de uma filosofia de gestão ori-entada a processos numa organização*. Nova Information Management School.

Russo, N., & Reis, L. (2019). Análise da Problemática Subjacente à Certificação de Programas Informáticos de Faturação. *CISTI'2019 - 14th Iberian Conference on Information Systems and Technologies*.

Schibi, O., & Lee, C. (2015). Project sponsorship: senior management's role in the successful outcome of projects. *EMEA, PA: Project Management Institute*. Obtido de https://www.pmi.org/learning/library/importance-of-project-sponsorship-9946

Silveira, C., Faria, P., Aguiar, A., & Vidal, R. (2005). Wiki Based Requirements Documentation of Generic Software Products. *Proceedings of The Tenth Australian Workshop on Requirements Engineering*.

Silveira, M., & Vidal, R. (2002). *Software Reuse with Use Case Patterns. In OOIS 2002, Reuse in Object-Oriented Information Systems Design, Proceedings*. Springer-Verlag.

Silveira, M. C. (2006). *A Reutilização de Requisitos no Desenvolvimento e Adaptação de Produtos de Software*. FEUP.

Smith, D., Bruyns, M., & Evans, S. (2011). project manager's optimism and stress management and IT project success. *International Journal of Managing Projects in Business*, *4*(1), 10–27. Advance online publication. doi:10.1108/17538371111096863

Stewart, R. (2008). A framework for the life cycle management of information technology projects: ProjectIT. *International Journal of Project Management*, *26*(2), 203–212. doi:10.1016/j.ijproman.2007.05.013

Sumner, M. (2018). ERP Project Retrospectives—55 Enterprise Systems: Evaluating Project Success, Lessons Learned, and Business Outcomes. Midwest Association for Information Systems, 12-23.

Sutcliffe, A. (2002). *User-Centred Requirements Engineering: Theory and Practice*. Springer. doi:10.1007/978-1-4471-0217-5

Tengan, C., & Aigbavboa, C. (2016). Evaluating Barriers to Effective Implementation of Pro-ject Monitoring and Evaluation in the Ghanaian Construction Industry. *Procedia Engineering*, *164*, 389–394. doi:10.1016/j.proeng.2016.11.635

Thew, S., & Sutcliffe, A. (2018). Value-based requirements engineering: Method and experience. *Requirements Engineering*, *23*(4), 443–464. doi:10.100700766-017-0273-y PMID:31258257

UNDP. (2015). *Sustainable Development Goals*. Obtido de United Nations Development Programme: www.undp.org/content/undp/en/home/sustainable-development-goals.html

Wadsworth, M., & Blanchard, A. (2015). Influence tactics in virtual teams. *Computers in Human Behavior*, *44*, 386–393. Advance online publication. doi:10.1016/j.chb.2014.11.026

Zelkowitz, M., & Wallace, D. (1998). Experimental Models for Validating Technology. *IEEE Computer*, *31*(5), 23–31. doi:10.1109/2.675630

KEY TERMS AND DEFINITIONS

Information and Communication Technologies: A technological resource set used to process information and ensure communication. When used in an integrated way it enhances information transmission and communication processes.

Information Systems: Is the organized set of components such as people, processes of collection and transmission of data and material resources, automated or manual. The interaction of components enhances the processing and dissemination of information.

International Projects: Projects developed outside the country of origin of the organization providing the service. Projects with various specificities such as language, legal and fiscal framework. They require specific skills.

Requirements Analysis: Iterative process to identify features and restrictions with a view to developing or adapting/customizing a software product.

Software Systems Implementation: The process of adapting/customizing a generic software product to the specific needs of an individual customer, and integrating it in the customer environment.

Sustainability: Ability to sustain life on the planet, considering the five dimensions: individual, social, economic, technical, and environmental.

Team Building: Should have as an assumption to be multidisciplinary and with specific characteristics in relation to the country where it will develop its activity.

Chapter 13
Comparative WebGIS Software Study:
How to Support Users Decisions on the Best Solution to Their Organizations

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ABSTRACT

The rapid evolution of information and communication technologies (ICT) has supported many changes in many areas over the last decade. One of the most successful ICT technologies to emerge was geographic information systems (GIS). These systems allow people to see the world differently, mapping the position and quantity of things, mapping the density of people and objects, and mapping any changes that occur. GIS also allows us to find out what is happening within a specific area or nearby. They can be used in various ways and across diverse areas thus becoming an important area of research. Regarding this chapter, the advantages and disadvantages involved in the use of GIS, especially WebGis or geoportals, were explored and presented, as well as a detailed comparative study in what concers to the main WebGis software solutions in terms of characteristics and functionalities. The main goal of the chapter was to provide users with a list of important recommendations that could help them in the process of choosing a WebGIS software, both in terms of free and proprietary solutions.

INTRODUCTION

Maps are essential tools in everyday practices, in personal and professional terms, and technological developments have contributed to the transition of cartography from its physical form (paper) to its current form (digital). Nowadays, cartographic information on natural risks favors interactivity, it is increasingly stored and made accessible online thanks to the dynamics of web tools (Arnaud, 2009).

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The increasing availability of spatial data systems and the rapid growth of Geographic Information Systems (GIS) technologies, is being used by Organizations, as an important tool to optimize their operational efficiency. In simple terms, GIS is the merging of cartography, statistical analysis, and database technology and helps to create new and revolutionary applications and possibilities. The software for GIS is unique in its ability to manipulate coordinates and associated data attributes and a considerable number of software tools and packages is available to help developing GIS. With the continuous improvement of technology, the future of GIS looks brighter than ever before.

Extensive knowledge on database technologies, map servers, web servers, desktop clients, application-specific business layers, as well as the integration of each component of the system, are necessary to address the data and its application layers. Currently, the Internet access is quite popular. Thus being, a great diversity of platform technologies were made available on the Web to allow, through a web browser and in a simple, fast and intuitive way, the performance of operations on potentially interesting geographical data sets. In general, this set of technologies and platforms offer several features depending on the capabilities of the software, allowing users to perform basic GIS operations, such as viewing, consulting and analyzing distributed geographic data. These applications that allow the distribution of data to users through the interface of a Web browser are, in general, called WebGIS (Bonnici, 2005).

Concluding, the merge of GIS technology with the Internet has introduced a new application area called WebGIS, the short term used to Web-based GIS. The term "WebGIS" refers to applications that distribute spatial data to users via a Web browser (Agrawal & Gupta, 2017). WebGIS applications have unique capabilities to integrate and allow access to disparate data sets. Depending on the software capabilities, users may view, query and analyze geographic data remotely via a Web browser. Because it is a relatively inexpensive way of disseminating spatial data and basic GIS functionalities, WebGIS have become widely used by both public and private organizations. Another advantage is that the majority of the basic functionalities available through the desktop GIS, are already available through the World Wide Web or intranet, thus allowing users to interact with the GIS databases through both technologies. Following Bonnici (2005), the main benefits of WebGIS include, amongst others, the following ones:

1. WebGIS have the ability to distribute GIS data and functionalities to a large audience and is constantly available;
2. WebGIS users don't need to buy GIS software;
3. WebGIS users do not normally need extensive training due to its easy of use.

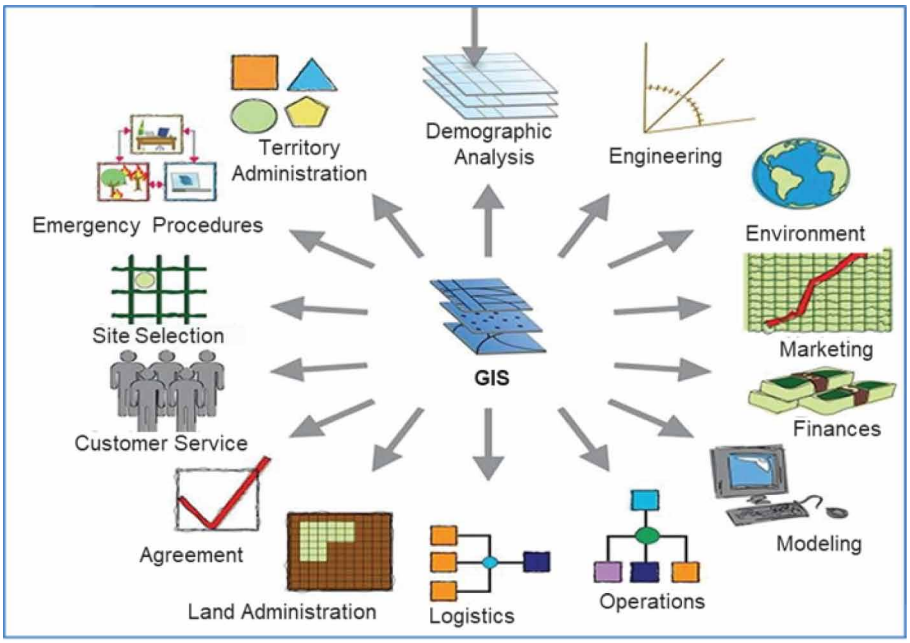
Similarly, following Ali Khan & Adnan (2010), the main reason behind the popularity of webGIS applications is the availability of these applications without the need to buy and install software. Using these applications does not require any expertise because of its simple and easy to use interfaces which is also a determinant factor.

In fact, with the emergence of internet and WebGIS, applications got a new ride. Nowadays, almost all businesses, government agencies and common people are regular users of webGIS applications and use them for different purposes like decision making, planning and as problem solving techniques. As internet is spreading, more people get access to it and its services. A good example of generic WebGIS use, relates to the use of GIS applications and satellite images to search directions when traveling.

The grouth of the search for GIS, in turn, disseminated the application of this technology to various segments, such as data conversion, application development, data mining and data migration. The development of GIS applications started to be extended beyond the Municipalities, or Central Administra-

tion, to diverse sectors of activity, such as forestry, electrical, commerce, mobile mapping, agriculture, national defense and security, hospitality and tourism, water resources management, education, logistics, telecommunications, real estate, among many others, as illustrated in Figure 1.

Figure 1. GIS applicability areas
Source: (GED, 2011)



Different customers, with very specific needs, ask, technically qualified and experienced, software developers to create customized applications to meet the requirements of a new and vast community of users. Thus being, in most cases, applications are developed based on the specific needs and requirements of the customers in order to optimize procedures and results, regardless of the type and complexity involved.

Another concept that arises is the concept of geoportal which is a type of web portal used to find and access geographic information and associated geographic services (as for instance, display, editing, analysis, etc.) via the internet (Maguire & Longley, 2005). In brief, a geoportal, is a digital platform organized to facilitate access to georeferenced databases and is frequently used as a synonymous of WebGIS, as it happens in this chapter.

In general, this chapter presents a study on concepts, technologies and support platforms for GIS on the Web – Geoportals or WebGIS – based on proprietary and open source software. This approach aims to guide managers in the implementation of this type of geotechnology with a main focus on low cost. Thus being, it is important to refer that the concepts of Geography used were the strictly necessary to assure the compreension of this work and that their study and discussion are not within the scope of this work.

BACKGROUND

In this section, fundamental concepts are presented and discussed, namely, Geographic Information Systems (GIS), the different types of GIS software (in terms of GIS development, GIS formats and GIS classification), GIS components, GIS mapping software and, finally, the advantages and disadvantages of using free and open source geotechnologies are discussed.

Geographic Information Systems

GIS is an acronym for Geographic Information System, which can be defined as systems composed of hardware, software and an institutional environment that allow capturing, storing, verifying, integrating, overlaying, manipulating, analyzing and visualizing geographically referenced data, working as a tool to support the resolution of geographical problems (Caeiro, 2013). It involves a spatially referenced database and its specific software. In this way, a GIS system should contain data entry, representation, data storage and research, data management, transformation and analysis, data output, production of reports, graphs, and statistics. GIS can integrate information from different scales and sources, such as analog maps in paper format, aerial photographs, multimedia components: image, video, sound, numerical cartography, alphanumeric tables, field data, remote sensing, and GPS (Yadav et al., 2015).

Once the data is referenced to spatial or geographical coordinates, the GIS can be used both as a database system with specific capabilities for spatially referenced data, and to perform operations to analyze the information sources.

According to Olaya (2012), and in more comprehensive terms, GIS are computational tools that allow analyze, present, and interpret data related to events on the earth surface. Starting with the detail of this definition, a GIS is a group of software and hardware specifically designed to obtain, maintain and use cartographic data, that is, a GIS is both a georeferenced database and a set of operations to deal with that data. Thus, it is possible to say that GIS are high quality maps.

GIS combines layers of information about places to give us a better understanding about them. The layers of information are combined depending on the purpose e.g. finding the best location for a new store, analyzing environment damages, viewing similar crimes in a city to detect a pattem, etc (Ali & Adnan, 2010).

According to (Ali & Adnan, 2010), the main objectives of GIS are:

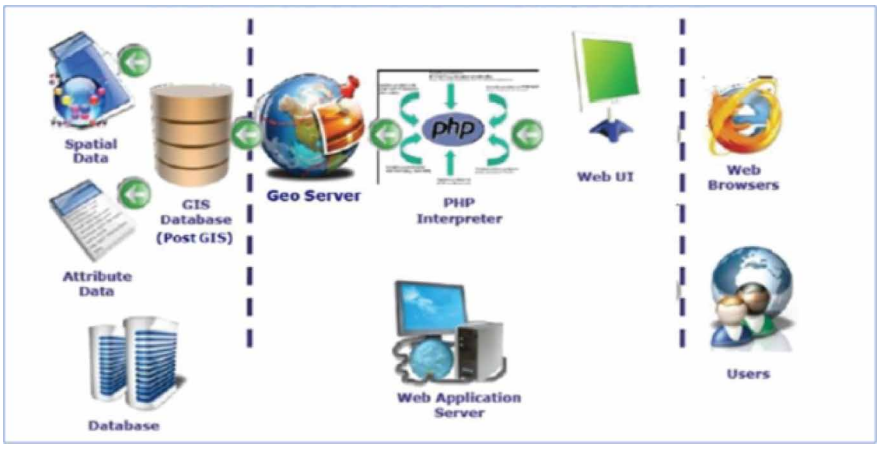
- To provide efficient ways for distributing and handling data;
- To maximize the efficiency of decision making and planning;
- To remove redundant data from the database in order to minimize duplication;
- Complex analysis/queries involving geographical referenced data to generate new information;
- To provide the capability to integrate information from many sources;
- To update data quickly and cheaply.

Different Types of GIS Software

In Terms of GIS Development

In order to build a solid infrastructure applied to spatial data, it is necessary to integrate different types of software. In addition to the software specific to collect, prepare and analyze data, which can be done with GIS software, databases are also needed to store large amounts of information. If other people and organizations wish/need to use this data, for planning and analysis purposes, a geographic map server can be useful for providing the data online. In addition, software libraries are displayed as an additional component, which can provide specific functionalities, such as data format conversion, geographic coordinates transformation, or data analysis algorithms (for example, calculations of optimal paths for solid urban waste recoil or optimal paths in terms of traffic control). An example of a spatial data infrastructure scheme that includes all these components is shown in Figure 2.

Figure 2. GIS basic infrastructure
Source: (Kumar & Babu, 2016)



In Terms of GIS Formats

Following Unearth Labs (2020) GIS are available into three main formats: desktop, online/cloud, and mobile. Many platforms are just available through one format while others are a combination of different formats.

In the Desktop GIS format, the software is installed directly onto a desktop or laptop computer. The program will run, solely, on that computer and all the data is stored on a local hard drive. In terms of functionality, dektop GIS tend to be more robust thus being suitable for organizations involved with geoscientific research, complex spatial analysis, and 3D rendering. This type of platform is not based on monthly or yearly subscriptions, it requires a one-time payment.

In the online/cloud-based GIS format, the GIS usually runs on cloud servers thus eliminating the need for installation and local data storage which turns to be an interesting advantage. With this cloud-based GIS platforms, users are also able to make updates in real-time, access data from anywhere, and share

information very quickly. This online GIS platforms operate on a monthly or yearly subscription basis which stands in contrast to the previously mentioned desktop platforms.

As to the mobile GIS format, in many ways, it is a subcategory of the online GIS. Most mobile devices don't have the processing power necessary to run a GIS software locally, thus relying on cloud-based mobile applications. Some GIS softwares offer mobile functionality as a built-in feature, while others require additional payment and purchase of a separate mobile program/module. In theoretical terms, mobile GIS can run on any mobile device; however, in practical terms, device cross-functionality depends on which platform is chosen.

In Terms of GIS Classification

There are different types of Geographic Information Systems available for retrieving, storing and analysing spatial/geographic data. People often search for commercial GIS software or free GIS software for students. These types of GIS software can be used for commercial and educational purposes to develop maps and such graphic representations to assess geographic data. In what refers to the GIS classification, and following Basu (2019), they may be classified as the following:

- **Desktop GIS:** Desktop GIS software is used for creating, visualising and analysing GIS data. The software manages this through such technical tools as interactive street displays, spreadsheets, databases and digital diagrams. The information is provided in the form of thematic maps and complex report forms;
- **Web GIS:** Web GIS application is a kind of distributed information system comprised of a server (GIS server) and a client (desktop/mobile application and web browser). This platform uses web technology for communicating between a server and a client. Users can access the information through the URL that helps end users find information;
- **Server GIS:** Server GIS is most primarily used for sharing geospatial data. The platform, designed for interoperability, is used for publishing data from any major spatial data source using open standards. The software has other features enabled such as WMS (Web Map Service), WFS (Web Feature Service), WCS (Web Coverage Service), WMTS (Web Map Tile Service), etc.;
- **Specialized GIS:** Specialised GIS software performs specific functions for specific industries. For instance, undertaking analytical functionality in order to identify risks and help organisations solve them. It is also used for doing performance monitoring tasks for fire and rescue services. As to the platform it is used "as a versatile planning constraints tool";
- **Image Classification:** Image classification software is used for transforming pictures of the earth into more meaningful map data, such as land use classes, types, etc. This classification of software is based on spectral information mechanism so that images could be converted into more informative text for the ease of understanding;
- **Lidar:** Light Detection and Ranging or LIDAR is based on remote sensing technology for measuring the features of the earth's surface and creating Digital Elevation Model (DEM). For the purpose, it uses digital laser beams to hit the targeted point and record immediately the energy that gets reflected back. LIDAR instruments are typically comprised of laser, scanner and a specialised GPS receiver.

GIS Components

Following Kanickaraj (2018) GIS has, mainly, five key components as illustrated in Figure 3, namely: the hardware module, the software module, method, people and data:

1. **Computer Software Module:** The GIS software includes the programs and the user interface to drive the hardware. Is designed to store, retrieve, manage, display, and analyze all types of geographic and spatial data. GIS software allows to produce maps and other graphic displays of geographic information for analysis and presentation. Thus, a good GIS software requires user friendliness, functionalities, compatibilities, updatability, documentation, cost effectiveness;
2. **Computer Hardware Module:** The central processing unit is the main hardware component of GIS. This is connected to a disk drive storage unit that provides space for storing data and programs;
3. **Method:** Methods are the set of procedures and rules to implement plans and business activities in GIS;
4. **People:** Without people, GIS technology has limited value. People manage and develop plans for applying it to real world problems. GIS users may be technical specialists to design and maintain the system as well as those who only use it to perform their daily work;
5. **Data:** The most important component of a GIS is data. The data can be collected in house, compiled to custom specifications and requirements, or purchased from a commercial data provider.

GIS Mapping Software

GIS software produces maps and other graphic displays of geographic information for analysis and presentation. With these capabilities a GIS is a valuable tool to visualize spatial data or to build decision support systems for use in any organization.

Following (Maptitude GIS, 2020), a GIS stores data about geographical features and their characteristics. The features are typically classified as points, lines, or areas, or as raster images. On a map the city data could be stored as points, road data could be stored as lines, and boundaries could be stored as areas, while aerial photos or scanned maps could be stored as raster images.

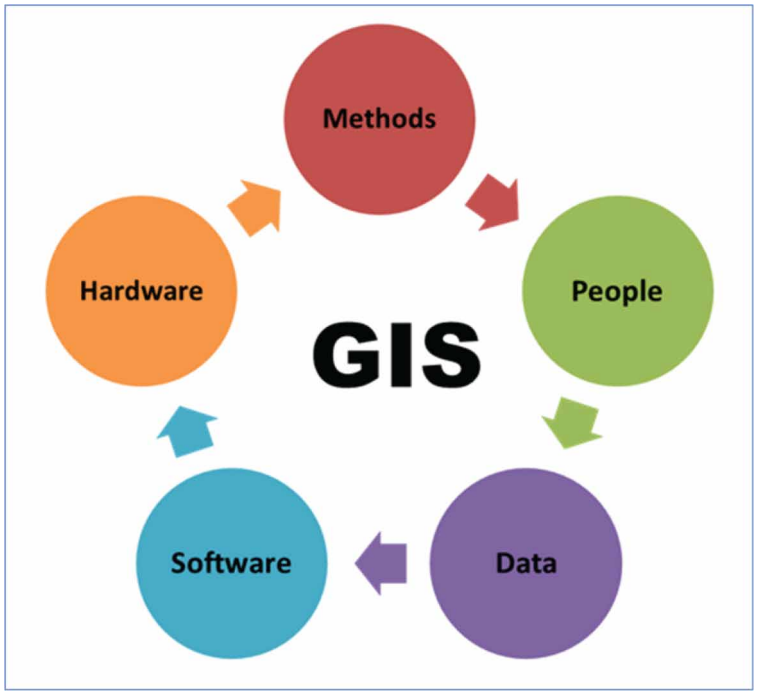
GIS stores information using spatial indices which make it possible to identify the features located in any arbitrary region of a map. For example, a GIS can quickly identify and map all the locations within a specified radius of a point, or all the streets that run through a territory. In addition, the use of a relational database is a critical feature for GIS software. Attribute data may be freely joined to and detached from geographic layers and tables. Relational data manipulation is integrated with geoprocessing for spatial queries, polygon overlay, and other location-based analyzes. This is supported seamlessly so that data are moved easily to and from relational tables and geographic databases (Maptitude GIS, 2020).

GIS Applications

Computerized mapping and spatial analysis have been developed simultaneously in several related fields. The present status would not have been achieved without close interaction between various fields such as utility networks, cadastral mapping, topographic mapping, thematic cartography, surveying and

photogrammetery remote sensing, image processing, computer science, rural and urban planning, earth science, and geography (Laffly, 2020).

Figure 3. Components of GIS
Source: (Kanicharaj, 2018)



The GIS technology is rapidly becoming a standard tool for management of natural resources. The effective use of large spatial data volumes is dependent upon the existence of an efficient geographic handling and processing system to transform this data into usable information. The GIS technology is used to assist decision-makers by indicating various alternatives in development and conservation planning and by modelling the potential outcomes of a series of scenarios. It should be noted that any task begins and ends with the real world. Data are collected about the real world. Of necessity, the product is an abstraction; it is not possible (and not desired) to handle every last detail. After the data are analysed, information is compiled for decision-makers. Based on this information, actions are taken and plans implemented in the real world (Laffly, 2020).

Data: The Core of a Mapping / GIS Project

When most people begin a GIS project, their immediate concern is with purchasing computer hardware and software. They enter into lengthy discussions with vendors about the merits of various components and carefully budget for acquisitions. Yet they often give little thought to the core of the system, the data that goes inside it. They fail to recognize that the choice of an initial data set has a tremendous influence on the ultimate success of their GIS project. Data, the core of any GIS project, must be accurate - but ac-

curacy is not enough. Having the appropriate level of accuracy is vital. Since an increase in data accuracy increases acquisition and maintenance costs, data that is too detailed for your needs can hurt a project just as surely as inaccurate data can. All any GIS project needs is data accurate enough to accomplish its objectives and no more. For example, you would not purchase an engineering workstation to run a simple word-processing application. Similarly, you would not need third-order survey accuracy for a GIS-based population study whose smallest unit of measurement is a county. Purchasing such data would be too costly and inappropriate for the project at hand. Even more critically, collecting overly complex data could be so time-consuming that the GIS project might lose support within the organization. Even so, many people argue that, since GIS data can far outlast the hardware and software on which it runs, no expense should be spared in its creation. Perfection, however, is relative. Projects and data requirements evolve. Rather than overinvest in data, invest reasonably in a well-documented, well-understood data foundation that meets today's needs and provides a path for future enhancements. This approach is a key to successful GIS project implementation (FaceGIS.com, 2020).

Advantages and Disadvantages of Using Free and Open Source Geotechnologies

In this section, the advantages and disadvantages of the development with free geotechnologies versus proprietary products is analyzed and compared from an academic perspective.

Concept of Open Source GIS

In the previous years GIS dataset was restricted to the use of researchers, planners, government and non-government workers, or any organization but now it is partially free. To continue innovation and improvement of GIS, open source GIS have been developed. They are freely available to anyone and can be used as an open-source desktop GIS to develop and distribute custom spatial data analysis tools capable of handling raster, topological vector, image and geographic data. It provides integration with other open source GIS packages, including Post GIS, GRASS and Map Server to give users extensive functionalities. Plug-in, written in Python, extend the capabilities of QGIS. Open Source software allows the programmer or developer to read the source code, debugs (error) and modify the code in order to continue innovation and improvement of the software capabilities. To ensure the use of various programming languages such as C, C++, Perl, Python, different technologies like .Net are used to customize the software (Gisgeography.com 2020).

Licensing Fees

The development of software using proprietary products requires the payment of a licensing fee, normally, an annual fee. This fee grants access to the development tools and requires the inclusion of a license fee for each software license. The use of free geotechnologies avoids the payment of this type of fees and allows immediate access to all the source code and the development tools necessary to the development. It also may be used without restrictions, that is, it is possible to use the software on any computer, for private or commercial purposes, without any restriction in what refers to the number of computer installations. Some authors state that it is safer to use proprietary software. However, to pay doesn't guarantee the absence of problems. In fact, many umpleasent situations may occur due to changes

in license distribution rules. As an example, GIS programmers, which produce code for proprietary GIS solutions, may, after a certain period, be forbidden to release software updates for free, due to changes in the proprietary GIS rules (Mendes, 2006).

Open Standards Support

According to ESOP, the Portuguese Association of Portuguese Open Source Software Companies, in addition to the obvious benefits of not having to pay licensing fees and being able to use of the software unlimited, there are many other benefits for the programmers that decide to use free software (ESOP, 2011). The support for open standards is determined by the right that is granted through its license to users, enabling them to use the software for any purpose, including its study, alteration or redistribution, whether modified or in its original form, without requiring payment to the previous developers. One of the most important benefits is a good support for open standards and commonly used formats. Open standards, from the original open standard definition, are standards available for free access and implementation, which are independent of royalties and other fees and without discrimination of use. This option, of progressive introducing open systems in the areas of Informatics, and more specifically of GIS, creates independence and autonomy in relation to the large companies of proprietary software, assuming that the progress in the software is distributed by the user community. Undoubtedly, the possibility of accessing the source code is an asset, as it allows not only to adapt the software to the needs of the organization, but also the possibility of translating the program itself into a certain language, which can be a determinant factor to the easy adaptation of users to the computer solutions at their disposal (ESOP, 2011).

At this stage of analysis, it is important to refer that, proprietary software is software whose copy, redistribution or modification is restricted by the creative company or its distributor. In order to be able to use or copy this type of software, a license fee is required.

Learning Curve

In what refers to GIS, software users should not expect zero costs when they move from a proprietary solution to a free solution. As an example, users training costs will arise in a similar manner to what happens when using proprietary products and installing the software may require specific know-how. Another disadvantage and/or difficulty, may be the limited availability and consistency of the existing documentation on this subject. Especially in the case of new projects, documentation for users and developers can be rare or practically nonexistent. Concluding, some factors should be considered when deciding about the adoption of free software, namely, the costs of training, the transition time, during which it is natural to have duplication of tasks and the need for more time to complete tasks due to the learning curve (Silva, 2011).

Development Support

People often ask if there is technical support available for open source products. The answer depends on the maturity of the product. If the software is mature and a well-dimensioned user community is established, companies often start offering personalized support and development to users who are willing to pay for it. In addition to the support offered by companies, the community of users and developers can

answer support questions in a timely manner, when queries and questions are sent to user email lists and virtual forums. It should be noted that SIG Desktop software has commercial support available through companies and consultants (Quadro, 2012).

Open Source GIS Software in Research and Teaching

At first sight, which software is used to teach the functionality of a GIS software may not seem important. However, open source software can help understanding concepts, as it allows direct access to the code in which the application was developed. This means to have access to the source code, that is, the spatial data structures and algorithms. Using free software in education is significant because of its potential to promote the development of a critical perspective on GIS. In addition, teaching with open source products will allow the student to legally download programs, extensions and data, so that he has the same experience of the teaching environment, at home, with the same software, without paying a license fee. Thus, free software promotes equal learning opportunities. According to Silva (2011), the main advantages inherent to the use os free software are:

- Programmers don't need to write new lines of code when they have already been written and are available on the internet;
- Free software inherently has documentation available, that is, you can study the source code to understand how things are done;
- Free software is adaptable to your own needs (research), without restrictions;
- Software updates are available more often and free of charge.

HOW TO CHOOSE A GIS SOFTWARE

This chapter main goal is to provide users with a list of important recommendations that could help them in the process of choosing a GIS/WebGIS software, both in terms of free/open source software versus proprietary solutions. So, lets start by an analysis of free versus proprietary solutions:

The interest in open source software has been growing in recent years. In the specific context of GIS software, it appears that it's possible to find a wide range of technologies, ranging from data storage and servers to the development of desktop, mobile and Web applications, with a high level of maturity, improvement, specialization, stability, usability and robustness, comparable to many proprietary products, characteristics that make them appropriate tools for the development of real solutions. One of the indicators of the success of these technologies is the growth of real application cases referenced on the project pages, associated with collaborative and active communities of an increasing number of users at an international level (Silva, 2011).

In the context of the production of GIS applications, the high licensing and support costs, usually associated with commercial solutions, contributed, in a way, to encourage and enhance the development of applications, technologies and platforms based on open source software that, in recent years, have been presented, to some extent, as an alternative to proprietary applications and tools.

One of the adversities facing the implementation of free software or open source in any public or private organization, has to do with the low level of confidence that many administrators still reveal in relation to this software cathegory. This observation, which is supported by an empirical basis, of

knowledge of those IT areas, leads us to admit that, before considering a possible migration, upstream, an analytical exercise should be implemented that allows listing and announcing the main reasons in which public managers should be (Patriarca, 2016).

Although technologies based on open source software still do not have a high level of acceptance from the part of organizations, it appears that they have started to be considered as alternatives to proprietary solutions, since they allow to reduce costs with the acquisition and maintenance of software. Indeed, the recognition of these technologies as valid and credible alternatives by government institutions is beginning to be visible, as is the case of Portugal with the inclusion of open source software in the National Catalog of Public Purchases (ESOP, 2011).

However, during this study and when analyzing the open source client technologies available to the implementation of geo-portals, it was possible to see that the development processes require, in the great majority, computer skills that imply the writing of source code or the creation of files with a XML structure. In fact, the number of projects that include graphical development tools and interfaces is small. Thus, one reason that may explain the option for proprietary technologies to the development of WebGIS applications, may be related to the existence of graphical tools for the user that allow the creation of applications without the need to write source code or files in specific formats. In this context, the development of graphical interfaces to facilitate the configuration of WebGIS client applications, in a friendly way, assumes itself as an area of potential interest to facilitate the use and adoption of open source technologies by GIS specialists.

Due to the pros and cons of both solutions (open source and proprietary software) our study includes both.

The question that we are trying to answer is: how to choose a GIS software? This is an issue that raises doubts for people working with GIS, especially given the numerous and varied range of program options for this type of application. Due to this large number and varied range of options available for this type of application, some criteria have been identified that can support the choice and help users during the process of choosing a GIS software for their projects (OGC, 2011). They are presented next grouped by the following categories:

The Objectives of the Project

Before choosing the program for manipulating the geographic information, it is essential to be very clear about the objectives of each project. Users will not be able to choose any application system before knowing the objectives of the project and thus being aware about their real needs.

Compatibility With the Operating System

There may be incompatibility between some GIS software and the Operating System used. For example, ESRI software (ArcGIS package), in general, does not run in a Linux environment, there are also those that in turn only have versions for the Unix platform. Thus, the information about the Operating Systems in which the evaluated program can be executed, is essential.

Features Available in the Software

The focus of the program may change. Therefore, it is important to check the features offered by the software. If it is intended to work with remote sensing products, the chosen program must have a set of tools for digital image processing (DIP), if integration with geographic databases is necessary, the support to the Database Management System (DBMS) must be verified, that is, the compatibility between the chosen GIS software and the existing DBMS has to be assured.

Interoperability

Interoperability is the characteristic of a program that refers to its capacity to support different geographic data formats. GIS software that does not read common formats like shapefile, DWG and DXF can cause problems and/or serious limitations. The same is true for the manipulation of raster information, tabular data or the standards of the Open Geospatial Consortium (OGC), such as the WMS. It is necessary to verify not only the possibilities of import, but also of export, since it is possible that the data generated will have to be integrated with other systems.

Software Expansibility

Consists on the software adapting capacity to changes in specifications. It includes the ability of the program to increase its functionalities through add-ons and external scripts, which can be developed using specific programming languages. For example, QGIS is one of the most popular open source software for Geoprocessing and already has a large number of tools. But this robust program can grow as new components are installed and/or enabled.

Software Development Plan

You should never choose to use a GIS program whose development project is stopped. This state may be an indication that it is technologically out of date and will not be able to respond satisfactorily to users' needs. As a rule, if a software has been without new versions, even test versions (release candidate), for more than two years then it should not be considered. However, the number of released versions, *per se,* its not an ensurance. A deeper analysis must be conducted. There are cases where a software has several versions released but without major changes in its functionalities which means that it should not be users first choice.

Strength of the International Community

The number of users and their coverage is relevant and should be checked. A software with an active international community is, usually, an indicator of robustness. The strength os the software community may be inferred from questions such as:

- Is the user community united and organized?
- Is there already a discussion group (support)? How active is that list?
- What can be said about the program documentation?

Performance Tests

Users should allways conduct performance tests before choosing a GIS software. Especially before entering the production environment, performance tests must be performed with the GIS software candidate to be chosen for a given project. Free software, in general, can be obtained for free and many proprietary software have trial versions that are useful for this situation.

Open Source Software Impact

Acording to Agrawal & Gupta (2017) the open source movement has a significant impact in the reach of webGIS to the users of different platforms. The FOSS (Free and Open Source Software) has made the software available to all, free of cost. According to the Free Software Foundation, free software grants four freedoms. These freedoms are: 1) run the program for any purpose, 2) study how the program works and adapt it to the needs, 3) redistribute copies, and 4) improve the program including the release of improvements to the public. The second and fourth freedom require that source code must be delivered with the software. Steiniger and Bocher (2009) used four indicators to measure the popularity of FOSS, namely, number of projects started in a couple of years, financial support by the government in the development of FOSS GIS projects, download rate of the software, and number of use cases.

WEBGIS SOFTWARE ANALYSIS

The history of GIS is linked to the Internet, especially to the Internet WWW application, which provides an ideal platform to strengthen public and government agencies with GIS technology through distributed GIS (Plewe, 1997; Peng & Tsou, 2003; Zhu et al., 2005).

As previously mentioned, the term "WebGIS" refers to applications that distribute spatial data to users through a web browser. Depending on the capabilities of the software, users can view, query and analyze geographic data remotely through a web browser interface. Is a relatively inexpensive way of disseminating spatial data and basic GIS functionality, WebGIS software has become widely used by both public and private organizations. A good part of the basic features of the GIS desktop are already available to users to interact with GIS databases through the WWW or an intranet (Bonnici, 2005). The main benefits of WebGIS include, amongst others, the ability to distribute GIS data and functionalities to a large audience without costs and extensive training.

However, there are also some difficulties associated with the use of WebGIS. In fact, the response time can be long, depending on several factors such as the connection type and capacity, the data in the network traffic volume and the processor capacity.

According to Bonnici (2005), the components of a typical WebGIS system include data, software and hardware as specified next:

- **Data:** See below:
  - **Spatial Data:** Data with a positional or geographic component, in specific data file formats (SHP or others) or stored in a specific database;
  - **Data Attributes:** Map resources characteristics or properties, stored as textual or tabular data, usually in a relational database;

- **Software:** See below:
  - **WebGIS server** (also called Map Server);
  - **Middleware Server:** To interpret the customer requests, interact with the WebGIS application and pack the data for transfer via the Web;
  - **Web Server:** As an example, Apache, Internet Information Server (IIS);
  - **Client Browser:** As an example, Internet Explorer, Mozilla, Google Chrome;
  - **Client-side Applet or Plug-in On:** This requirement depends on the technology used;
  - **Web Software for the Database:** As an example, PHP, ASP.NET, ColdFusion, PostGis, SqlServer, Oracle, etc.
- **Hardware:** See below:
  - Central server;
  - Client computers;
  - Connection via the Internet or, to intranet sites, through a LAN or WAN;
  - Geographic database server (Oracle Spatial, PostGis, PostGres, SQL Server Spatial).

In order to facilitate the analysis of which type of WebGIS Software to choose, a comparative and detailed study was carried out between the various Geotechnologies available, at the moment of reseach, both in terms of free and proprietary software solutions. The more relevant WebGIS technologies found, were grouped into three categories (open source software, proprietary software and public APIs), and are presented on Table 1.

Each one of these WebGIS technologies categories, has its advantages and disadvantages that must be considered when planning a WebGIS.

Free software can be used, copied and distributed without any restrictions. The advantage of public APIs (Application Programming Interface) is that they are free and the supplier provides a set of base layers whose symbology and resolution changes when the map scale is changed.

One of the most important components in terms of WebGIS Architecture are the Map Servers. Therefore, in Tables 2 and 3, a comparative study between 3 free and 3 paid solutions is presented. The three Map Servers of free software origin are Geoserver, Mapserver, and QGIS (Quantum Gis) and the three Map Servers of proprietary origin are: ArcGisServer (from ESRI companies), Geomedia Webmap (from Hexagon) and Autodesk.

In the analysis of Table 2, the characteristics of each Software under Analysis was presented. As to Table 3, it presents the platforms (Operating System, Databases, Standards and also the advantages and disadvantages of each software).

If an Organization does not intend to spend money on paid software, and opts for a free software solution, it may choose the software that offers the most guarantees. After a detailed research, and as can be perceived from the analysis of tables 1, 2 and 3, QGIS-Server is the software that stands out. It is compatible with several operating systems thus operating on different platforms: Microsoft, Mac and Linux. Despite needing additional patches to manage vector files, QGIS offers many advantages. In fact, in addition to being open source, has support for Python plugins and allows the development and implementation of new features in a quickly and efficient manner. It is a vehicle for WMS standards (OpenSIG Standard - WebMap Service Interface), WFS (Web Feature Service Interface Standard), WFS-T and WCS. Note that WFS is a standard that refers to sending and receiving geospatial data through HTTP, WFS-T is a standard to Web Feature Service Transaction, which additionally allows the creation, exclusion and updating of resources of the Open Geospatial Consorcium (OGC). In addition to

the advantages presented, QGIS is compatible with the ArcGis Software. As to the advantage that stands out when compared with the other free GIS softwares under analysis, QGIS allows complementarity in terms of mixed licensing, leading to savings in terms of investment by Organizations. Thus being, in what refers to free software solutions, QGIS-Server is the most complete and thus the one proposed in this research work.

Table 1. Main technologies involved in a WebGIS

Software	Web Address
Open Source Software	
GeoServer	http://geoserver.org
MapServer	http://mapserver.org
QGIS Server	https://www.qgis.org/en/site/
Proprietary Software	
ArcGIS Server	http://www.esri.com
GeoMedia WebMap	http://www.intergraph.com
Autodesk Map Guide Enterprise	http://www.autodesk.com
Public APIs	Public Development platforms:
Google Maps	http://maps.google.com
Yahoo! Maps	http://maps.yahoo.com
Microsoft Virtual Earth (2D)	https://www.bing.com/maps
MapQuest˝s OpenAPI	http://www.mapquest.com
Google Earth	http://www.google.com/intl/pt-PT/earth/index.html
Microsoft Virtual Earth (3D)	http://www.microsoft.com/download/en/details.aspx?id=6436
NASA WorldWind	https://worldwind.arc.nasa.gov/java/

Note: API, or Application Programming Interface, is a computing interface to a software component or a system, that defines how other components or systems can use it.

If the organization is willing to pay for the software, ArcGis Server is the one that stands out most positively, as it is compatible with the QGIS software, as well as open source databases, postgis SQL and postgres. In addition, ArcGis Server has elements in open-source communities. Thus being, in what refers to proprietary solutions, ArcGis Server is the most complete and thus the one proposed in this research.

FUTURE RESEARCH DIRECTIONS

As to future research directions, the authors intend to keep up to date in what refers to all the available solutions in the market (free and proprietary) in terms of WebGIS software. The research of specific cases of success in different areas, with a specific emphasys on Municipal Administration, is being conducted.

Table 2. MAP SERVERS - Characteristics

Map Servers		Characteristics
Free Software	**GeoServer** geoserver.org	GeoServer is a free software, maintained by the Open Planning Project, which allows the development of Webmappin solutions and which integrates several repositories of geographic data with simplicity and high performance. GeoServer is a fully functional Web Map Service (WMS), Web Coverage Service (WCS) and Web Feature Service-Transaction (WFS-T) server that follows the specifications of the Open Geospatial Consortium (OGC).
	MapServer mapserver.org	MapServer is a free software that serves as a development environment for building space applications on the internet. Development environment for building space applications focused on WEB. It is not a complete GIS software, nor does it have this objective. It was created by the University of Minnesota with support from NASA.
	QGIS-Server live.osgeo.org	The QGIS server is an open source implementation of WMS 1.3, WFS 1.0.0, WFS 1.1.0 and WCS 1.1.1 which, in addition, implements advanced cartographic features for thematic mapping. The QGIS server is a FastCGI / CGI (Common Gateway Interface) application written in C ++ that works in conjunction with a web server (for example, Apache, Lighttpd).
Proprietary Software	**ArcGIS Server** esri.com	ArcGIS Server services provide mapping and GIS capabilities via ArcGIS Online for Esri web and client applications, such as ArcGIS Desktop, ArcLogistics, ArcGIS.com Viewer, ArcGIS Explorer, ArcGIS Explorer Online, ArcGIS Viewer for Flex, ArcGIS Mapping for SharePoint, Esri Business Analyst Online (BAO) and applications created with ArcGIS for iOS or BAO for iOS. Numerous third-party applications are also licensed to use ArcGIS Server services.
	Geomedia Webmap hexagongeospatial.com	GeoMedia WebMap supports a wide range of customers who need to view and analyze geographic data on the web. From the easy creation of standards-compliant web services to the provision of sophisticated visualization and analysis in interactive web mapping applications, GeoMedia WebMap enables the creation of powerful solutions for sharing an organization's geospatial data.
	Autodesk MapGuide Enterprise autodesk.com	Autodesk MapGuide® Enterprise geospatial software is the new generation of webGIS technology. MapGuide Enterprise offers a powerful platform for distributing map information quickly, easily and economically. In addition to increasing productivity, it also improves communication between internal teams, employees on the ground and customers. Autodesk MapGuide® Studio.

CONCLUSION

The purpose of this chapter was to present the advantages and disadvantages involved in the use of GIS, especially WebGIS or geoportals, as well as present a detailed comparative study in what concers to the main WebGIS software solutions in terms of characteristics and functionalities. The main goal of the chapter was to provide users with a list of important recommendations that could help them in the process of choosing a WebGIS software, *both in terms of free and proprietary solutions.*

As a result, the use of open source software, both in organization practices and in research, was explicitly advocated. It can be highlighted that the principles of free software are in accordance with a fundamental research principle in which the results of the experiments must be reproducible, that is, if the source code is given, everyone should be able to learn from it, in addition to directly improving their algorithms and models without risking misinterpretation.

Table 3. Comparative study between several MAP SERVERS

Map Servers		Operating System	Data Base	Standards OGC (Open Geospatial Consorcium)	Advantages	Disadvantages
Free Software	**GeoServer** geoserver.org	Windows, Linux, MacOS	Oracle, ArcSDE, DB2, MYSQL, PostgreSQL	WCS, WMS, WFS	Open code. Compatible with OGC (Open Geospatial consorcium) webservice standards. It has an administration interface. Reads various data formats. High execution speed.	Limited choice in terms of cartographic symbology.
	MapServer mapserver.org	Linux, Windows, Mac OS X, Solaris	Oracle, ArcSDE, DB2, MYSQL, PostgreSQL	WMS, WFS, WMC, WCS, SLD, Filter Encoding, GML, SO	Open code. Compatible with OGC webservice standards. Reads various data formats. High execution speed. It has an administration interface.	Configuration with computer code only (MapFile). Not compatible with OGC WFS-T standard.
	QGIS-Server live.osgeo.org	Windows, Linux, MacOS	Postgis, PostgreSQL, Oracle	WMS, WFS, WFS-T, WCS	Open code. Support for Python plugins, allowing the development and implementation of new features in a fast and efficient way. Vehicle to the OGC WMS, WFS and WFS-T standards. Configuration via QGIS interface (open source software).	Patches needed to manage vector files. Some functions in development, because the project is still recent and is evolving.
Proprietary Software	**ArcGIS Server** esri.com	Windows, Linux	Oracle, Microsoft Access, SQL Server, Informix, DB2 e PostgreSQL	WMS, WCS, WFS, WFS-T, locator, globe	Compatible with many of the OGC webservice standards. Administration interface. Map configuration via ArcGIS software interface. High speed. Very complete solution including manipulation of vector, raster and 3D data. Support for mobile platforms, geocoding and routing services. Access to several DBMSs including Oracle Spatial. Implementation of OGC and ISO standards, catalog. Web and desktop solution.	Proprietary software, under license only compatible for shapefile formats and geodatabase data formats.
	Geomedia Webmap hexagongeospatial.com	Windows	MGE, MGE Segment Manager, Oracle, Access, SQL Server	WMS, WFS, SOAP, WSDL, OPENLS	Very complete solution including manipulation of vector, raster and 3D data. Support for mobile platforms, geocoding and routing services. Access to several DBMSs including Oracle Spatial. Implementation of OGC and ISO standards, catalog. Web and desktop solution.	Higher cost, has no elements in OpenSource communities, development model and technologies extremely linked to Microsoft proprietary models.
	Autodesk MapGuide Enterprise autodesk.com	Windows	Oracle, SQL Server	WMS, WFS	Reduced cost, opensource version that provides a range of components at reduced cost.	Web services: only implements WMS and WFS. Limited metadata management, implemented through Topobase. Web map editing is not supported. It does not include services for mobile platforms.

Due to the many benefits of the GIS technologies in general, and WebGIS or Geoportals in particular, the use of these tools must be highly considered. However, this reality is not found in most Portuguese municipalities, in which the reasons presented by managers for not investing in technologies of this nature are diverse, ranging from political interests and influences to the scarcity of financial, human and technological resources. Thus being, this study should serve as a motivation to boost a strong investment, by public entities, in the design and maintenance of this type of geotechnology. The advantages of each software, as well as a detailed comparative study on the main software WebGIS solutions characteristics,

both free and proprietary, were presented and discussed. With this information in mind users are better informed to choose which software would be more apropriate to their situation.

Important to refer that, as was discussed, the use of free software is a viable alternative, mainly within the scope of Geoinformation Technologies, and it is increasingly consolidated as a public policy at national and international levels.

REFERENCES

Agrawal, S., & Gupta, R. (2017). Web GIS and its architecture: A review. *Arabian Journal of Geosciences*, *10*(23), 518. doi:10.100712517-017-3296-2

Ali Khan, Z., & Adnan, M. (2010). *Usability Evaluation of Web-based GIS Applications a Comparative Study of Google Maps and MapQues*t (M.Sc Thesis). Blekinge Institute of Technology.

Arnaud, A. (2009). *Valorization of information dedicated to regional events in risk. An application on the Grenoble crown* (Doctoral thesis). Joseph Fourier University.

Basu, R. (2019). *15 Best GIS Software in 2020 for Analysing Geospatial Data*. Retrieved from https://www.techjockey.com/blog/top-gis-software-for-analysing-geographic-data

Bonnici, A. (2005). WebGIS Software Comparision Framework. Geomatics Dpt., Sir Sandford Fleming College.

Cairo, S. (2013). *Geographic information systems: Main concepts*. Lisbon. *Ed. Autor*, *2013*, 41.

ESOP. (2011). *European Symposium on Programming*. Retrieved from https://link.springer.com/conference/esop

FaceGIS.com. (2020). *Geographical Data Sets*. Retrieved from http://facegis.nuarsa.info/?id=3

Gisgeography.com. (2020). *13 Free GIS Software Options: Map the World in Open Source*. Retrieved from https://gisgeography.com/free-gis-software/

Kanickaraj, L. (2018). *Geographic Information Systems (GIS) Defined*. Retrieved from https://www.arcweb.com/blog/geographic-information-systems-gis-defined

Kumar, S., & Babu, S. (2016). A Web GIS Based Decision Support System for Agriculture Crop Monitoring System - A Case Study from Part of Medak District. *J Remote Sensing & GIS*, *5*(04), 177. doi:10.4172/2469-4134.1000177

Laffly, D. (2020). *TORUS 2 – Toward an Open Resource Using Services, Cloud Computing for Environmental Data*. ISTE.

Maguire, D., & Longley, P. (2005). The emergence of geoportals and their role in spatial data infrastructures. *Computers, Environment and Urban Systems*, *29*(1), 3–14. doi:10.1016/S0198-9715(04)00045-6

MaptitudeG. I. S. (2020). Retrieved from https://www.caliper.com/maptitude/gis_software/default.htm

Medeiros, A. (2012). *ArcGIS vs. QGIS: Comparison of 10 characteristics*. Retrieved from: http://www.clickgeo.com.br/arcgis-vs-qgis-comparativo-de-10-caracteristicas

Mendes, C. (2006). *Free software and technological innovation: an analysis from the perspective of intellectual property*.

Monge L., Torres J., López L. & Navarro C. (2010). *Comparative analysis of map servers.* GeoFocus Rev Int Cienc y Tecnol la Geographic Inf. 2010.

OGC. (2011). *About OGC | OGC (R)*. Retrieved from http://www.opengeospatial.org/ogc

Olaya, V. (2012). *Geographic Information Systems* (1st ed. Rev.). Retrieved from https://www.bubok.es/libros/191920/Sistemas-de-Informacion-Geografica

Patriarca, J. (2016). *Free and Open Source Software in Public Administration - From myths to issues of a legal, ethical and optimization of public resources* (Master's thesis). Faculty of Arts, University of Coimbra, Coimbra.

Peng, Z., & Tsou, M. (2003). *Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks*. John Wiley & Sons.

Plewe, B. (1997). The Cartographic Representation of Gradation: Fuzzy Maps from Fuzzy Data. *Proceedings of AUTO-CARTO 13*.

Quadro, F. (2012). *GIS Development, a New World Being Discovered*. Revista FOSSGIS Brasil. Retrieved from http://www.fossgisbrasil.com.br

Siddiqui, S., Alam, M., & Bokhari, M. (2012). Software Tools Required to Develop GIS Applications: An Overview. *2012 Second International Conference on Advanced Computing & Communication Technologies*, 51-56. 10.1109/ACCT.2012.106

Silva, A. (2011). *Implementation of a geographic information system in a municipality using free and open source software*. New University of Lisbon. Retrieved from https://run.unl.pt/handle/10362/5161

Steiniger, S., & Bocher, E. (2009). An overview on current free and open source desktop GIS developments. *International Journal of Geographical Information Science*, *23*(10), 1345–1370. doi:10.1080/13658810802634956

Unearth Labs. (2020). *GIS Software*. Retrieved from: https://unearthlabs.com/gis-software-comparison/

Yadav, A., Kanga, S., & Chauhan, R. (2015). The Development and Customization of Desktop GIS Application with Map Window & Dot Technology. *International Journal for Scientific Research & Development*, *3*(2), 1705–1710.

Zhu, Y., Yang, C., Wong, D., & Kafatos, M. (2005). A Distributed GIS for Managing Shanghai Landscape Resources. The International Association of Chinese Professionals in Geographic Information Science (CPGIS). doi:10.1080/10824000509480598

Chapter 14
Designing DMO Communication Strategies Through the Use of a Step-by-Step Model

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ABSTRACT

Nowadays, the internet, social media, mobile devices, and other equipment with an internet connection play a crucial role in our daily lives and the complex networks of modern society. Destination management organizations (DMO) must regard social media as essential tools for improving their competitiveness through, for instance, engagement to extract and understand customer behaviors and needs. The question is, how may DMO tackle the challenge of bringing social media into their communication plans and strategies? With this challenge in mind, a model was designed and tested to contribute to the DMO's goal of integrating and enhancing the use of social media in their communication and promotion-related activities. The model presented in this chapter is partially the result of two questionnaires. One applied to travelers, and the other was used with DMO and in the observation of the usage of several DMO social media accounts; and a case study was developed in cooperation with a local DMO.

INTRODUCTION

Nowadays, the Internet, social media, mobile devices, and other equipment with an Internet connection, play a crucial role in our daily life and the complex networks of modern society. Everyone uses the Internet for so much more than we can even imagine, from searching necessary information quickly and

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seamlessly to booking a trip or scheduling a medical checkup to an uncountable number of actions that just run continuously in an immense technological background landscape.

With this reality in mind, one might wonder about and question the ever-changing role of social media. If considered to some as a means to help people and businesses connect, for others, these same social networks are an environment for self-expression or even the search for support groups for health-related issues. From a business point of view, these social networks and the widespread use of social media have changed the way that consumers communicate with each other and the way companies interact with their new and long term consumers through their marketing actions (Appel, Grewal, Hadi, & Stephen, 2020). Friedman's theory: "The world is flat", believes that consumers are gaining power in determining the production and distribution of information mostly due to the increasing easiness of access to the Internet (Friedman, 2007) and, in particular social media. These have provided tools and have reviewed continuously the way information is generated and shared among users by empowering users to act both as information producers and consumers (Bronner & de Hoog, 2010; Chung, Han, & Koo, 2015; Sigala, 2012). At the same time, users have also been invited to contribute online in a collaborative or non-collaborative manner, thus overcoming the traditional time-related and geographical barriers dealt with in a not so distant past (Carvalho & Raposo, 2012). The devices used have also played a center-stage role in the construction of this reality. Mobile devices, such as smartphones, have contributed to the individuals' digital nomadicity by enabling them to connect to the Internet and social networks anywhere and at any time through social media. Despite the pockets of resistance still found in areas such as service coverage, unaffordable data package plans, and poor user experience (UX) design, the technology ecosystem has, in general, tended towards a seamless, technologically embedded, digital nomad prone smart space.

Tourism has, throughout the years, kept in focus on these trends mostly since it is an information-intensive global industry (Buhalis, 2002; O'Connor, 1999; Werthner & Klein, 1999). It is unquestionable that, when using these technologies for travel purposes, they help travelers to connect to information and service providers in each of the different stages of their trips, from pre-trip to post-trip. Social media has become for travelers: (i) authoritative travel-related information sources; (ii) decision-making influencers (Magno & Cassia, 2018; Nujic, Palic, & Herak, 2018) and (iii) interfaces for interaction with service providers (Kwahk & Kim, 2017; Zeng & Gerritsen, 2014). Social media plays an important role in affecting the way consumers search, decide and book and helps consumers in collecting information about products and services, assessing alternatives and making their choices (Gupta, 2019). All the data and information produced and provided by the activity developed on social media may be and, in current practices, is used by the tourism industry, and particularly by the Destination Management Organizations (DMO), to enhance management decision making and consequently increase the competitiveness of the destination (Gretzel, Werthner, Koo, & Lamsfus, 2015; Hunter, Chung, Gretzel, & Koo, 2015; Koo, Gretzel, Hunter, & Chung, 2015). Based on this fact, social media must be regarded by DMO as essential tools for improving their competitiveness through, for instance, engagement to extract and understand customer behaviors and needs (V. Roque & Raposo, 2016), or communicating with entire online communities with interests in specific segments of the tourism market. The question that, therefore, must be put is how may DMO tackle the challenge of bringing social media into their communication plans and strategies. With this challenge in mind, a model was designed and tested to contribute to the DMO's goal of integrating and enhancing the use of social media in their communication and promotion-related activities (Vitor Roque, 2014; Vitor Roque & Raposo, 2017).

The model, presented in remaining of this chapter, was designed according to the results obtained from two questionnaires. One applied to travelers, and the other used to the DMO (Vitor Roque & Raposo, 2015, 2016a, 2016b). It also received inputs from the results of a case study developed with a local DMO. To introduce the context and to provide an overview of current research in the field, the following section of this chapter comprises a short literature review.

LITERATURE REVIEW

To understand the role of technology in a tourism scenario one must first establish a basic sense regarding some of the main concepts involved in this contect of use. Tourism is undoubtedly itself the guiding concept that must first be genuinely grasped and only then discussed as a powerhouse context of use for technology. According to McIntosh & Goeldner (1986), tourism may be understood as a collection of activities, services, and industries which deliver a travel experience comprising transportation, accommodation, eating and drinking establishments, retail shops, entertainment businesses and other hospitality services provided for individuals or groups traveling away from home. The sum of the phenomena and relationships arising from the interaction of tourists, business suppliers, host governments, and host communities in the process of attracting and hosting these tourists and other visitors. The World Tourism Organization (UNWTO) adds that tourism comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes. In a world where technological ubiquity drive users to an almost omnipresent existence, even if only limited to a virtual one, tourists and tourism have embraced this reality and built new perspectives and rethought existing paradigms upon the existing ones outlined by authors before the Web 2.0 revolution (O'Reilly, 2005). Sources such as the UNWTO International Tourism Highlights 2019 report clearly show that tourism, as an international economic activity continues to outpace the global economy as a whole and has done so for some years. In some cases, such as Portugal, the increase has reached double-digit growth (UNWTO, 2019).

Previous reports from 2017 show that tourism in Portugal has gained increasing importance as one of the main fuels for economic growth. According to the latest information from the World Travel & Tourism Council (WTTC) report for Portugal, approximately 10,4% of the Gross Domestic Product (GDP) is generated by this sector, and it is responsible for about 9,9% of national employability (WTTC, 2018). As a strategic sector for the national economy, strategic markets, such as Spain, Germany, United Kingdom, France, Brazil, Holland, Ireland, and Scandinavia, have also been joined by dynamic emerging markets, mostly from Asia. It is interesting to see that these markets share techno-savvy characteristics, that demand adequate responses at a service and communication level. Lipstick on a pig solutions, poor client service, and the inability to meet expectations quickly spread online and damage brands and services in the blink of an eye.

Portugal has a strategical position has bet on the integration of Information and Communication Technologies (ICT) in strategies licked to innovation, development and the consolidation of differentiating segments. The country is endowed with technological infrastructures to increase its competitiveness, as sustainable tourism is only possible based on innovation, personalization of services and access to tourist information in real-time and sensitive to the context of the moment. The Tourism Strategy 2027 document is just one of the government's most recent measures focused on the tourism industry in which technology does and will play a vital role (TdP, 2017).

A common characteristic shared currently among tourists is, undoubtedly, the gradual integration of technology-related activities in their experience. From looking up, to checking out, tourists have gradually integrated technology in the before, during, and after stages of their experience. As pointed out in previous research (Raposo, Beça, de Figueiredo, & dos Santos, 2012), technology, what is done with it, when and where are variables that shift among different users and evolve due to the simple fact that users themselves as individuals also change over time.

Currently, tourists are highly dependent on technology, very active on social networks, and seek to live tailored experiences. Just in time, just enough, just for me, is no longer an exception but rather an increasing rule of the trade. The profile of the tourist and traveler of the 21st century expects a lot, but also provides, sometimes unknowingly, a lot as well. The typical user is continuously leaving a trail of data and information about themselves and their experience wherever they go and, in many cases, concerning whatever they do. Being always online, digital nomadicity and the increase of smart spaces has provided companies useful resources for understanding tourists, experiences, areas, and as a result aided the improvement of their strategy design.

According to The Global Digital Traveler Research report (Travelport, 2017), 47% of travelers use voice search when looking for travel, more than 33% of travelers book their trip via mobile devices, and an average of 16 different categories of APPS are used when traveling. In the case of Spanish travelers/tourists, they are so confident in the technology, that 68% would provide their biometric data to reduce waiting time at security controls (Pestana, 2019).

Leung (Leung, 2019) goes a bit further and suggests that in service delivery, and its evolution, in the field of e-tourism may be summarized according to three stages: service, e-service and m-service and that there is a emerging fourth stage of service evolution which may be understood as an "a-service". This a-service encompasses three features: i) service automation and human-robot interaction; ii) artificial intelligence and big data; iii) and smart travel experience. The evolution of this a-service has become gradually more evident in the number of tasks that have become seamless in various e-tourism related activities. Some of these activities have slowly collected information about the user and have adjusted the experience with effective yet sometimes questionable results. Advert spamming, user profiling and price inflation based on user interest, something is often done by online accommodation and travel websites, are just some of the more commonly known effects of a-service on the user's experience.

Welcoming and engaging with a universe of users and expectations, which make up this e-tourism ecosystem, is an everyday challenge tackled by Destination Management Organizations. DMO have sought out solutions capable of helping them to keep their head above water when the competition, the number of tourists and the amount of data and information produced, all seem to present themselves as overwhelming and challenging to manage. This becomes more evident in cases in which the DMO has a relatively small team, low budget and more of a technophobia than a technomania. The model presented in this chapter focuses on dealing with this sort of DMO and the limitations that have kept them at bay about integrating technological solutions, such as social media, in their communication strategies and activities.

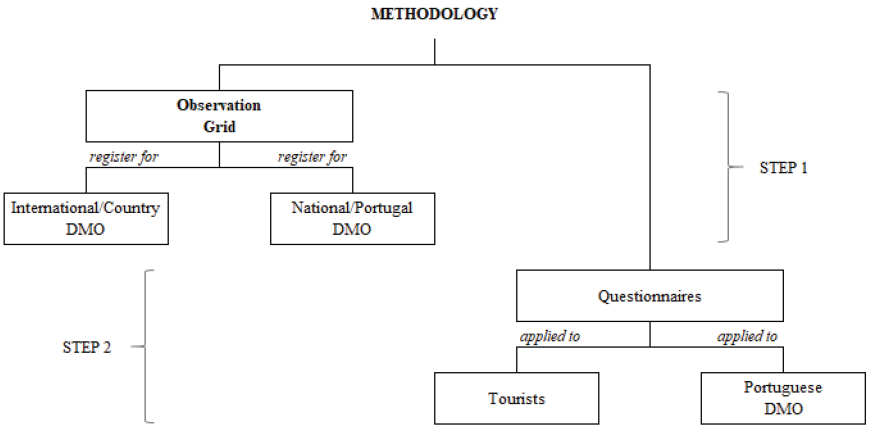
RESEARCH METHODOLOGY

The research and development of the model described in this chapter was triggered by the question: How are Destination Management Organizations (DMO) using social media as a tool to promote engage-

ment with tourists? This question, made up of several layers of understanding, supported much of the research developed and targeted at the enhancement of the levels of engagement with tourists through the use of social media.

To collect data and information for the study, a two (2) step methodology was developed and mixed observational activities and questionnaires (Figure 1).

Figure 1. Adopted methodology



An observation grid used to register a set of data regarding the use of social media by a list of chosen DMO. The list, divided into two groups, comprised of international DMOs and national, regional and local DMOs from Portugal. The observation grid was structured according to a set of indicators and online activities to be observed in each DMO. Through the analysis of the collected data, it was possible to (i) determine which social media were the most used by the observed DMOs and (ii) compare publishing practices in each of the social media considered.

The two questionnaires, one applied to tourists and another applied to DMO were used to understand the demand, access and use by tourists of the information made available by DMO through social media and, the other, used to evaluate the use of social media by Portuguese DMOs at the time. The previously mentioned observation grid was used to characterize the DMO and describe the use of social media by the DMO. In a later phase of the research, a third dimension included a more qualitative essence, in which publications were characterized according to their contents.

A generic characterization of each DMO was done by considering some variables, such as i) the presence of an active web page; ii) the website's address; iii) the references on the site to their presence on social media (i.e. Facebook, Twitter, Instagram). Each social media platform used was deconstructed into particular and specific variables helpful for characterizing the DMO activity. Table 1 presents some examples of the data and information collected regarding the use of Facebook.

Table 1. Variables used in the characterization of the Facebook APP

Facebook APP variables	
Page address	The web address of the DMO Facebook page
Type of Page	Brand or Personal
Number of followers	Number of people they may receive updates about the Page in their News Feed
Publications type: Text Image Video Link	 The number of publications; The number of likes associated with each publication; The number of comments related to each publication; The number of shares associated with each publication.
Event posts	Number of events created;
Photo albums	The number of photo albums created; The number of profile photos; T number of cover photos; Total number of pictures; The number of videos.

It should be outlined that the list of DMOs chosen for observation, complied to some general conditions:

1. At least one DMO should represent all continents;
2. The chosen European DMO should benefit preferentially from countries geographically closest to Portugal;
3. The European DMOs should include representatives from the northern, the central and the southern regions of Europe;
4. The DMO websites must be their country's official online presence.

The DMOs to be included in the study and observed are listed in Table 2.

Table 2. List of international DMO to observe

Country	**Website address**
Portugal	http://www.visitportugal.com
Spain	http://www.spain.info
France	http://www.rendezvousenfrance.com > https://www.france.fr
Italy	http://www.italia.it
Greece	http://www.visitgreece.gr
United Kingdom	http://www.visitbritain.com
Germany	http://www.germany.travel
Austria	http://www.austria.info
Norway	http://www.visitnorway.com

The social media platforms to be analyzed were chosen according to two simple and straightforward rules:

Table 3. Data observation and register, time of the day

Time of the day		APP	Website
day n	22:30	Alexa	https://www.alexa.com/
	22:45	Youtube	https://www.youtube.com/
	23:15	Pinterest	https://www.pinterest.com/
	23:30	Foursquare	https://foursquare.com/
	23:45	Flickr	https://www.flickr.com/
day n+1	9:00	Facebook	https://www.facebook.com/
	10:00	Google+	discontinued
	10:30	Twitter	https://twitter.com

1. The social media platforms had to be used by at least two DMOs in their communication strategy;
2. The social media platforms had to be referred to on the DMO's official website.

After filtering and reviewing the chosen DMO, according to these rules, the social media platforms chosen were: (a) Twitter[1] - a social network of microblogging; (b) Facebook[2] - general social network; (c) Google+[3] - general social network; (d) Flickr[4] - a specific social network for sharing photos; (e) Youtube[5] - a specific video-sharing social network, (f) Pinterest[6] - online board to organize and share things liked and (g) Foursquare[7] - a location-based social network for mobile devices.

The observations were conducted during two different periods according to tourism high and low seasonality. The observation and data collection time were the same in both periods and are summarized in Table 3.

Table 4. List of national DMO to observe

	DMO	Official DMO Website	Name of the Website
national	PORTUGAL	http://www.visitportugal.com	Portal Oficial do Turismo de Portugal
regional	North	http://www.visitportoandnorth.travel/ http://www.portoenorte.pt/	Porto e Norte Portugal | Agência de Promoção Turistica Porto e Norte Turismo do Porto e Norte de Portugal
	Centre	http://www.visitcentro.com/ http://www.turismodocentro.pt/	Centro de Portugal Turismo do Centro
	Lisboa e Vale do Tejo	http://www.visitlisboa.com/	www.visitlisboa.com
	Alentejo	http://www.visitalentejo.pt/	Turismo do Alentejo
	Algarve	http://www.visitalgarve.pt/	VisitAlgarve - Portal de Turismo do Algarve
	Madeira	http://www.visitmadeira.pt/	Turismo da Madeira
	Azores	http://www.visitazores.com	Visit Azores
local	Guarda	http://www.mun-guarda.pt/	Municipio da Guarda
	Viseu	http://www.cm-viseu.pt/	Câmara Municipal de Viseu
	Aveiro	http://www.aveiro.eu/	aveiroturismo
	Coimbra	http://www.turismodecoimbra.pt/	
	Porto	http://www.portoturismo.pt/	Turismo do Porto - Portal Oficial

A similar procedure was also followed for the Portuguese DMOs. The DMO considered are presented in Table 4.

In the case of Portuguese DMO the chosen social media platforms, in line with the defined criteria were: (a) Twitter; (b) Facebook; (c) Flickr; (d) Youtube and (e) Pinterest.

Two questionnaires were also developed, one applied to Portuguese tourists and a second applied to Portuguese DMO. The questionnaire applied to Portuguese tourists intended to understand if the DMO were using social media platforms and if they were publishing information according to the interests of their consumers. Other goals included the identification of:

1. The most used equipment, to access the Internet, when looking for tourism information;
2. The most used social media platforms in the search for information about tourism;
3. The most sought out content on social media when searching for tourist information;
4. The most used social media platforms for sharing content from tourist experiences.

The first questionnaire comprised 23 close-ended questions. This type of question was selected based on several factors, pointed out by different authors (Carmo & Ferreira, 2008; Hill & Hill, 2008; Moreira, 2009), and fuelled by the fact that respondents prefer these types of questions. The questionnaire was validated by a group of experts from different scientific areas, and a pre-test was carried out with the participation of five respondents. The questionnaire was made available online at https://questionarios.ua.pt/index.php/221163/lang-pt, for 40 days. The final sample obtained contained 1222 responses, 202 of which were incomplete and one of the respondents indicated that he was under 18. For research purposed, 1019 valid answers were considered and analyzed.

In terms of its content, the questionnaire included 23 questions, distributed in 3 sections each with its purpose (Vitor Roque & Raposo, 2016b):

Section A: Demographic information and use of social media - characterization of the respondent.
Section B: Travel habits and search for information about destinations - outline of the respondent's travel habits and the devices used.
Section C: Consumption of information made available by DMOs on social media - obtain information from respondents regarding the use of social media platforms for searching for information about destinations and also for sharing their tourist experiences.

The second questionnaire, for the Portuguese DMO, allowed the assessment of their use of social media platforms. In methodological terms, as to the questionnaire's validation, the steps taken in the previous questionnaire were also followed (Vitor Roque & Raposo, 2015, 2016a).

This questionnaire, a bit longer than the one used with the tourists, included 42 questions distributed in 11 sections and involved:

Section A: Identification and characterization of the DMO - identify and characterize the DMO.
Section B: Blog information - analyze DMO's use of blogs.
Section C: Social media - assess the use of social media by DMO.
Section D: Photo and video sharing - evaluate the use of social media for sharing photos and videos by DMO.

Section E: Other social media platforms and tools - assess whether DMO uses social media specific to the tourism industry.

Section F: Return on social media - assess how DMOs measure the return on investment on social media.

Section G: Value - assess which or which social media APPs have had a more significant contribution to the DMO's activity.

Section H: Good practices in the use of social media by Portuguese DMO - list good practices in the use of social media.

Section I: Help and support - analyze which information sources are used in the development of the content to be published, the time spent in preparing it and who determines the publication.

The DMOs were selected based on two criteria: (i) coverage in terms of geographic area according to national and regional legislation and (ii) local DMOs representative of the municipalities in the central region, namely along the A25 route (i.e. Guarda, Viseu, and Aveiro).

Accordingly, to the defined criteria, the following DMOs were selected (Table 5).

Table 5. Selected DMO

Agência Regional de Promoção Turística Centro de Portugal | www.visitcentro.com	Entidade Regional de Turismo do Centro de Portugal | www.turismodocentro.pt
Associação de Promoção da Madeira | www.ap-madeira.pt	Município de Aveiro | Aveiro Welcome Center | www.aveiro.eu
Associação de Turismo do Porto – Porto Convention Bureau | www.visitportoandnorth.travel	Turismo de Coimbra | www.turismodecoimbra.pt *(did not participate)*
Câmara Municipal da Guarda | www.mun-guarda.pt	Turismo de Lisboa | www.visitlisboa.com
Câmara Municipal do Porto | Departamento Municipal de Turismo | www.visitporto.travel	Turismo do Alentejo, ERT | www.visitalentejo.pt
Câmara Municipal de Viseu | http://www.cm-viseu.pt *(did not participate)*	Turismo do Porto e Norte de Portugal. E.R | www.portoenorte.pt
Direção Regional do Turismo da Madeira | www.visitmadeira.pt	Turismo dos Açores | www.visitazores.com
Entidade Regional de Turismo do Algarve | www.visitalgarve.pt	

Among the 15 DMO selected and invited to take part in this study, 2 DMO were not available to participate and withdrawn from the list. These tools allowed the collection of a wide range and differentiated data and information that was used to aid the development and proposal of a model for DMO to use in order to enhance their use of social media for communicating with tourists.

MAIN RESULTS

This chapter presents the main results of the data analysis obtained from the four data collection instruments previously described. Data analysis was done through the use of Microsoft Excel and the Statistical Package for the Social Sciences (SPSS)[8].

Results From the Observation of International and National DMOs

From the observation of international DMOs (V. Roque & Raposo, 2016), it was found that Facebook and Twitter applications are used in communication strategies by all the DMOs considered. These observations were conducted during two distinct periods. The choice of these two periods, one in the high tourist season and the other in the low tourist season, were based on the assumption that there may eventually be differences in the publication of content by the DMO, an assumption that ended up not being verifiable. The periodicity and cadence of publications in both periods remained constant and without any significant fluctuations.

Regarding the type of publications, it was found that there is a significant difference, in terms of interaction/engagement generated by images when compared to other types of content (text, video, and shared links). DMOs published Image-based material with a percentage of 73.56%, an overwhelming value when compared to the other three types of content above mentioned.

In the case of Facebook, interaction/engagement was defined, for the study's purpose, as the use of the available options to show interest in a publication, namely through the use of options such as (a) likes; (b) comments; and (c) shares (Boyd & Ellison, 2008; Connor, 2011; Stankov, 2010; Zouganeli, Trihas, & Antonaki, 2011). The interaction calculation was performed using Formula 1:

$$\frac{\left(total_{like} + total_{comment} + total_{share}\right)}{number_{publication}}$$

Formula 1: Interaction/Engagement Calculation

It was found that the publications that generate the most interaction/engagement with consumers/tourists were image publications. Results demonstrate that these interaction/engagement tendencies are clearly understood by the majority of the DMOs due to the amount of images used in their activities on social media. Another relevant aspect observed was that DMOs publish mostly in English and their country's mother tongue.

Regarding the observation done on Portuguese DMOs (Vitor Roque & Raposo, 2013), it was possible to verify that, as in the case of the international DMOs, Facebook and Twitter applications were also the most used for communication purposes. It was also found that Facebook is the social media platform that generates greater interaction/engagement with consumers/tourists. Image-based publications also produce the highest interaction/engagement with consumers/tourists and, for that reason, this type of content is also the most published by Portuguese DMOs.

Results From the Questionnaire Applied to Portuguese Consumers/Tourists

As to the questionnaire answered by Portuguese consumers/tourists, there are a set of interesting results that are worth analyzing. The majority of respondents were female (59,4%) and mostly had a degree in education (57,0%).

In terms of the devices used, laptops (43,0%) were the most used to search for tourist information, followed by desktop computers (20,5%). Smartphones came in the 3rd position (17,3%) as the most

used equipment used to search for tourist information. As for sources used for searching for information, DMO websites are where the most significant number of respondents search for tourist information (43,3%), and only 3,9% of respondents (n = 74) affirm to search for tourist information on social media. These findings show us that there is a potential for growth concerning the demand for tourist information through this source. For respondents who indicated using social media as their source for tourist information, Facebook was the application mostly chosen to carry out this search. It was also found that image-based content is the content most accessed and also the most shared by consumers/tourists. Most respondents agree that the tourist information provided by the DMO is sufficient. However, it is interesting to see that those who have a higher level of education think that the tourist information published is not enough for their needs.

When asked most respondents establish that ease of use is the main reason for resorting to social media when searching for tourist information and the preferred time to do so is between 21-24h (46,4%) and 19-21h (20,6%).

Results From the Questionnaire Applied to Portuguese DMO

The last instrument developed and used within the study presented in this chapter was a questionnaire applied to Portuguese DMOs. From the data analysis, the results most relevant obtained are summarized in the following paragraphs and may be further explored in other works already published (Vitor Roque & Raposo, 2015, 2016a).

For the sample of DMO that took part in the study, Facebook was the social media application most used in communication activities with consumers/tourists, followed by Twitter. Paid advertisements were outlined as the strategy most used to promote the DMO's activities and events. When questioned about the main objectives to be achieved with their presence on social media, DMO indicated: (a) Increase the reputation of the destination/brand; (b) Build and increase the relationship (engagement) with the consumer/tourist and (c) Increase the visibility of the destination/brand. The accomplishment of these goals, according to particular key performance indicators (KPI), was measured through the use of statistical analysis tools provided by each of the social platforms used. Within the sample, only one of the surveyed DMOs stated to measure their performance on social media with the use of commercial tools.

The leisure market was the most chosen by DMO as the one to reach with their presence on social media. Comments received, via social media platforms, where considered important for they were recognized as an added value, useful for improving the DMO's communication and services provided through these channels. Most of the DMOs indicated that they manage their own presence and interaction on social media with a yearly budget, made available for communication, marketing, and advertising, between 2000K € and 5000K €.

The Model: Phases, Modules, Activities, and Tools

The model designed, described in the following sections, intends to combine some physical and digital communication components with the primary goal of aiding DMO in the design of engaging communication dynamics with their public (tourists, visitors, and others) on social media.

With the model's application DMO are expected to be able to enhance engagement by:

1. Increasing the number of followers on DMO social media platforms;

2. Promoting a participatory culture by improving the DMO's ability to interact with its target audience;
3. Developing online activities capable of capturing the attention of the target audience and leading them to participate;
4. Involving the DMO's human resources in participating in social media-related activities;
5. Publicizing and integrating references to the social media platforms on the DMO's website;
6. Focusing on the DMO's digital communication on the chosen social media platforms;
7. Enhancing the visibility of the DMO's website and content.

According to the data and information collected, it was established that the model would include 3 phases (Figure 2):

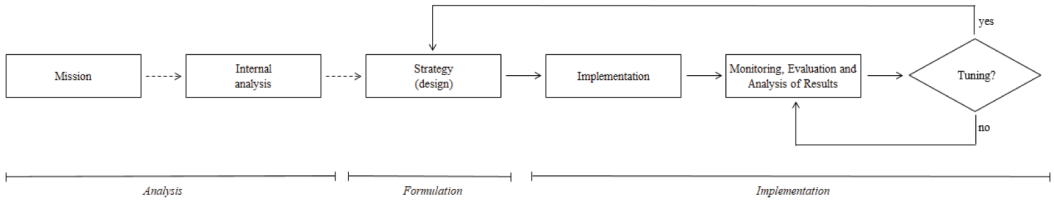
Phase 1 – Analysis: The first phase was outlined based on the findings, obtained through the questionnaire applied to Portuguese DMO. It proved that there is some uncertainty and need for guidance in tasks related to the adoption and management of communication activities by the DMO on social media.

Phase 2 - Strategy design: The analysis of the publication strategies supported the need for including this stage in the overall model. Through the observations made, there were significant and visible differences at this level, with significant advantages regarding the engagement of the target audience detained by the international DMOs. The questionnaire applied to Portuguese DMOs verified that the lack of a thought-out strategy design leads to problems in the workflow. One of the last things needed is a general uncertainty about who should manage the communication activities (i.e. KPI, work plan, feedback), who is responsible for reviewing, copywriting, validating and publishing content and when or what content should be published.

Phase 3 – Implementation: The structure of this phase was based on some of the results obtained from the questionnaire applied to tourists as to their preferences, such as the type of content and the preferred time of the day to connect to social networks, among other user engagement related issues. The observations made also aided the development of each of the modules included in this phase.

The model (Figure 2) comprises these 3 phases, sometimes divided into more than one module that involves specific activities, goals, and tools. Each of these modules will be described in the following paragraphs.

Figure 2. The model



Phase 1 – Analysis

This phase contains the Mission and Internal Analysis modules.

The Mission module focuses on the organization and its overall goals. In it, the DMO must be able to answer the following questions in a simple, straight forward, and objective manner:

1. What is our purpose?
2. Who is affected by our work?
3. What are the information needs of those looking for our services or products?
4. What main tasks should be carried out to fulfill our mission?

Information collected in this module, through a set of short 1-to-1 interviews or with the aid of a focus group session, will allow DMO to take a step back and be able to express its purpose and it is perceived in the eyes of the members responsible for the DMO's communication online. It also helps to define and characterize the information needs of those who use its services or may be interested in its products.

The Internal Analysis module sets the stage for the DMO self-assessment activity, in other words, where it is at the moment and where it places itself in the corresponding ecosystem. The following questions should be asked and discussed with DMO staff:

1. Where are we now?
2. What does the data from the evaluations we do tell us?
3. What are we doing well and should keep doing?
4. Where can we improve?
5. What are the external strengths/weaknesses and opportunities/threats faced by our DMO and its activities?
6. What is happening in our field? What are the current trends?

The answer to these questions will enable DMO to be proactively prepared for the challenges that may arise.

Phase 2 – Formulation

This phase consists of a single module called Strategy (design). This module works with, among other inputs, information collected in the Internal Analysis module.

The strategy should comprise: (a) the definition of objectives that are the goals intended to be achieved, (b) the activities to be developed, which may be understood as the actions that must be undertaken to achieve the objectives defined and, last but not least, (c) the instruments to be used to develop the actions in each of the activities.

There are, of course, a broad set of objectives that may be defined for each DMO, according to variables such as its team's size, its location, and its budget. The communication strategy of DMOs based on social media make take into account the pursuit of some of the following objectives:

1. Increase the level of engagement with visitors;
2. Increase relevant participation (produce, make available and manage content), in the social media platforms, such as in Facebook, Twitter, Youtube, and other social media platforms, where your target audience is active;
3. Enable the sharing of content produced by visitors. If it is already possible, encourage its increase;

4. Conceive and develop promotion and dissemination campaigns through social media;
5. Design and develop activities (i.e., contests or auctions) online;
6. Preferably share content in social media platforms according to the preferences expressed by the target audience, that is, making available the types of content that promote greater engagement with the target audience;
7. Identify and get acquainted with the leading influencers in the social media platforms used, and that may play an influential role with the DMO's target audience;
8. Provide content in different languages to reach a broader and more international audience;
9. Motivate the participation of other team members in the DMO communication strategy.

In order to achieve some of these goals, the following activities may be developed:

1. An exploratory interview with the head of the DMO that should provide information such as:
   a. The DMO's position in terms of hierarchical structure and decision making;
   b. The role of the DMO, concerning tourism-related communication activities in the destination it represents, with an emphasis on its self-regulation autonomy regarding the production, management, dissemination, and publication of contents;
   c. The selection of the human resources assigned to the DMO and their competences and training in the core areas of the project (ICT and social media);
   d. The availability and form of collaboration of human resources with the project;
2. A presentation of the purpose of the project focused on the design of a communication strategy for the DMO based on social media;
3. The development of a short and compact training program in social media for the DMO's human resources, outlining the potential of these applications as communication tools;
4. The definition of social media platforms to be used in the communication strategy;
5. The establishment of the Key Performance Indicators (KPI) for the DMO's activity on the chosen social media platforms;
6. The definition of the content to be produced and published on social media:
   a. What may be considered exciting content;
   b. Who creates the content;
   c. Which periodicity should be followed for content publication;
   d. What type of content (i.e., text, photos, videos) should be preferably published;
   e. Which are the most appropriate time slots for publishing content;
   f. Which language should the content be published in;
7. The setting up of a team capable of interacting, promptly, with the target audience on social media;
8. The creation of mechanisms and routines capable of collecting the data that will enable the DMO's performance assessment according to the established KPI:
   a. Use of observation grids;
   b. Use of specific data analysis applications;
   c. Use of online questionnaires with the DMO's audience.

There are currently dozens of social media platforms available[9] for use in communication strategies. The choice made, and presented below, is based on research already carried out and that identified choices made in communication strategies from international DMO (V. Roque & Raposo, 2016) and

Portuguese DMO (Vitor Roque, Fernandes, Sardo, Martins, & Melo, 2013; Vitor Roque, Fernandes, & Raposo, 2012; Vitor Roque & Raposo, 2013). It also considers social media used by Portuguese tourists (Vitor Roque & Raposo, 2016b). The following social media platforms were considered to be the most appropriate for tourism-related communication contexts of use: (a) Blogue; (b) Twitter; (c) Facebook; Youtube; Flickr; e Pinterest.

Table 6. Activities and tools of the formulation phase

PHASE 2 - Formulation	
Activities	**Tools**
Exploratory interview to assess DMO	Structured interview with the head of the DMO
Explain the purpose of the project	Structured interview with the human resources and Powerpoint presentation of the overall project
Assess the level of training of the human resources that will integrate the project	Questionnaire
Train the human resources that will integrate the project	Workshops and tutorials
Define the social media applications to be used in the DMO's communication strategy	SWOT analysis with observation grid / focus group
Define the indicators to be measured (KPI - Key Performance Indicators) for the selected social media applications	Focus group
Determine how to manage: Content production Content update Online responses KPI registration	Detailed Gantt maps
Determine how to analyze the data collected	Observation grids

For each of the selected social media platforms, a set of functions or characteristics should be listed to justify their inclusion. Just as an example, the following features may validate the integration of Facebook in a communication strategy.

The DMO may, through the use of Facebook, and to achieve their goals:

1. Create and develop an easy to find an online presence;
2. Create communities;
3. Manage and interact with a community of followers that progressively grow;
4. Identify the followers that most influence the community and convince them to contribute to the visibility of DMO, its activities, products, and services;
5. Share information and news;
6. Promote the engagement with followers and information mine the results of the activity developed online;
7. Answer questions and reply to comments placed by followers;
8. Organize and promote events.

Table 6 summarizes the activities and tools that must be considered in the Formulation phase to achieve the objectives established.

Phase 3 – Implementation

This phase includes three modules, the Implementation module, the Monitoring, Evaluation, and Analysis of Results module and the Tuning decision module.

Implementation Module

This module comprises the implementation of the activities outlined in the strategy design. The purpose of this module is to increase DMO's communication capacity on social media. According to the activities proposed in the Strategy module, the following instruments are recommended for carrying out the listed activities (Table 7).

Table 7. Activities and tools of the implementation phase

PHASE 3 - Implementation	
Activities	**Tools**
Publish content on DMO social media applications	Follow the indications in the grid defined for that purpose
Monitor and record KPIs for social media applications	Follow the indications in the grid defined for that purpose
Analyze the KPI collected on social media applications	Follow the indications in the grid defined for that purpose

Monitoring, Evaluation and Analysis of Results Module

Monitoring, evaluating and analyzing the results will make it possible to assess whether the previously outlined objectives are being achieved.

According to different authors, several indicators can be observed for various applications of social media (Hays, Page, & Buhalis, 2013; V. Roque & Raposo, 2016). Facebook, for instance, one may use the following indicators:

1. Number of followers;
2. Type of content posted (text, image, video, link);
3. Number of likes per post;
4. Number of comments per post;
5. Number of shares per post;
6. Number of posts;
7. Photos (number of albums, number of chronology photos, number of profile photos, number of cover photos).

According to these indicators, and through the use of Facebook insights, the application manager can measure the DMO's performance and pin-point possible activity changes to made in the future. Insights

are just an example of already existing applications that may facilitate the analysis of the KPI defined for each social media platform.

There are, of course, cases in which the team may choose to revert to more straightforward solutions, such as observation grids. Although time-consuming these tools maybe eventually be an introductory solution for team members with scarce technical competences.

Being able to, from time to time, compare results and try and draw some conclusions is an essential activity within this module. Understanding the evolutions and fluctuations of the DMO's performance on social media is necessary as a reference for qualifying the level of success of the adopted strategy. The collected and compared values allow the DMO to measure whether the efforts that are being developed are in line with the objectives initially established or if they are falling short and need to be reviewed.

It is also imperative to have data on our competitor DMO to compare and to assess whether our performance is higher, the same or lower. Hays et al. (2013), Mariani, Di Felice, & Mura (2016) and (V. Roque & Raposo, 2016) present a set of comparative results between social media platforms, which can be used to establish how different DMO may be compared. The approach taken some of the work done by the authors is primarily based on quantitative indicators. It is also possible to analyze qualitative indicators, such as the language and the thematic associated with the content published in case of considering the hypothesis of a selection of publications by thematic area. One may eventually use as a reference some of the work done by Martínez-Valerio (2012) regarding thematic areas such as (a) Sport; (b) Accommodation; (c) Tours; (d) Art and music; (e) News; (f) Gastronomy; (g) Transport; (h) Citizenship and (i) others.

Tuning Module

The tuning module is a decision module and is dependent on the results obtained. If the results obtained are positive and in line with the objectives, the process of monitoring, evaluating and analyzing results continues without changes or adjustments at the strategy level; otherwise, the strategy must be reviewed and reformulated to try to achieve the desired results. Some aspects that commonly need some reviewing to include:

1. Lack of control over the content published by third parties on the social media platforms managed by DMO (i.e., Comments which include trolling, obscene comments);
2. Non-regular publications of content and inconsistency between them, as to the message that is conveyed, on the different social media platforms managed by the DMO;
3. Little or no interaction with the target audience, which ends up making them feel that their contributions are not crucial for the DMO;
4. Difficulties in structuring a multidisciplinary and interdepartmental team of human resources, for the production of content to communicate a transversal, comprehensive and consistent vision of the DMO;
5. Strategic rules regarding content publishing are not followed, which conveys an erratic and inconsistent image of the DMO and its strategy.

Failing to comeback from negative results regarding one or more of these actions can have damaging consequences on the DMO's image and brand. This is why the tuning module plays a vital role in aiding the correction of the strategy and trying to realign the activities with the objectives.

The model was applied in a case study with a local DMO in the city of Aveiro. Since the study was conducted, the local and regional tourism management organization has been restructured, and it does no longer exist. It did, at the time, provide a new context for a field trial based on the model. The work done in this field trial is presented in the remainder of this chapter.

CASE STUDY

The Aveiro Welcome Center (Figure 3), at the time responsible for the Tourism sector in the municipality of Aveiro, was the DMO chosen to validate and validate the proposed model. The Aveiro Welcome Center was responsible for structuring and promoting tourism-related products and services in the municipality, playing a central and fundamental role in municipal tourist demand.

Figure 3. Aveiro welcome center

The services provided by the Aveiro Welcome Center were relevant for the promotion and development of tourism, for it provided information about the tourism offer for the municipality of Aveiro, as to activities, products, and services, in a single location.

The Aveiro Welcome Center provided the public with a set of nuclear services that are aimed to promote strategic tourist products, (i) Sun and Sea; (ii) Business Tourism; (iii) Nature Tourism; (iv) City Break; (v) Nautical Tourism and (vi) Gastronomy and Wines.

The services available include the following:

1. Tourist entertainment activities:
    a. Radical activities;
    b. Moliceiro boat tours in the urban canals;
    c. BUGA[10] tours around the city;
    d. Routes and circuits;
2. Organization of conferences and workshops;
3. Aveiro Welcome Centre Store;
4. Temporary exhibitions;
5. Promotion of local and regional products;
6. Actions to raise awareness about heritage;

7. Production of tourist information documentation (digital and analog);
8. Interface for the provision of conditions and spaces to the realization of events in the municipality;
9. Documentation centre.

These services focused on the tourist and aimed to make their stay in Aveiro as pleasant as possible.

In terms of digital communication, the Aveiro Welcome Center managed a Facebook page[11] that was used in the model testing. The objectives of the communication strategy of the Aveiro Welcome Center were the following:

1. Organize, disseminate and promote projects, events, and activities;
2. Disseminate and promote the tourist heritage of the city and the region;
3. Share information and news about the city and the region;
4. Enhance the proximity with the community, to increase the interaction with the Aveiro Welcome Center;
5. Enhance the use of the services provided by the Aveiro Welcome Center;
6. Associate a confidence image to the Aveiro Welcome Center;
7. Increase the credibility and notoriety of the Aveiro Welcome Center;
8. Moderate and resolve issues with followers quickly and effectively;
9. Respond promptly to requests for information from the followers of Aveiro Welcome Center;
10. Promote engagement with the public of the Aveiro Welcome Center;
11. Raise new audiences;
12. Make available the information resources (i.e., documents, images, videos) available at Aveiro Welcome Center.

With these objectives, the overall goal was to bring the public closer to the Aveiro Welcome Center and, subsequently, to the tourist heritage it represents, creating an increasingly tight spiral in the relationship.

Table 8 shows the main stages of the model application at the Aveiro Welcome Center to pursue the previous objectives and prove its validity.

CONCLUSION AND STUDY LIMITATIONS

Tourism is, despite de current major paradigm shifts taking place in the world due to the COVID-19 virus, a field that will learn from the new realities presented and learn to adapt itself as best as possible. It is unquestionable that it will change more than anyone would expect a year or less ago, but there is no doubt that it will find its way back as an activity that makes communities and countries strive and people dream and smile. Communication will play an important role in the rethinking of this global phenomenon as it will help establish the networks of needs, desires and the people and destinations capable of providing products and services capable of satisfying expectations. DMO will need, more than ever, the tools and the guidelines capable of helping them to understand their part in society. The model presented in this chapter, concerned with enhancing the DMO digital communication on social media and thus strengthening the relationship and engagement with its consumers (tourists, visitors and, others), may contribute to this understanding. The use of social media will never replace the tourists'

experience itself but will enable the DMO to try and promote its valuation thus making it more enriching, flexible, dynamic and closer to concerns previously not considered.

Table 8. Main stages of the model application at the aveiro welcome center

		MODULES	ACTIVITIES
MODEL	Phase 1 – ANALYSIS	**Mission**	**Interview with the coordinator of the Aveiro Welcome Center** Why do we exist? Who is affected by our work? What are the information needs of those looking for our services and products? What are the main functions to perform in order to fulfill our mission?
		Internal Analysis	**Interview with the coordinator of the Aveiro Welcome Center (cont.)** Where are we now? What do the data from the evaluations we do tell us? What are we doing well? What can we improve? What are the external strengths/weaknesses and opportunities/threats? What is happening outside? What are the trends?
	Phase 2 - FORMULATION	**Strategy**	**Exploratory interview with the coordinator of the Aveiro Welcome Center** In order to understand, its internal operation, the human resources available, the knowledge of human resources in the area of ICT and in particular in social media applications, the role of the Aveiro Welcome Center in the context of the Aveiro region in terms of tourism , the role of the Aveiro Welcome Center in tourism communication and the resources, tasks and routines already used and implemented in the communication process. **Presentation of the project and assessment of the need for training in social media** **Training in social media applications** **Tasks to develop** Determine which social media applications to use *. Facebook* Determine the KPIs to watch *. Facebook KPI* Determine similar DMOs to be observed *. Gutmarães Turismo DMO* *. Turismo do Porto DMO* Determine he campaigns to be carried out *. 5000 followers campaing* *. Photo contest* Determine the grids to be used *. Content production management grid* *. Content update management grid* *. Online scheduling management grid* *. KPI registration management grid* Determine the number of daily publications *. 4 publications* Determine the time for publishing *. 1st publication between 10-10:30h* *. 2nd publication between 14:30-15h* *. 3rd publication between 16-16:30h* *. 4th publication between 21:30-22h*
	Phase 3 - IMPLEMENTATION	**Implementation**	**Monitoring period and Facebook KPI registration in the pre-implementation period of the strategy** **Monitoring period and Facebook KPI registration in the implementation period of the strategy** Facebook launch of the 5000 followers campaign Facebook launch of the photo contest
		Monitoring, evaluation and analysis of results	**Key Performance Indicators** Followers indicator | first day - **3566** | last day - **4058** People Talking About This (week average) indicator | first week - **48** | last week - **433** Like indicator | first week - **47** | last week - **631** Comment indicator | first week - **0** | last week - **35** Share indicator | first week - **2** | last week - **12** Engagement* indicator | first week - 2,35 | last week - 22,60
		Tunning	**Creation of a new photo library, with better quality photos** **Redefinition of the form and content of the publication's text**

** the engagement is calculated using the formula - (like+comment+share)/total_publications*

The model developed, presented and tested with a local DMO, aims to enhance the use of social media by the DMO and in a simple way enable the DMO to manage their presence in social media platforms, without resorting to external service providing and according to their reality as to competences

and needs. The use of the model enabled the local DMO to improve its presence on social media more effectively and efficiently, as demonstrated by the results obtained and presented.

The model's flexibility assures its application in different situations regardless of the size or complexity of the DMO's structure. It is assumed that the entire strategy must focus on the consumer (tourists, visitors and, others) to promote engagement and also information sharing and collaboration. This sharing and collaboration may nurture the relationship between consumers and the DMO, thus enhancing the engagement levels within the network and creating value for all stakeholders.

The model presented does have some limitations that start with the fact that is was tested with only one small-sized DMO. There are underway other field trials that may shed some additional light on the results achieved and support a review of the model with suggestions for improvement. It does, nevertheless, provide a valid starting point for discussing the subject within the DMO and blueprinting a collaboratively designed plan to follow. Sometimes the hardest thing to have is a plan that the team agrees on and capable of guiding them along the way. We hope that the model is capable of providing some aid on this matter.

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REFERENCES

Appel, G., Grewal, L., Hadi, R., & Stephen, A. T. (2020). The future of social media in marketing. *Journal of the Academy of Marketing Science*, *48*(1), 79–95. doi:10.100711747-019-00695-1 PMID:32431463

Boyd, D. M., & Ellison, N. B. (2008). Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication*, *13*(1), 210–230. doi:10.1111/j.1083-6101.2007.00393.x

Bronner, F., & de Hoog, R. (2010). Vacationers and eWOM: Who Posts, and Why, Where, and What? *Journal of Travel Research*, *50*(1), 15–26. doi:10.1177/0047287509355324

Buhalis, D. (2002). eTourism: Information Technology for Strategic Tourism Management (1st ed.). Pearson.

Carmo, H., & Ferreira, M. M. (2008). Metodologia da Investigação: Guia para Auto-Aprendizagem (2a). Lisboa: Universidade Aberta.

Carvalho, J., & Raposo, R. (2012). O Potencial dos Social Media como Ferramenta de Comunicação dos Museus com o seu Público através do Digital. *Revista Comunicando, 1*(1), 223–234. Retrieved from http://revistacomunicando.sopcom.pt/ficheiros/20130108-social_media.pdf

Chung, N., Han, H., & Koo, C. (2015). Adoption of travel information in user-generated content on social media: The moderating effect of social presence. *Behaviour & Information Technology*, *34*(9), 902–919. doi:10.1080/0144929X.2015.1039060

Connor, P. O. (2011). An analysis of the use of Facebook by international hotel chains. International Council on Hotel, Restaurant and Institutional Education (CHRIE) Conference.

Friedman, T. L. (2007). *The World is Flat: A Brief History of the Twenty-first Century* (3rd ed.). Picador.

Gretzel, U., Werthner, H., Koo, C., & Lamsfus, C. (2015). Conceptual foundations for understanding smart tourism ecosystems. *Computers in Human Behavior*, *50*, 558–563. doi:10.1016/j.chb.2015.03.043

Gupta, V. (2019). The influencing role of social media in the consumer's hotel decision-making process. *Worldwide Hospitality and Tourism Themes*, *11*(4), 378–391. doi:10.1108/WHATT-04-2019-0019

Hays, S., Page, S. J., & Buhalis, D. (2013). Social media as a destination marketing tool: Its use by national tourism organisations. *Current Issues in Tourism*, *16*(3), 211–239. doi:10.1080/13683500.2012.662215

Hill, A., & Hill, M. (2008). *Investigação por questionário* (2nd ed.). Edições Sílabo. Retrieved from https://books.google.pt/books?id=-6neOwAACAAJ

Hunter, W. C., Chung, N., Gretzel, U., & Koo, C. (2015). Constructivist research in smart tourism. *Asia Pacific Journal of Information Systems, 25*(1), 105–120.

Koo, C., Gretzel, U., Hunter, W. C., & Chung, N. (2015). The Role of IT in Tourism. *Asia Pacific Journal of Information Systems, 25*(1), 99–101.

Kwahk, K.-Y., & Kim, B. (2017). Effects of social media on consumers' purchase decisions: Evidence from Taobao. *Service Business*, *11*(4), 803–829. doi:10.100711628-016-0331-4

Leung, X. (2019). Technology-enabled service evolution in tourism: A perspective article. *Tourism Review*, *75*(1), 279–282. doi:10.1108/TR-06-2019-0229

Magno, F., & Cassia, F. (2018). The impact of social media influencers in tourism. *Anatolia-International Journal of Tourism and Hospitality Research*, *29*(2), 288–290. doi:10.1080/13032917.2018.147698

Mariani, M. M., Di Felice, M., & Mura, M. (2016). Facebook as a destination marketing tool: Evidence from Italian regional Destination Management Organizations. *Tourism Management*, *54*, 321–343. doi:10.1016/j.tourman.2015.12.008

Martínez-Valerio, L. (2012). Estrategias de promoción turística a través de Facebook. *Palabra Clave (La Plata)*, *15*(2), 318–338.

McIntosh, R., & Goeldner, C. (1986). *Tourism: Principles, Practices, Philosophies*. John Wiley & Sons.

Moreira, J. M. (2009). *Questionários: Teoria e Prática*. Almedina.

Nujic, L., Palic, T., & Herak, M. (2018). The impact of social media influencers on tourism industry: A literature review. In Interdisciplinary Management Research XIV (IMR 2018) (Vol. 14, pp. 1258–1275). Univ Applied Sciences.

O'Connor, P. (1999). *Electronic Information Distribution in Tourism and Hospitality* (1st ed.). CABI.

O'Reilly, T. (2005). *What is Web 2.0? Design patterns and business models for the next generation of software*. Retrieved April 4, 2020, from https://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html

Pestana, J. (2019). La Era del Turista Digital. *Hosteltur*, 28–29.

Raposo, R., Beça, P., de Figueiredo, C. M., & dos Santos, H. R. (2012). Mesh-T: An on-going project on ubiquitous and context-aware technologies in tourism. *Ereview of Tourism Research*, *10*(2), 72–75.

Roque, V., Fernandes, G., & Raposo, R. (2012). Identificação dos Media Sociais utilizados pelas organizações de gestão de destinos: O caso de estudo do destino turístico Serra da Estrela. *Journal of Tourism and Development*, *17/18*(1), 311–320.

Roque, V., Fernandes, G. P., Sardo, A., Martins, J. A., & Melo, A. (2013). Tourism Promotion and the (Re) Functionalization of Information Offices: The Case of Serra da Estrela. *Papers de Turisme*, (54), 70–87.

Roque, V., & Raposo, R. (2013). Os Media Sociais como uma Ferramenta de Comunicação e Marketing no Turismo: uma análise das atividades online dos principais atores portugueses. In C. Ramos, M. Correia, F. Serra, J. Santos, & P. Águas (Eds.), *Competitividade, Marketing e Tecnologias de Informação e Comunicação no Turismo* (pp. 237–260). Faro: Universidade do Algarve, Escola Superior de Gestão, Hotelaria e Turismo.

Roque, V. (2014). *A Integração de Media Sociais nas Organizações de Gestão de Destinos: proposta de um modelo orientador para a utilização de media sociais nas atividades de comunicação com os turistas*. Universidade de Aveiro. Retrieved from http://hdl.handle.net/10773/13649

Roque, V., & Raposo, R. (2015). A utilização de Media Sociais pelas organizações de gestão de destinos. O caso de estudo das OGD portuguesas. Dos Algarves: A Multidisciplinary e-Journal, 26(2), 87–114. doi:10.18089/DAMeJ.2015.26.2.5

Roque, V., & Raposo, R. (2016a). Avaliação da Implementação e da Utilização de Media Sociais pelas Organizações Públicas Portuguesas de Gestão de Destinos. In C. Sousa, M. Correia, P. Cascada, R. Guerreiro, & C. Henriques (Eds.), *Desafios, Estratégias e Tendências em Gestão e Novas Tecnologias de Informação e Comunicação* (pp. 499–526). Faro: Universidade do Algarve, Escola Superior de Gestão, Hotelaria e Turismo.

Roque, V., & Raposo, R. (2016b). Looking for Tourism Related Information in the Social Media Landscape: an Analysis of Portuguese Tourists' Habits. In C. Bernadas & D. Minchella (Eds.), *3rd European Conference on Social Media Research* (pp. 349–359). Caen: Academic Conferences and Publishing International Limited.

Roque, V., & Raposo, R. (2016). Social media as a communication and marketing tool in tourism: An analysis of online activities from international key player DMO. *Anatolia*, *27*(1), 58–70. doi:10.1080/13032917.2015.1083209

Roque, V., & Raposo, R. (2017). Uma proposta de modelo para melhorar a performance das Organizações de Gestão de Destinos na utilização de media sociais no processo de comunicação com os turistas. *Revista Turismo & Desenvolvimento, 1*(27/28), 1379–1397. Retrieved from http://revistas.ua.pt/index.php/rtd/article/view/7164/5646

Sigala, M. (2012). Social networks and customer involvement in new service development (NSD): The case of www.mystarbucksidea.com. International Journal of Contemporary Hospitality Management, 24(7), 966–990. doi:10.1108/09596111211258874

Stankov, U. (2010). The extent of use of basic Facebook user-generated content by the national tourism organizations in Europe. *European Journal of Tourism Research*, *3*(2), 105–113.

TdP. (2017). *Estratégia Turismo 2027 - Liderar o Turismo do Futuro*. Retrieved from https://estrategia.turismodeportugal.pt/sites/default/files/Estrategia_Turismo_Portugal_ET27.pdf

Travelport. (2017). *The Global Digital Traveler Research*. Retrieved from https://img06.en25.com/Web/Travelport/%7Bed15e0a6-2592-4fe0-9110-339d047aae6e%7D_Travelport_The_Global_Digital_Traveler_Research.pdf?elqTrackId=82111c8593fa46f9a9b078cd418b76a6&elqaid=1800&elqat=2

UNWTO. (2019). *International Tourism Highlights, 2019 Edition*. Madrid: UNWTO.

Werthner, H., & Klein, S. (1999). *Information Technology and Tourism — A Challenging Relationship*. Springer. doi:10.1007/978-3-7091-6363-4

Wikipedia. (2020). *List of social networking websites*. Retrieved February 27, 2020, from https://en.wikipedia.org/wiki/List_of_social_networking_websites

WTTC. (2018). *Travel & Tourism Economic Impact 2018 - Portugal*. Retrieved from https://www.sgeconomia.gov.pt/ficheiros-externos-sg/wttc_portugal2018-pdf.aspx

Zeng, B., & Gerritsen, R. (2014). What do we know about social media in tourism? A review. *Tourism Management Perspectives*, *10*, 27–36. doi:10.1016/j.tmp.2014.01.001

Zouganeli, S., Trihas, N., & Antonaki, M. (2011). Social media and tourism: The use of Facebook by the European national tourism organizations. *Tourism Today (Nicosia)*, *11*, 110–121.

KEY TERMS AND DEFINITIONS

DMO: DMO stands for Destination Marketing Organization which are organizations responsible for helping destinations to develop their long-term travel and tourism strategy.

E-Tourism: The analysis, design, implementation and application of Information and Communication Technology based solutions and services in the travel and tourism experience.

Engagement: Within this chapter Engagement refers to the relationship established with followers on social media and is measured according to public shares, likes and comments related with social media based actions.

Facebook Followers: Users who have chosen to "follow" a Facebook profile or page and, as a result, will receive its content updates in their timeline.

Facebook Insights: Facebook's version of web page analysis, which allows the manager of a facebook page to keep track, through online information visualization tools, of page related activity information such as page views, its followers demographic information, content type access and preference information, etc.

KPI: KPI are Key Performance Indicators, which area measurable values that demonstrate how effectively an organization is achieving team defined key objectives.

Posts: Content published online, such as text, images or vídeos, typically on a blog or social media website or application.

Shares: The result of the action of sharing, without editing, social media content previously created and posted by other users on a social network. The user who is sharing may include additional information describing the content or conveying his or her opinion regarding the content or the issues portrayed.

Social Media: Websites and applications that enable users to create and share content or to participate in social networking as a member of an online community.

ENDNOTES

1 https://twitter.com/
2 https://www.facebook.com/
3 Closed since April 2019 - https://support.google.com/plus/?hl=en#topic=9259565
4 https://www.flickr.com/
5 https://www.youtube.com/
6 https://www.pinterest.pt/
7 https://foursquare.com/
8 https://www.ibm.com/analytics/spss-statistics-software.
9 List of Social Networking Websites (Wikipedia, 2020). https://en.wikipedia.org/wiki/List_of_social_networking_websites
10 BUGA - Aveiro free use bicycle
11 https://www.facebook.com/aveirowelcomecenter

Chapter 15
Accessibility Solutions for Visually Impaired Persons:
A Digital Platform Conceptualization

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ABSTRACT

This chapter aims to address a study in which it is intended to conceptualize, develop, and evaluate an aggregation platform of accessible solutions target to Portuguese people with visual impairment, incorporating not only an information layer but also a training layer using, for example, explanatory videos and tutorials. The platform contents will be nourished through a logic of volunteering and be available through an interactive television (iTV) application and a web/mobile application accessible to visually impaired users. In this chapter, a state-of-the-art survey is made to identify types of digital solutions target to visually impaired users. Based on this survey, an analysis is made to understand what features and functionalities the proposed platform can integrate and how it can become a powerful solution for people with visual impairment. In addition to the state-of-the-art survey and its analysis, the chapter includes the identification and description of the system architecture that will support the proposed platform.

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INTRODUCTION

Digital inclusion of citizens with special needs has become the basis of many public policies in Europe in recent years. Portugal is not an exception country, where various initiatives and actions are created to promote accessibility in various areas of society to equalize the opportunities of participation by this public. For visually impaired citizens (blind and with low vision), there are several information and communication technologies, systems and services in Portugal that follow the accessibility requirements applicable to visual problems. According to the 2011 Portuguese Census (INE, 2012), about 1 million persons have visual impairment: 97% of them have great difficulty in seeing and 3% are blind. However, this considerable number of citizens do not have mechanisms and tools to quickly search accessibility solutions, and these people are unfamiliar with the solutions they can use in their daily lives. The reason for this lack of knowledge often relates to the weak information and dissemination of these solutions to the final public.

The main project that supports the paper is based on the study of new strategies to promote the digital inclusion of visually impaired people in society, with the purpose of disseminating accessibility solutions of different types (digital, television, cultural, etc.) for this kind of users, and also the training of this audience in order to acquire skills to use these solutions. Therefore, this paper aims to address and discuss the initial key steps to conceptualize the platform of accessibility solutions aggregation for visually impaired people. It is intended that the platform integrates solutions of various types; however, this first study only analyzes digital solutions. In the near future, we intend to analyze solutions from other areas and verify if the functional requirements remain adequate or new ones need to be added.

The paper is organized as follows. In the next section, a theoretical background about inclusion, universal design and accessibility is performed. Next, a state of the art concerning digital solutions for people with visual impairment is presented. In the fourth section, the proposed platform is conceptualized and its features and functionalities are discussed. In the fifth section, the system architecture of the proposed platform is identified and explained. The final section presents the most relevant conclusions and the work to be done in the future.

THEORETICAL BACKGROUND

As Castells (2007) argues, information technologies triggered a technological revolution that caused significant social impacts, such as the production of exclusion phenomena and the establishment of isolated communities. For the author, in the informational and global economy, individuals, companies, and regions are dependent on technologies, information and knowledge, making the economy more susceptible to the production of exclusion phenomena. In other words, for the author, the digital exclusion does not mean simply considering the lack of equipment or information systems accessible to citizens, it is also a process of social, economic and cultural exclusion. Thus, there is little space for people who are not familiar with technology, for people who consume less information and for territories not updated with communication, creating a boundary between people 'with' and 'without' access to information.

Similarly, Hamelink (2000) considers that the potential of information technologies is ambivalent. On the one hand, they can induce positive changes, but on the other hand, they can have heavy social costs, since despite the advocacy of free and universal access to ICTs, this scenario is still made up by a minority, which must be become a large majority.

For Morin (1999), cultural production in a context of mass culture is a process where productive needs and standardization techniques are faced with an individualized character. According to the author, mass culture meets the average quality required by the average consumer. This fact influences the participation process of consumers with special needs, because individual differences are not considered leading to their discrimination.

It is also in this sense that Wolton (1999: 299) states that: "It is possible that there is equal access, but there is no equality in the capacity to use it.". Universal Design tries to answer this question, seeking to satisfy the needs of all types of users and responding to the diversity of user experiences and contexts of use.

The universal design of interfaces implies an effort to develop and put into practice the challenges mentioned above, through the application of design methodologies in the area of human-computer interaction (HCI). The universal design of interfaces presents an approach for the development of computational environments that are able to accommodate the widest possible range of skills, abilities, needs and preferences of its users.

Consequently, and according to Stephanidis (2001) the interfaces of universal use should not be conceived as an effort to promote a single solution for all, but rather, as a new perspective in HCI, which excludes all obstacles related to universal access.

The advantages of applying Universal Design are clear and well known, however in the development of commercial solutions related to ICT, this concept is not widely applied. This may be due to a combination of several factors, as indicated by Klironomos and Abascal (2010) and which are described below:

- Lack of awareness of universal design: many design professionals often ignore the fact that they can design for a wider population simply by avoiding certain options that create barriers to accessibility for users with special needs;
- Lack of knowledge / research about users 'needs: professionals also develop without prior analysis of users' needs. Their products are often based on their mental model and their own abilities and perceptions.

From the perspective of Meiselwitz, Wentz and Lazaro (2010), the design of interactive systems emphasized the need to integrate the concept of diversity early on in the process, and it is essential to involve users from the beginning, so that it is possible to create an inclusive design. "… Information and Communication Technology (ICT) design process emphasized the need to incorporate diversity into the design process early on. In many cases, accessibility and usability were considered at the end of the design or development process — more like an afterthought rather than an approach to inclusive design, which would involve users in the process from the beginning." (Meiselwitz, Wentz e Lazaro, 2010:219).

The concept of accessibility can be defined as the capacity given to the largest possible number of people to access and use products, systems, services, devices and environments, regardless of their physical or technological abilities. Assistive products are essential means to facilitate the access and participation of a person with special needs in different fields, allowing different activities to be carried out. The most distinguishing feature of the concept of accessibility lies in the significant importance that is attached to human diversity. Systems designed without taking into account the characteristics, needs, interests, perceptions and behaviors of users are doomed to failure (Klironomos and Abascal, 2010).

However, as already mentioned, many of the interaction systems continue to be designed for the typical "normal user", ignoring the great diversity of users. In this context, it is important to mention

the accessibility standards of the W3C consortium's Web Accessibility Initiative (WAI), namely the Web Content Accessibility Guidelines (WCAG) (W3C, 2018), which are of great importance, creating a pioneering experience for the advancement of accessibility, so they should be taken into account in other technological domains besides the context of the web (Klironomos and Abascal, 2010).

The strict focus on accessibility, as a measurement item, does not help users with special needs. To support these users in carrying out critical tasks, a usability perspective will have to be adopted (Nielsen, 2005). For the author, when it is intended to improve a system for users with special needs, it is necessary to remember the true objective: to help them make better use of that system. Accessibility is a necessary goal, but not a sufficient one. For the author, when it is intended to improve a system for users with special needs, it is necessary to remember the true objective: to help them make better use of that system. Accessibility is a necessary goal, but not a sufficient one. The main focus should be on the usability of the system for users with special needs, with an emphasis on how the design helps them in carrying out tasks. In this context, User Experience (Hartson and Pyla, 2013) is of fundamental importance, since in addition to considering the practical aspects of user interaction with a given system (ease of use and utility), it also considers emotional and significant aspects of the interaction, making it a subjective methodology as it needs to take into account the perception and individual thinking of each user in relation to the system. Thus, universal design also presents itself as an approach to the accessible implementation of the user experience: when viewing accessibility as an experience design challenge and not as a technical challenge, accessibility and usability requirements can be met in each layer of the product.

STATE OF THE ART SURVEY

Living without sight is a difficult approach to understand and only explainable by whom is forced into this condition. Not being able to have a clear idea of what a colour is like, contemplating a landscape or enjoy a painting, among many other things, are situations that make life impossible to experience in the same way as the majority of the population. There are various day-to-day situations that, no matter how ordinary they appear to be, present themselves as major obstacles for those who have blindness or a high degree of visual impairment such as walking on the street, watching television, surfing the internet, among many others. As previously mentioned, Portugal has a considerable number of people with visual impairment that should not be overlooked and, whenever possible, included in the Information Society. Information Systems (IS), by default, are not designed for this slice of the population, but for the general user. It is thus complicated to imagine how someone who is blind can use the internet without seeing the mouse cursor, choose a program recorded on the television or enjoy a movie listening only to the dialogues between the actors. There are, however, some electronic solutions, based on information systems, which allow minimizing this exclusion and proposing a better integration of people with visual impairment. These solutions are largely focus on reading electronic text, auxiliary audio and audio description. Following, a state of the art survey of some of these solutions will be carried out, which is divided by types of systems.

Websites

According to the study by Sambhanthan and Good (2012) on accessibility to e-commerce sites in developing countries, people with blindness are considered unable to "see" the site or access a regular web page without the aid of audio content (audio track or screen reader), solutions that can help, but in general are limited. Since the clear majority of sites are designed taking into account their visual component, the difficulties presented by this author citing the World Wide Web Council (W3C) and are divided into two categories: one related to blind people and the other related to people with low vision.

In this follow-up, for people with blindness the barriers to use web pages mostly include these listed below, resulting in not only the difficulty of use, but in certain cases a total impossibility:

- Images without "alt" text;
- Complex images (e.g. graphics) not properly described;
- Video without text or audio description;
- Tables that lose their meaning when read in a linear fashion;
- Page contours without description beyond what is visible;
- Forms that cannot be advanced sequentially (with tab key);
- Search engines without the possibility to use the keyboard with all its functionalities;
- Search engines that do not have standard user interfaces for the operating system on which they are based;
- Non-standard documents that present reading difficulties for screen readers.

In turn, people with low vision have the following barriers to use:

- Web pages with absolute font sizes (the font size cannot be changed);
- Web pages where, due to their inconsistent design, have difficulties in navigating when enlarged due to loss of context;
- Web pages or their images that have low contrast and, when exists, it cannot be changed;
- Text in image that cannot be rearranged;
- Depending on the degree of vision loss, various barriers for the blind can also be applied.

Good (2008) states that although people who suffer from blindness may have greater difficulties in using web pages than people with low vision, the problems are similar in that the lack of consistency in the design presents itself as the basis of these difficulties.

In general, Chiang et al. (2005) presents in his study a conclusion that meets the aforementioned difficulties. With the evolution of the internet and the hardware, pages that were previously based on text started to be based on a "point and click" system and have links to other pages where the layout could be completely different, the design of internet pages evolved to easily recognizable graphical widgets such as icons, buttons, menus and checkboxes that are recognizable to most users through vision. According to Hoffmann (2008), the text in electronic format is a key intermediate point for accessing information when related to users with visual impairment who have access to their own technology because text in electronic format can be transmitted to distant receivers, read by speech synthesizers, converted to braille or converted to other size dimensions.

Television Content and Interactive TV

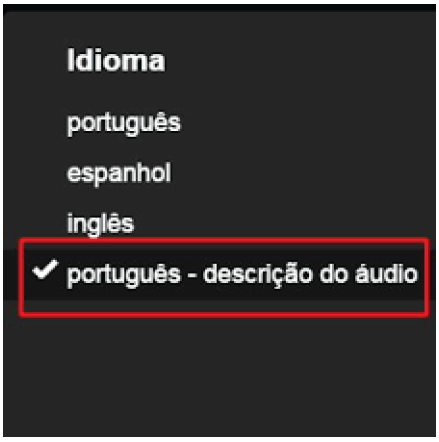
Focusing on television content and taking advantage of interactive television (iTV), in Portugal the options come down to programs with audio description (AD). AD is an additional narrative audio track that can be included in performing arts and in media such as television, cinema and films in electronic format. In Portugal, since the revision in 2011 of the Television Law (Law no. 27/2007, of 30 July), it was put in the letter of the law a multi-annual plan establishing obligations for television channels in matters of accessibility of its contents to people with disabilities (Santos, 2017) and since 2005, RTP (2020) has tried to ensure this offer.

Initially, this option was only based on the regular transmission of a program with AD, but this service was transmitted via radio waves, analogically, which demonstrated that even after the transition to the Terrestrial Digital Television (TDT) service (a milestone that could be used as an important opportunity to improve this auxiliary means of communication through its digitalization or interactivity), visually impaired citizens had difficulty using the service and were forced to own two devices, the TV and radio (Oliveira et al, 2017). Later on, in February 2018, RTP's AD service, in collaboration with the three main cable distribution platforms in Portugal, NOS, MEO and Vodafone, implemented a dual audio system (Figure 1). The user, when watching a program containing this functionality has to manually change the audio track (which requires navigating the TV service menus), which can be an obstacle. It should be noted that, RTP announces this service at no cost to the user, but the cable services that support this solution are paid.

Figure 1. Warning of a program with audio description on RTP channel
Source: Authors

There are also TV streaming services, such as Netflix, which offer some AD options in films and series (Netflix, 2020). There are also smart TV boxes that allow the reproduction of digital media through the installation of applications such as the case of the previously mentioned Netflix (Figure 2), among others (e.g. YouTube). One of those smart boxes is Apple TV, which integrates voice over (VO) functionality that benefits people with visual impairment (Apple, 2020).

Figure 2. Selection of the AD track in the Netflix service in Portuguese (Netflix, 2020)
Source: Netflix, 2020



The VO is a digital reading of the text in these digital services menus, sometimes containing more information to detail the menu itself. In the case of Apple TV, the VO indicates the coordinates in which this menu is located (e.g. "System Preferences", column 1, line 1). With the possibility of using its integrated "Siri" digital assistant, Apple TV also has the possibility of being controlled by voice using a button on your remote control. For people with low vision, this device allows the adjustment of image contrast and text outline in their menus, as well as enlarging the image, applying color filters and changing the brightness and intensity of colors.

The Portuguese commercial IPTV "MEO" solution provides, since the end of 2013, without additional cost for the user, the "Audio Zapping" service (MEO, 2014), an accessibility feature aimed to help blind and low-vision users to control TV content, by following sounds indicative of each action carried out through the control remote. With this service visually impaired users can more easily use the MEO service, throughout sound indications about the channel they are on, channel change (when the user is 'zapping'), however the user must previously install the functionality.

In the U.K., Sky's TV service with its smart TV box, known as Sky Q (Sky, 2020) offers the normal TV channels but also the possibility to install streaming applications, recording and storage of TV programs and the possibility of voice control (VC) by its specific remote, however, it does not have a native VO function.

In the USA, there are similar services like Comcast's Xfinity X1 (Figure 3) and Flex (lower option, but includes the aforementioned points), both similar to Sky Q but in addition to the normal TV channels, application installation and VC, they also feature a VO system when navigating its menus (Xfinity, 2020).

Figure 3. Setup of the Xfinity X1 solution (XF1)
Source: Xfinity, 2020

Smartphones and Mobile Applications

The VO is a feature offered by most smartphone manufacturers. Apple offers its VO system as the virtual smart assistant Siri (for VC and text creation from voice) and Google offers the VO TalkBack system (Google, 2020) with its virtual personal assistant. Thus, smartphones can be used by anyone with visual impairment in their original features, as long as certain options are activated. Considering that these options are active, it is possible to have the screen read to you with the touch of a finger on an icon, to have a sequential screen reading with a finger slide and to dictate voice commands.

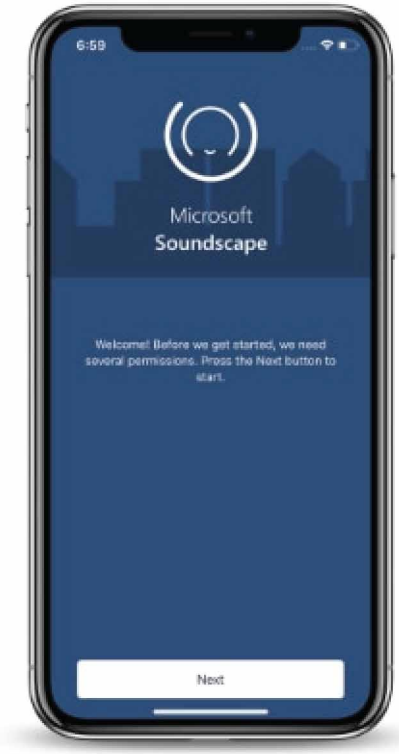
Other operating systems that have low market shares, have not been studied in depth, however there are varied and interesting offers such as the example of the TechSilver (2020) system in the United Kingdom as it offers an operating system dedicated to people with visual impairment. All its menus are designed with simple and visually amplified functions, there is VO in all its actions and the applications are specially planned for this specific group of users, such as a magnifying glass with focus and contrast, using the camera on the smartphone. In addition to the solutions provided by default on smartphones, there are several applications that can be downloaded. One that deserves to be highlighted is Seeing AI (Microsoft, 2020a). Using the device's camera, this application can transform a captured image into text for later diction. Although possible, it is not a practical option to read a complete book, but is a great option to read a restaurant menu, multicultural event posters, or even a transport Schedule.

Another smartphone app aimed at visually impaired users is Be My Eyes (2020). This app is a video call communication channel between a visually impaired user and a volunteer who offers his help to read or explain what the user is unable to observe. Despite being very interesting in its concept, this application works based on the fact that there are volunteers available to answer and assist users' questions.

Other application, this one related to mobility, is the RightHear (2020). This app is a hearing assistant for people with visual impairment, which reports the surrounding environment giving indications at the entrance and inside commercial establishments. It is very useful but limited to a few places, mostly located in Israel, where this solution was idealized. The hearing assistant of audio descriptions can also be customized from another computer application, also designed for visually impaired users.

Microsoft has a similar offer known as Microsoft Soundscape (Figure 4) that details the surrounding atmosphere, in 3D, from an audio map (Microsoft, 2020b). This solution uses the existing map and compass on the phone to report the surroundings. A particularity of this offer is that when you choose a destination you hear a cadenced ringing sound and when directed to the destination you hear a bell indicating the precise direction. On the way to the destination, this app also mentions other possibilities and alerts. At the moment, this is only available in some countries such as USA, UK and Australia.

Figure 4. Welcome screen of Microsoft SoundScape (Microsoft, 2020b)
Source: Microsoft, 2020b



These two previous solutions meet the ones mentioned by Paiva and Gupta (2020), capable of mitigating problems faced by people with visual impairments, being them:

- Audible or vibro-tactile systems for pedestrians that are capable of giving them accurate information about their location;
- Mobile recognition systems for shopping access;
- Mobile city mapping assistance systems.

In Spain, the Audesc Mobile application was created allowing the access to AD of several types of audio-visual productions, using audio fingerprint (analysis of a sound excerpt recorded by the applica-

tion) (ONCE, 2014). The WhatsCine app (WhatsCine, 2016), also created in Spain, allows the access of audio description, subtitling and sign language in television and cinemas.

Electronic Devices and Wearables

Regarding devices designed for mobility, there are devices such as UltraCane, a walking stick similar in appearance to those used by people with visual impairment, however UltraCane does not require continuous physical contact because it uses ultrasound. According to Donati et al. (2020) two points were taken into consideration in its design when compared to traditional walking sticks: i) the possibility of creating a larger safety area for its user, creating an obstacle detector not only in front of the user but also at height, at the level of the head; ii) a larger range so that a larger observation field could be perceived, allowing a more fluid mobility, without the need for constant movement of the object. The device includes a tactile user interface.

IrisVision (IrisVision, 2020) is a device based on several pathologies associated with the loss of vision (e.g., glaucoma or optical atrophy) that allows, through the usage, a return to the lost vision. It is a non-evasive device with various services, from VC, zoom and various specialized modes of use, one of which is the TV mode. Another similar example is NuEyes (NuEyes, 2020), a device identical to the IrisVision but in its development, has a partnership created with Comcast Xfinity, in order to allow its users to watch TV. Orcam MyEye2 (Orcam, 2020) (Figure 5) is a small device with a camera that, being attached to the rods of common glasses, allows reading assistance and facial recognition.

Figure 5. OrCam MyEye 2 (OrCam, 2020)
Source: OrCam, 2020

Advancing on this topic and bringing us closer to cases where the users effectively suffer from blindness, there are systems of extreme complexity known as bionic eyes. These devices (glasses and portable processing unit) are used in conjunction with retina implants placed evasively on their users. The glasses are equipped with a camera which, together with the other accessories, captures and processes images by sending signals to the implant. This solution is still only authorized in the USA and is called Argus II (SecondSight, 2019), which is currently only used by 350 individuals.

Aggregation of Solutions for Visually Impaired Persons on a Voluntary Basis

All solutions presented are individual offers based on a concept of profit or social responsibility. As individual offers, there is a need for the users to try different products in order to understand which one is most suitable for their needs. In cases where the user is effectively blind, this review of offers can become too demanding to carry out alone.

Alternatively, there are initiatives that have the objective of aggregating services to help people with visual impairment. One case is the Blind Help Project (Blind Help Project, 2020) website which is managed from Pakistan and is supported on a voluntary basis. This platform contains specialized content on digital solutions for people with visual impairment, including: digital resources, demonstrations, user guides and support from the project community. However, being a website, a screen reader is still needed for blind users to access it. The constant technological evolution and the lack of some offers are recognized by the website and therefore the project is committed to fill these gaps. Although it exists only since 2014 and, being developed by volunteers, this project offers on its website, without any costs of utilization, several solutions dedicated to the community with visual impaired (software, games, articles, podcasts, etc.) for various operating systems, however only English is used.

Another solution for people with visual impairment present in a single platform is the website of the Royal National Institute of Blind People (RNIB, 2020). RNIB has the goal of inserting people with visual impairment into society through their capacitation. One of their offers is specialized access to newspapers and magazines, directly through their website, in various formats. The content is available by subscription in the UK and also has a dedicated support line. Regarding TV services, RNIB mentions the existence of some of the offers already described (such as Apple TV and handsets with VO) but for information only, placing external links for more information, not providing any specific explanation on the use of each solution.

Financially, a service or product when released on the market has, most of the time, the intention to reach as many consumers as possible. The reviewed offers are based on a voluntary basis and there is the possibility of abandoning the project. This has been the case with Blindy.TV (Blindy.TV, 2018), an online TV service especially dedicated to the blind users with the intention of providing a TV content experience similar to regular TV which ended in 2018 after almost 6 years of activity due to loss of interest in the project.

There are other initiatives, some of them in Portugal, that take advantage of a volunteer model to provide inclusive services target to visually impaired users, such as the creation of audiobooks (BNP, 2018; Librivox, 2018; PLIP, 2018), audio description book illustrations (PLIP 2018) and for the supply of geographical information (Parker et al., 2013) and social initiatives (Paredes et al., 2015).

PLATFORM CONCEPTUALIZATION

The conducted state of the art survey enables the identification and definition of the functional requirements of the proposed platform.

The fundamental features of the proposed platform are divided into three components, namely: i) the dissemination of accessibility solutions (digital, television, cultural, etc.) for people with visual impairment; ii) the dissemination of specific contents (general information, tutorials and training videos) about

each solution; and iii) the easy and assisted access to the platform. Below, these three components are explained in more detail:

1. Currently, visual impaired persons have to search for solutions target to them and also information about these solutions (e.g., how is accessed, its functionalities, etc.) in several sources and for each they must have a specific solution that interpret the contained information. With the proposed platform, the users will not have to search for solutions and use a specific tool to "translate" the content. The platform should present the solutions by categories or areas and the Portuguese language should be mandatory to identify and describe international solutions;
2. The platform will be sustained by volunteers (usually sighted users) who are knowledgeable about accessibility solutions and who will be willing to contribute to nourish the platform. Other stakeholders (e.g. associations of blind and partially sighted people) will be important agents in the platform support. The platform should include a training area, where tips will be given to volunteers so they can create the best content possible;
3. Regarding the development of mechanisms to help and assist users to access the platform, it should integrate features that simultaneously meet the interface design principles for web and interactive television targeted to visually impaired users. These features will involve the use of audio feedback of the largest amount of content and the permanent support of the user in the actions to be performed in the service.

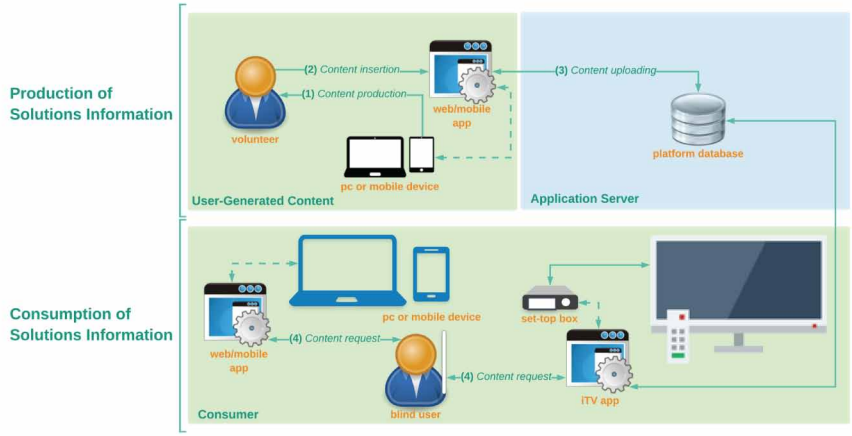
System Architecture

Technically, the platform will consist of three main modules: i) the backend application which volunteers will use to submit the information about a solution; ii) the front-end application to access the platform by visual impaired users; and iii) the iTV application which works as a shortcut to the main application.

The system architecture (Figure 6) of the platform is following described, supported on the functional requirements identified previously.

The content production process begins on the Production of Solutions Information side, where the volunteer has access to its computer or mobile device to create the content related to the solution he wants to add information. The volunteer can write text, identify links, make tutorials and videos and upload them to the server. After that, the created contents are stored in a database. Finally, on the side of the Consumption of Solutions Information, the visually impaired user through its PC or mobile device or through an iTV application (a shortcut of the web/mobile application) available in the set-up box can access to the platform, requesting information about the solution he desires.

Figure 6. System Architecture of the proposed platform
Source: Authors



CONCLUSION AND FUTURE WORK

Nowadays, social cohesion is one of the main policies of European cooperation and integration, so European countries are increasingly becoming a space for progress, solidarity, and tolerance, where everyone shares a greater sense of belonging to this community. In that sense, the reduction of social inequalities becomes essential for this integration and it is necessary to promote active social inclusion measures, especially for the most vulnerable groups, namely people with disabilities.

The main goals of the project address to this paper are the specification, development and evaluation of a solution in the area of new media for people with visual impairment and the study of the relationship between users with visual impairment and technologies, promoting their participation in society and literacy processes. In this paper, a preliminary analysis about digital solutions target to visually impaired users was made in order to verify the functional requirements of the platform that will be prototyped. The aggregation platform of accessible solutions has an interesting potential to increase the empowerment of the independent living of persons who are blind or partially sighted. Strengthening their quality of life through informational inclusion as a key to social engagement, the platform will contribute to their autonomy in terms of reaching and understand the solutions available in the market target to them.

The presented results are significant to enable the development of the forthcoming steps of this research, which are: i) to analyze the audience receptivity to the proposed platform, both volunteers and visually impaired people, understanding if the users would use the system in the future; and ii) to analyze solutions from other areas and verify if the functional requirements remain adequate or they need to be adjusted.

REFERENCES

W3C. (2018). *Web Content Accessibility Guidelines (WCAG) 2.1*. Retrieved from https://www.w3.org/TR/WCAG21/

Apple. (2020). *Apple TV App User Guide – Use VoiceOver in the Apple TV app*. Retrieved from https://support.apple.com/en-am/guide/tvapp/atvbfa4ff6cd/web

Be My Eyes. (2020). *Be My Eyes – Portal*. Retrieved from https://www.bemyeyes.com/

Biblioteca Nacional de Portugal (BNP). (2018). *Leitura para Deficientes Visuais – Recursos áudio*. Retrieved from http://www.bnportugal.gov.pt/index.php?option=com_content&view=article&id=123&Itemid=128&lang=pt

Blind Help Project. (2020). *Envisioning a Brighter Tomorrow Through the Lens of Technology*. Retrieved from https://blindhelp.net/

Blindy.TV. (2018). *Good Bye from Blindy.TV*. Retrieved from http://blindy.tv/

Castells, M. (2009). *The Rise of the Network Society* (2nd ed., Vol. 1). Wiley-Blackwell. doi:10.1002/9781444319514

Chiang, M., Cole, R., Gupta, S., Kaiser, G., & Starren, J. (2005). Computer and World Wide Web Accessibility by Visually Disabled Patients: Problems and Solutions. *Survey of Ophthalmology*, *50*(4), 394–405. doi:10.1016/j.survophthal.2005.04.004 PMID:15967193

Donati, M., Iacopetti, F., Celli, A., Roncella, R., & Fanucci, L. (2020). An Aid System for Autonomous Mobility of Visually Impaired People on the Historical City Walls in Lucca, Italy. In S., Paiva (Ed). Technological Trends in Improved Mobility of the Visually Impaired (pp. 379-411). EAI/Springer Innovations in Communication and Computing. Springer, Cham. doi:10.1007/978-3-030-16450-8_16

European Commission. (2019, June 19). *Digital Inclusion for a better EU society, Shaping Europe's digital future – Policy.* Retrieved from https://ec.europa.eu/digital-single-market/en/digital-inclusion-better-eu-society

Good, A. (2008). *An Investigation of a Method for Improving Accessibility to Web-Based information for Users with Impairments* (Doctoral Thesis). University of Portsmouth, Portsmouth.

Google. (2020). *TalkBack – Android Accessibility Help*. Retrieved from https://support.google.com/accessibility/android/topic/3529932?hl=en&ref_topic=9078845

Hamelink, C. (2000). *The ethics of cyberspace*. Sage.

Hartson, R., & Pyla, P. (2012). *The UX Book: Process and Guidelines for Ensuring a Quality User Experience*. Elsevier.

Hoffmann, R. (2008). Speech, Text and Braille Conversion Technology. In M. Hersh & M. Johnson (Eds.), *Assistive Technology for Visually Impaired and Blind People* (pp. 497–554). Springer. doi:10.1007/978-1-84628-867-8_14

Instituto Nacional de Estatística (INE). (2012). *Dificuldades (N.º) da população residente com dificuldades por Local de residência (à data dos Censos 2011), Sexo, Grupo etário, Tipo de dificuldade, Grau de dificuldade e Dimensão (indivíduos com dificuldades)*. Retrieved from https://censos.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=ine_censos_indicador&contexto=ind&indOcorrCod=0006369&selTab=tab10

IrisVision. (2020). *IrisVision | Wearable Low Vision Glasses for Visually Impaired*. Retrieved from https://irisvision.com/

Klironomos, I., & Abascal, J. (2010). *An Introduction to the Key Issues Relating to Accessible User Interfaces*. Cardiac Project.

KMP. (2014). *KMPlayer | Multimedia Player*. Retrieved from http://www.kmplayer.com/

Librivox. (2020). *Acoustical liberation of books in the public domain*. Retrieved from https://librivox.org/

Meiselwitz, G., Wentz, B., & Lazar, J. (2010). Universal Usability: Past, Present, and Future. *Foundations and Trends in Human Computer Interaction*, *3*(4), 213–233. doi:10.1561/1100000029

MEO. (2014, February 21). *Sabe o que é Áudio Zapping?* Retrieved from https://blog.meo.pt/sabe-o-que-e-audio-zapping-113236

Microsoft. (2020a). *Seeing AI App from Microsoft*. Retrieved from https://www.microsoft.com/en-us/ai/seeing-ai

Microsoft. (2020b). *Microsoft Soundscape – Microsoft Research*. Retrieved from https://www.microsoft.com/en-us/research/product/soundscape/

Morin, E. (1999). *Une tête bien faite: Repenser la réforme, réformer la pensée*. Le Seuil.

Netflix. (2020). *Help Center – Audio Descriptions for Netflix Movies and TV Shows*. Retrieved from https://help.netflix.com/en/node/25079

Nielsen, J. (2005). *Accessibility Is Not Enough, Nielsen Norman Group*. Retrieved from https://www.nngroup.com/articles/accessibility-is-not-enough/

NuEyes. (2020). *NuEyes – Electronic Glasses for Low Vision*. Retrieved from https://nueyes.com/

Oliveira, R., de Abreu, J. F., & Almeida, A. M. (2017). *Promoting interactive television (iTV) accessibility: an adapted service for users with visual impairments. Univ Access Inf Soc, 16, 533-544*.

OrCam. (2020). *OrCam MyEye 2.0*. Retrieved from https://www.orcam.com/en/myeye2/

Organización Nacional de Ciegos Españoles (ONCE). (2014). *Audesc Mobile: la audiodescripción en nuestra mano. CIDAT (Centro de Tiflotecnología e Innovación de la ONCE)*. Retrieved from http://cidat.once.es/home.cfm?id=1516&nivel=2

Paiva, S., & Gupta, N. (2020). Technologies and Systems to Improve Mobility of Visually Impaired People: A State of the Art. In Technological Trends in Improved Mobility of the Visually Impaired (pp. 105-123). EAI/Springer Innovations in Communication and Computing. Springer. doi:10.1007/978-3-030-16450-8_5

Paredes, H., Fernandes, H., Sousa, A., Fortes, R., Koch, F., Filipe, V., & Barroso, J. (2015) CanIHelp - A platform for inclusive collaboration. Universal Access in Human-Computer Interaction - Access to Interaction, 9176, 474-483.

Parker, C., May, A., Mitchell, V., & Burrows, A. (2013). Capturing Volunteered Information for Inclusive Service Design: Potential Benefits and Challenges. *The Design Journal*, *16*(2), 198–218. doi:10.2752/175630613X13584367984947

Projeto de Leitura Inclusiva Partilhada (PLIP). (2018). *KITS PLIP - Instituto Politécnico de Leiria*. Retrieved from https://plip.ipleiria.pt/dinamizacao

Rádio Televisão Portuguesa (RTP). (2020). *RTP Acessibilidades - Audiodescrição*. Portal RTP. Retrieved from http://www.rtp.pt/wportal/acessibilidades/audiodescricao.php

RightHear. (2020). *Right Hear: App for Visually Impaired & Blind People*. Retrieved from https://www.right-hear.com/

RNIB. (2020). *RNIB - See differently*. Retrieved from https://www.rnib.org.uk/

Sambhanthan, A., & Good, A. (2012). Implications for improving accessibility to e-commerce websites in developing countries: A study of hotel websites. *International Journal of Knowledge-Based Organizations*, *2*(2), 1–20. doi:10.4018/ijkbo.2012040101

Santos, R. (2017). O direito das pessoas a verem televisão. *Revista Louis Braille*, *20*, 21-23.

SecondSight. (2019). *Argus II: the life-changing retinitis pigmentosa treatment*. Retrieved from https://secondsight.com/discover-argus/

Sky. (2020). *Products & Packages – Sky Q*. Retrieved from https://www.sky.com/shop/tv/sky-q/

Stephanidis, C. (2001). User Interfaces for All – New perspectives into Human-Computer Interaction. In C., Stephanidis (Ed.), *User Interfaces for All - Concepts, Methods, and Tools* (pp. 3–17). Lawrence Erlbaum Associates.

TechSilver. (2020). *Smartphone for the Visually Impaired / Blind – Portal TechSilver*. Retrieved from https://www.techsilver.co.uk/product/smartphone-mobile-blind-visually-sight-impaired/

Whatscine. (2016). *Accesibilidad audiovisual en cines y television.* Retrieved from http://www.whatscine.es/

Wolton, D. (1999). *Pensar a Comunicação*. Difel.

Xfinity. (2020). *Xfinity X1*. Retrieved from https://www.xfinity.com/learn/digital-cable-tv/x1

ADDITIONAL READING

Oliveira, R., Abreu, J., & Almeida, A. M. (2016). Audio Description in Interactive Television (iTV): Proposal of a Collaborative and Voluntary Approach. *Procedia Computer Science*, *100*, 935–940. doi:10.1016/j.procs.2016.09.252

Oliveira, R., Abreu, J., & Almeida, A. M. (2018). Audio Description of Television Programs: A Voluntary Production Approach. Applications and Usability of Interactive Television. In M. J. Abásolo, J. Abreu, P. Almeida, & T. Silva (Eds.), *Communications in Computer and Information Science (CCIS)* (Vol. 813, pp. 150–160). Springer Berlin Heidelberg.

Oliveira, R., Abreu, J., Almeida, M., & Cardoso, B. (2016): Inclusive approaches for audiovisual translation production in Interactive Television (iTV). In *Proceedings of the 7th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion (DSAI 2016)*. ACM. 10.1145/3019943.3019965

Oliveira, R., Abreu, J. F., & Almeida, A. M. (2014). Promoting IPTV accessibility for visually impaired users: Implementation of an adapted service. In Procedia Computer Science (Vol. 27, pp. 113–122). doi:10.1016/j.procs.2014.02.014

Oliveira, R., Silva, T., Abreu, J., & Almeida, M. (2016): Automatic identification in accessible iTV services: proposal of an IPTV interface. In *Proceedings of the 7th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion (DSAI 2016)*. ACM. 10.1145/3019943.3019998

Oliveira, R., Silva, T., & De Abreu, J. F. (2015). Development and evaluation of Clouds4All interface: A tag clouds reader for visually impaired users. In *10th Iberian Conference on Information Systems and Technologies, CISTI 2015* (pp. 1–6). 10.1109/CISTI.2015.7170507

Silva, T., Caravau, H., & Reis, L. (2019). Lessons learned from testing iTV applications with seniors. *Communications in Computer and Information Science*, *1004*, 148–161. doi:10.1007/978-3-030-23862-9_11

Silva, T., Oliveira, R., Abreu, J., Almeida, A. M., Santos, R., & Almeida, P. (2019). Eye Senior Getting Information Adjusted to Seniors with Blindness or Low Vision. *14th Iberian Conference on Information Systems and Technologies (CISTI)*, Coimbra, Portugal, p. 1-4. 10.23919/CISTI.2019.8760736

KEY TERMS AND DEFINITIONS

Accessibility: The capability given to as many people as possible to access and use products, systems, services, devices, and environments, regardless of their physical or technological abilities. Assistive products are essential means to facilitate the access and participation of a person with special needs in different fields, allowing different activities to be carried out.

Audio Description: An audiovisual translation technique targeted to visually impaired people enabling them the full access of visual content. This technique can be applied in several contexts, as is the case of Television, where a professional storyteller describes the visual scenes not perceptible by viewers with blindness and low vision, based on a pre-produced script made by a screenwriter.

Information Society: It is based on a model of economic development, in which information and communication technologies, as a means of producing knowledge, plays a fundamental role in the generation of wealth and in the quality of life of all citizens.

Interactive Television: All television systems with a return channel that allow the user to perform interactions, with content or services, which go beyond the operation of traditional teletext, changing channels and image and sound adjustments.

Visual Impairment: It is divided in distance and near presenting vision impairment. Distance vision impairment includes mild, moderate, and severe visual acuity (worse than 6/12 to 6/60) and also blindness (visual acuity worse than 3/60). In near vision impairment, visual acuity is worse than N6 or M.08 with existing correction.

Voice Control: It is a system that allows user to control devices (e.g., computers, television, and mobile phone) only with his voice.

Voice Over: It is a technology based on a screen reader that describes aloud the text that appears on digital screens (e.g., computers, television, and mobile phone).

Chapter 16
Sustainability Design Applied to the Digital Signature of Documents

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ABSTRACT

Information and communication technologies can be an added value in order to provide integrated services to customers. With the technological advancements of the last decades, writing is increasingly done in electronic documents. Digital signatures are designed to ensure authentication, integrity, and non-repudiation of such documents. The methodology was based on the literature review of the field, as well as the description of the case study which emphasizes the added value of the developed application, since it addresses concerns of several dimensions of sustainability. The purpose of the chapter is to describe a case study in which an Android mobile application, SoftDigital, was developed for document flow management in a hospital environment, meeting the principles of sustainability design for the development of software systems. It is therefore considered that the main conclusions are to allow healthcare professionals and patients (or their legal representative) to integrate their digital signature into documents for approval of treatments electronically.

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INTRODUCTION

Currently, people have different forms of access to devices that enable access to the Internet from computers, smartphones, tablets and smart watches. Mobile marketing is constantly evolving and innovating, in order to motivate customers to use it. This innovation, in terms of digital transformation, became possible thanks to the existence of numerous applications providing improvement in the quality of life of the population and solving everyday problems.

In order to solve everyday problems, the developed project consists of a mobile application on Android - SoftDigital (Ovelheiro, 2019), for the management of documents in a hospital environment, allowing health professionals and users (or legal representative of the user) to integrate their digital signature in documents for electronic treatment approvals (Ovelheiro & Silveira, 2020). The application allows fully digital workflows, with the ability to upload and send documents so that the respective people can sign them. It also allows users to receive notifications and view the status of the document at any time.

Security is considered indispensable in all types of computer applications because there is a need for greater reliability and confidence in all information, including its origin. In fact, security (Mamede, 2006; Wang, Duong & Chen, 2016) is an important issue when designing an application with a digital signature system. A breach in information security could jeopardize a confidential document, which could be signed using a private key not owned by the signer. On the other hand, (Russo & Reis, 2019) advocate that preparing a continuity plan, which does not necessarily need to have a high complexity in the case of small organizations, in order to analyze risks, and understanding how to continue the business in the event of a disaster and recover from that disaster, are crucial activities in business continuity and should be understood as adding value to organizations and not just as a requirement to be met or solely to be in compliance. Digital signatures are designed to ensure authentication, integrity and non-repudiation of electronic documents (Fortunato, 2018).

The motivation to develop this chapter focuses on the opportunity to present the development of a solution to an organizational problem identified by a health professional. It was mentioned that for each exam that the patient does a document has to be signed for the patient to be informed. It was emphasized that with a digital signature, much less paper and time would be spent. In this way, sustainability and resource savings are being promoted.

In this way, the reason for the realization of the project was to create a viable solution to facilitate integration with the qualified signature (AMA, 2019) of the hospital's digital documents, create document flows, stop paper and cartridge waste, reduce waiting time and contribute to the digital transformation and automatization of resources. The application will take into account the limitations of mobile devices, when compared to a traditional computer, due to possible technical, ergonomic or economic implications in the development of applications (Anacleto, et al., 2014).

This chapter is organized into five sections. The first is the introduction in which the need identified in the organizational context is presented, specifying the objective of the chapter. In the second section, the theoretical framework is presented with regard to the various themes that are addressed in the chapter. The development of the Mobile Application is presented in the third section in order to present the concerns underlying sustainability. The fourth section describes the procedures underlying the verification and validation in order to assess whether the developed application meets the requirements and if it implements the principles of the Karlskrona Manifesto. Finally, in the fifth section, conclusions are drawn and proposals for future work are presented, in order to envision the evolution of the work developed.

BACKGROUND

It is considered that knowledge is creative and must be stimulated to develop itself (Davenport & Prusak, 1998). In this way, technology can constitute a means to optimize communication and collaboration between employees, enhancing the sharing of experiences and skills. Today's projects increasingly demand agile and human-centered approaches to discover and meet the often complex needs of the various stakeholders involved (Hehn & Uebernickel, 2018).

The realization of the study of some existing applications on the market and the critical analysis intends to identify and try to counter the existing flaws, thus being able to be beneficial in the development of the application. The authors' perspective was studied (Husni, Leksono & Rosa, 2015; Husni, 2017), showing the complexity involved in developing an application with a qualified and secure digital signature. There are different types of signature: digitized hand written signature, qualified digital signature through the Portuguese Citizen Card (CC) and digital signature equal to the hand written, theso-called "classic" digital signature.

Electronic documents are documents that can be signed electronically. The digital signature is used to identify the authorship of the documents and has the same authenticity and legal value as a handwritten signature. For the signature to be considered valid, it is necessary to contain mandatory mentions and satisfy the conditions required by the current laws, guaranteeing the veracity of its origin and the integrity of the content (Husni, Leksono & Rosa, 2015). Digital signatures were created in order to guarantee the authentication, integrity and non-repudiation of electronic documents. For this to result it is essential to acquire a certificate made available by the certifying entities.

In view of the specificity of the theme, it is considered essential to include concerns in the field of information security.

There are three main sources of security requirements, (ISO/IEC 27002:2013):

1. The assessment of risks to the organization, taking into account the organization's overall business strategy and objectives. Through a risk assessment, threats to assets are identified, vulnerability to and probability of occurrence is evaluated and potential impact is estimated;
2. The legal, statutory, regulatory and contractual requirements that an organization, its trading partners, contractors and service providers have to satisfy, and their socio-cultural environment;
3. The set of principles, objectives and business requirements for information handling, processing, storing, communicating and archiving that an organization has developed to support its operations.

Resources employed in implementing controls, (ISO/IEC 27002:2013), need to be balanced against the business harm likely to result from security issues in the absence of those controls. The results of a risk assessment will help guide and determine the appropriate management action and priorities for managing information security risks and for implementing controls selected to protect against these risks.

The National Data Protection Commission is the National Authority for the Control of Personal Data, cooperating with the data protection control authorities of other States (CNPD, 2018). It is an independent administrative entity with powers of authority, with the task of controlling and supervising the processing of personal data. Given the specificity of the case study under development, the problem of data protection is of particular interest in view of the amount of private data collected (Silveira, 2019). In this sense, the General Data Protection Regulation, establishes fundamental principles that must be followed. The principles apply, (RGPD, 2018), to all the processing of personal data and it is important

that companies understand and apply them. These principles must always be present when working with personal data processing.

These concerns are addressed in the recommended solution, as well as in the construction of test cases, test execution and detection of errors or anomalies. Software testing is increasingly an essential step in the life cycle of a software product. During the development of a software application, errors can arise that are only detected when the tests are performed.

The author (Tarlinder, 2016), say how important is the design for testability and utilize techniques like refactoring, dependency breaking, unit testing, data-driven testing, and test-driven development to achieve the highest possible confidence in software. For (Hierons et al., 2009) software testing benefits from the presence of formal mechanisms.

In the face of problems that go beyond the limits of human knowledge and even the daily tasks of research, software has made an invaluable contribution over time to the advancement of research (Software Sustainability Institute, 2019). Good software practices will allow the development of solutions in terms of reproducibility and reuse of research.

In light of the imminent threats of global climate change and environmental degradation, the scientific software community has begun to recognize the need to transition to sustainability. However, the process of detecting, specifying and evaluating requirements related to sustainability is still neglected (Roher & Richardson, 2013).

In this sense, it is considered that software sustainability creates reliable, reproducible and reusable software (Hettrick, 2016), namely: the results generated by reliable and well-tested software which can be trusted; reusing software has the potential to save a significant amount of resources that can be invested in further research; the software that continues to function allows continuous access and use of research data, aiding in reproducibility and helping to extract the greatest return on the investment made in data collection. In fact, software reuse is the reapplication of a variety of types of knowledge from one system to another similar system in order to reduce the development effort, improving productivity and software quality (Silveira & Vidal, 2002). Software Product Line Engineering is also a promising paradigm for reusing knowledge and artifacts among similar software products (Reinhartz-Berger & Kemelman, 2019).

The concept of sustainability is often extrapolated to software development with the Karlskrona Manifesto (Becker et al., 2015). This manifesto appeared in Karlskrona, Sweden at the Third International Workshop on Requirements Engineering for Sustainable Systems (RE4SuSy) and serves as a guide to design and develop more sustainable software systems. The Karlskrona Manifesto for Sustainability Design includes nine principles (Becker et al., 2015), are presented in Table 1.

Table 1. Karlskrona manifesto - principles

P#	Principles Descriptions
P1	**Sustainability is systemic:** Sustainability is never an isolated property. Systems thinking has to be the starting point for the transdisciplinary common ground of sustainability.
P2	**Sustainability has multiple dimensions:** We have to include those dimensions into our analysis if we are to understand the nature of sustainability in any given situation.
P3	**Sustainability transcends multiple disciplines:** Working in sustainability means working with people from across many disciplines, addressing the challenges from multiple perspectives.
P4	**Sustainability is a concern independent of the purpose of the system:** Sustainability has to be considered even if the primary focus of the system under design is not sustainability.
P5	**Sustainability applies to both a system and its wider contexts**: There are at least two spheres to consider in system design: the sustainability of the system itself and how it affects sustainability of the wider system of which it will be part.
P6	**Sustainability requires action on multiple levels:** Some interventions have more leverage on a system than others. Whenever we take action towards sustainability, we should consider opportunity costs: action at other levels may offer more effective forms of intervention.
P7	**System visibility is a necessary precondition and enabler for sustainability design**: The status of the system and its context should be visible at different levels of abstraction and perspectives to enable participation and informed responsible choice.
P8	**It is possible to meet the needs of future generations without sacrificing the prosperity of the current generation:** Innovation in sustainability can play out as decoupling present and future needs. By moving away from the language of conflict and the trade-off mindset, we can identify and enact choices that benefit both present and future.
P9	**Sustainability requires long-term thinking**: We should assess benefits and impacts on multiple timescales, and include longer-term indicators in assessment and decisions.

Source: Adapted from (Becker et al., 2015)

These principles are general and abstract, but provide the basis for creating a reference point that can be applied during the design of the software by different stakeholders.

The Manifesto also includes five sustainability dimensions (Becker et al., 2015):

- **Individual:** Refers to the well-being of humans as individuals. This includes mental and physical well-being, education, self-respect, skills, mobility, etc.;
- **Social:** Concerned with societal communities (groups of people, organizations) and the factors that erode trust in society. This dimension includes social equity, justice, employment, democracy, etc.;
- **Economic:** Focused on assets, capital and added value. This includes wealth creation, prosperity, profitability, capital investment, income, etc.;
- **Environmental:** Concerned with the long-term effects of human activities on natural systems. This dimension includes ecosystems, raw resources, climate change, food production, water, pollution, waste, etc.;
- **Technical Sustainability:** Refers to longevity of information, systems, and infrastructure and their adequate evolution with changing surrounding conditions.

These dimensions are interrelated and provide an instrument to disaggregate and analyze relevant issues, taking into account that sustainability is fundamental to our society.

On September 25, 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development (UNDP, 2015), defining 17 objectives (see Figure 1) and 169 goals, covering the

social, economic and environmental dimensions throughout the world. The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

The objectives emphasize the answer to growing social inequalities and human rights. They also include concerns such as peace, security and climate change.

Within the scope of this study and in view of the specificity under analysis, the authors highlight the following SDGs (UNDP, 2015):

Goal 3: Good health and well-being: good health is essential to sustainable development and the 2030 Agenda reflects the complexity and interconnectedness of the two.

Goal 5: Gender equality: Ending all discrimination against women and girls is not only a basic human right, it's crucial for sustainable future; it's proven that empowering women and girls helps economic growth and development.

Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Goal 9: Industry, innovation and infrastructure: Investment in infrastructure and innovation are crucial drivers of economic growth and development. Technological progress is also key to finding lasting solutions to both economic and environmental challenges.

Goal 10: Reduce inequality within and among countries: Income inequality has increased in nearly everywhere in recent decades, but at different speeds. It's lowest in Europe and highest in the Middle East.

Goal 12: Responsible consumption and production: achieving economic growth and sustainable development requires that we urgently reduce our ecological footprint by changing the way we produce and consume goods and resources.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Goal 17: Partnerships for the goals: the SDGs can only be realized with strong global partnerships and cooperation.

Figure 1 shows the most relevant SDGs for the case study - development of a mobile application for digital document flow in a hospital environment.

Figure 1. Sustainable development goals
Source: (UNDP, 2015)

It is important to note that the SDGs cannot be analyzed in isolation (Reis, Silveira, Carvalho & Mata, 2020), since the improvement of one SDG will have a positive (s) and / or negative (s) impact (s) on other SDGs (Reis et al., 2020).

DEVELOPMENT OF THE MOBILE APPLICATION

This section aims to present the development process of the mobile application (SoftDigital) that will allow for the flow of documents for digital signature through an Android smartphone.

The specific objectives of the mobile application are:

- Insert documents for digital signature - the doctor selects a desired document and loads it onto the application;
- Send documents to the recipient, which covers the process from choosing the document to be signed, to integrating with the software (Autenticação.GOV or other) for signature and later sending it to the recipient;
- View documents that need to be signed, are waiting for other signatures, documents that are signed and by all involved;
- Create users with different access profiles.

Agile Development

The development process in this project was a personalized adaptation of the Scrum methodology. In the perspective of (Jacobson & Seidewitz, 2014), agile software development teams are responsible for applying the methods they consider necessary for the project in question, adapting the development process throughout the project as needed. Indeed, Scrum is an agile methodology framework, being used in more than half of agile projects worldwide (CollabNet, 2019), mainly for its simplicity and ease of adoption and adaptation. As the name suggests, agile software development is about promoting flexibility and adaptability in the face of inevitably changing requirements. This is done by producing

software in small increments, obtaining feedback in rapid iterations, and continually adjusting as necessary (Jacobson & Seidewitz, 2014).

Table 2. Karlskrona manifesto principles in relation to agile software development phases

Scrum Phase	Karlskrona Manifesto Principles That Apply
Product Backlog	P1- **Sustainability is systemic**: This ensures that the project initiation considers sustainability in the overall project definition from the beginning. P2- **Sustainability has multiple dimensions**: Software sustainability has different dimensions that must be considered from the beginning. P3- **Sustainability transcends multiple disciplines**: Analysis, requirements specification involves a multidisciplinary team with transversal knowledge of the software development process and business processes, which must incorporate sustainability concerns. P5- **Sustainability applies to both a system and its wider contexts:** Cross evaluate the consequential impacts of the system sustainability requirements and the environment in which the system will function.
Sprint Backlog	P2- **Sustainability has multiple dimensions:** Applying this principle provides a blueprint for system evaluation from all sustainability dimensions (economic, environment, social, individual and technical). P4- **Sustainability is a concern independent of the purpose of the system**: At this phase, this principle helps to encourage analysis of system design based on sustainability in order to facilitate better sustainable system. P6- **Sustainability requires action on multiple levels:** Application of this principle enables better visual and visible overview of the system from different levels of abstraction.
Sprint	P2- **Sustainability has multiple dimensions** This will encourage developers during this phase to consider different sustainability dimensions, especially technical, social, environmental and individual dimensions. P4- **Sustainability is a concern independent of the purpose of the system** Encourage the search for better avenues to make the system sustainable from the development perspective (developers) and also the functions of the system to aid longevity. P8- **Sustainability requires long-term thinking**: This will provide better understanding during analysis to make better choices that will help the potential users of the system in present and in future when the system evolves.
Sprint Review	P2- **Sustainability has multiple dimensions** Provides integration and for the test team to have a sustainability template that can be used to test the system for all sustainability dimensions based on the sustainability requirement output from phases “Product Backlog” and “Sprint Backlog”. P4- **Sustainability is a concern independent of the purpose of the system** Application of this principle will aid consideration of sustainability in this phase even if the primary focus of system is not about sustainability.
Sprint Retrospective	P5- **Sustainability applies to both a system and its wider contexts** Provides beforehand reasoning for the development team to consider the sustainability of the system, its production environment and when pushing it live for use. P7- **System visibility is a necessary precondition and enabler for sustainability design:** This principle will aid consideration of seeking the involvement of different stakeholders to make the actualization of the system sustainability possible in the production environment and when pushed live. P9- **It is possible to meet the needs of future generations without sacrificing the prosperity of the current generation:** This principle at this stage help to create the conscious awareness so that when the system is in a live environment, there will be continuous evaluation to assess the system sustainability and think of ways for optimizing and improving the sustainability of the system from the different dimensions.

Source: Adapted for Scrum from Oyedeji, Seffah, & Penzenstadler (2018)

The Scrum methodology is characterized by the development stages, defined as Sprints, briefly:

- **Product Backlog:** Includes the set of features (use case format) that the product must have and that have not yet been implemented, that is, a set of high-level requirements priorities;
- **Sprint Backlog:** A planning meeting is held in which the list of features (selected from the Product Backlog) to be developed in the current sprint is ordered by priority;

- **Sprint:** Development of potentially deliverable product increment (for example, functional and tested software). The set of features that go into a sprint come from the Product Backlog. After finishing each sprint, the software is presented and tested; each increment is added to all previous increments and thoroughly tested ensuring that all increments work together;
- **Sprint Review:** Held at the end of a Sprint cycle, to inspect the artifact. This includes the Sprint Review Meeting, a meeting in which the development team presents the features that were implemented in that cycle and the difficulties and solutions encountered;
- **Sprint Retrospective:** With the lessons learned during the cycle, the positive aspects and what needs to be improved in the next Sprints. Afterwards, the next Sprint is planned.

It is important to also mention the relevance of the Daily Scrum, a meeting with a maximum duration of 15 minutes that takes place at the beginning of each day, in which the team does a briefing about what was done the previous day and what is the plan for the day itself. This meeting also identifies any situations that are slowing down the development process.

The objective of the project, presented in this case study, is to develop a digital signature application that promotes sustainability awareness, mainly by reducing paper usage. In this sense, the principles and dimensions of the Karlskrona Manifesto (listed in Table 1) were transposed into this case study.

Table 2 allows crossing the principles of the Karlskrona Manifesto in view of the agile methodology used in order to emphasize the various dimensions of sustainability.

In the development of the theme, some applications were analyzed in terms of the functionalities they provide. The applications shown in Table 3, Auntenticação.GOV (AMA, 2019), and others studied (DocuSign, 2019; SignEasy, 2019), have innovative characteristics and similarities with the objectives proposed for the SoftDigital mobile application.

Table 3. Features of similar existing applications

Features	Autenticação.GOV	Others	Softdigital
Signature with Digital Mobile Key	Yes	No	To be integrated
Signing documents in PDF format	Yes	Yes	To be integrated
Sending signed documents	No	Yes	Yes
Sequential Signing	No	Yes	Possible
Check document status	No	Yes	Yes
Notifications	No	Yes	Yes
Offline Signature	Yes	Yes	To be integrated
Authorization with fingerprint	No	Yes/No	Possible

The feature “Signature with Digital Mobile Key” is a feature developed by (AMA, 2019). It is a simple and safe way of authentication of citizens in Public Administration Internet portals and sites with two safety factors: keyword, and SMS or e-mail code.

After analyzing the functionalities of each of the applications (Table 3), the proposal of this project aims to improve and complement them. The SoftDigital application will have the following features: send signed documents; view document status; notifications; offline subscription; fingerprint authoriza-

Table 4. List of objectives of each actor of the SoftDigital application

Actors	Goals
Healthcare Professional	Upload document for digital signature; Digitally sign document; View signature status; View document activity history; Create user; Receive notification with unsigned document.
Patient/Patient's legal representative	Digitally sign document; View document activity history; Create user; Receive notification with unsigned document.
Autenticação.GOV or other	Qualified digital signature.

tion. It should be noted that the automatic integration with the Autenticação.GOV software will be left as future work. It should also be noted that all cryptography-related issues inherent to creating a digital signature (Husni, Leksono & Rosa, 2015) are outside the scope of this study.

Requirements Analysis

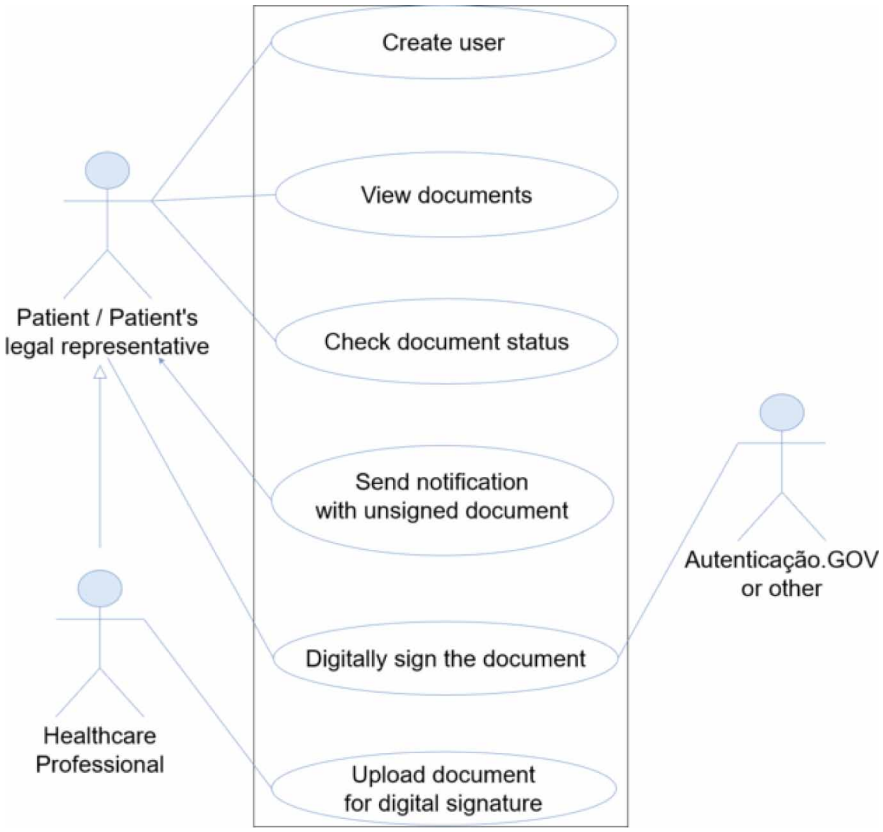
Requirements analysis, (ReQtest, 2018), is the process of defining the expectations of the users for an application that is to be built or modified. Requirements analysis involves all the tasks that are conducted to identify the needs of different stakeholders. Therefore, requirements analysis means to analyze, document, validate and manage software or system requirements.

Poor requirements management processes (or lack of thereof) have been identified as a leading cause of project failure (Kumar, 2006). In reality, requirements are fundamental to the success of software development (DeMarco & Lister, 2003). Many other authors (Alexander and Stevens, 2002; Berry & Lawrence, 1998; Biddle et al., 2000; Daneva, 2000; Gottesdiener, 2003; Jacobson, 2004; Kotonya & Sommerville, 1998; Maiden & Gizikis, 2001, Sommerville, 2005) state that requirements are a crucial element in software development. Maiden and Gizikis (2001) even mention that to build competitive and creative products, the obvious cannot be implemented, that is, they understand that it is necessary to print creativity (Santos, 2018; Thew, & Sutcliffe, 2018) in the requirements engineering process. Design Thinking is also one of the most promising methods to solve serious problems and define innovative solutions (Hehn & Uebernickel, 2018).

The requirements are characteristics that the software or application to develop must fulfill. They clearly define what the software will have to do to satisfy the needs of the organization and users, and it is essential to pay more attention to the requirements gathering process as a way to improve the quality of the software (Silveira, 2006). Alexander & Stevens, (2002) also mention the existence of different actors that intervene in the survey of system requirements. Thus, the requirements are used by different people in the process: users identify their needs; development engineers rely on requirements to make sure they're solving the right problems; test engineers use them to know what they have to test; and managers also rely on the requirements to better manage the evolution of the project.

During the requirements analysis, the following activities were carried out:

Figure 2. SoftDigital use-case diagram



- Meeting at the Local Health Unit;
- Identification of actors and respective objectives;
- Elaboration of the Use Case Diagram;
- Documentation of each use case;
- Diagram of document signing activities;
- Diagram of document states.

The list of actors and their objectives (see Table 4), shows what each actor wants the SoftDigital application to do. It corresponds to the actor's response "What do you intend to use the application for?"

Each actor plays a role in the system which is described below:

- **Healthcare Professional:** Is an end user who can: insert documents (informed consent for surgery or other treatment/examination) for digital signature; digitally sign the document; check the status of the document's signature; view the document's activity history; create user and receive notification with unsigned document;
- **Patient/Patient's Legal Representative:** Is An end user who can: digitally sign the document; view the document's activity history; create user and receive notification with unsigned document.

Table 5. Use case description "upload document for digital signature"

Name	Upload document for digital signature.
Description	This use case aims to describe the process of the upload a document for digital signature. The documents to be upload can be, for example for surgery, informed consent, among others.
Precondition	Valid login.
Main Path	1. The actor selects the option "Select the document"; 2. The system displays a list; 3. The actor selects the desired document, enters a name for the document and selects the option "Upload document"; 4. The system loads the desired document and presents the document for signature.
Alternative Paths	2.a) Empty document list; 3.a) Failed to load document, the system redirects to the home page; 4.a) The system alerts the actor who did not enter a name for the document.
Postcondition	The system sends a notification with the document "Needs signature".
Adornments	It will be tested if the document has been uploaded (click on Upload document without selecting any document; click on Upload document without entering a name for the document).
Sustainability Principles	P1 Sustainability is systemic; P2 Sustainability has multiple dimensions; P3 Sustainability transcends multiple disciplines; P4 Sustainability is a concern independent of the purpose of the system; P8 Sustainability requires long-term thinking.

When the Patient /Patient's legal representative does not have a mobile device, the administrative services may provide equipment to proceed with the digital signature;

- **Autenticação.GOV or Other:** Represents the connection to another system to integrate with the SoftDigital application in order to allow qualified digital signature. The Autenticação.GOV is an application for electronic identification, digital signature and secure authentication of the State associated with the Portuguese Citizen Card (AMA, 2019). Autenticação.GOV uses the qualified digital signature (digital signature permissible with citizen card or issued by a certifying entity) that allows the holders of a CC, willingly, to sign with the personal key existing in their CC. Any entity may verify the digital signature using the citizen's personal digital certificate and means of verifying the validity of this certificate (AMA, 2019).

The Unified Modeling Language (UML) is used to model the SoftDigital application requirements (Nunes & O'Neill, 2007). UML is a graphical modeling language for the specification, visualization, construction and documentation of software or other systems (Booch, Jacobson & Rumbaugh, 1999).

To illustrate the actors and their objectives, Figure 2 shows the Use Case Diagram, in UML notation (Booch, Jacobson & Rumbaugh 1999). A use case is a special sequence of transactions carried out, in the form of a dialogue, between a user and a system (Jacobson, 2004). More specifically, a Use Case is a "portion" of functionality (Quatrani, 2001). Jacobson also developed a separate model to describe the system from an external perspective that he called Use-Case Model, being a key aspect for all development activities (Jacobson, 2004; Jacobson et al., 2017). Use case modeling is very popular to represent the functionality of a system to be developed (Seki, Hayashi & Saeki, 2019).

Table 6. Use case description "digitally sign the documents"

Name	Digitally sign the documents.
Description	This use case aims to describe the process of digitally signing documents with the digital signature.
Precondition	Valid login.
Main Path	1. The actor selects the option "Sign document"; 2. The system features the document(s) that must be signed; 3. The actor selects the document to sign; 4. The system opens the selected document; 5. The actor selects the sign icon; 6. The system interacts with the signature software (Autenticação.GOV or other); 7. The actor signs the document and submits it; 8. The system saves the signed document and sends it.
Alternative Paths	1. a) The actor selects the status bar related to the documents it is necessary to sign; 2. a) List of documents that "need signature" is empty; 4. a) Failure to open the document, the system redirects to the home page with the message "Failed to open document"; 8. a) If the actor is the Healthcare Professional, send a document to the Patient/ Patient's legal representative; 8. b) If the actor is the patient, send a document to the Healthcare Professional.
Postcondition	The system sends a notification that the document has been successfully sent.
Sustainability Principles	P1 Sustainability is systemic; P2 Sustainability has multiple dimensions; P3 Sustainability transcends multiple disciplines; P6 Sustainability requires action on multiple levels; P7 System visibility is a necessary precondition and enabler for sustainability design; P8 Sustainability requires long-term thinking.

The use cases shown in the diagram in Figure 2 correspond to the actors' objectives, in which the VerbPhraseName standard was applied (Adolph & Bramble, 2003): name the use case with a strong verb in a sentence representing the main actor's objective. Meaningless generic names do not meet the reader's expectations and do not provide an adequate point of reference.

Table 7. Use case description "view documents"

Name	View documents.
Description	This use case aims to view the documents and check the status.
Precondition	Valid login.
Main Path	1. The actor clicks to view documents; 2. The system displays all documents; 3. The actor selects one of the available options (needs signature, waiting for others, signed); 4. The system displays the document according to the selected status (Document name and sender's name).
Alternative Paths	2.a) The system displays an empty list.
Adornments	Test if the document that is unsigned is in the completed state; Test if the document is already signed and be presented in the "Needs signature" list.
Sustainability Principles	P1 Sustainability is systemic; P2 Sustainability has multiple dimensions; P7 System visibility is a necessary precondition and enabler for sustainability design; P8 Sustainability requires long-term thinking; P9 It is possible to meet the needs of future generations without sacrificing the prosperity of the current generation.

Figure 3. State diagram

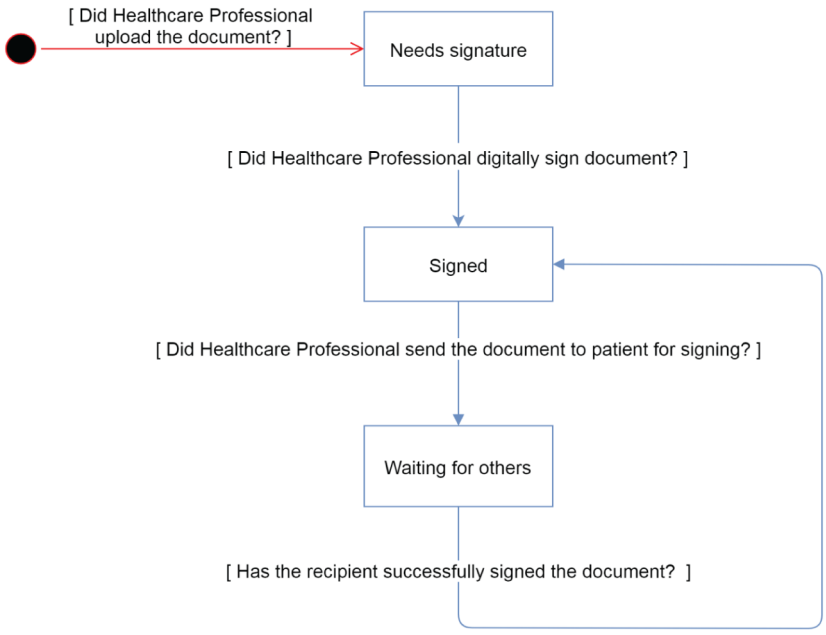


Figure 2 intends to show all the features that the SoftDigital application will have, and who has access to those features. It also shows the inheritance between two actors, that is, the actor "Healthcare Professional" has access to all the features of the actor "Patient/Patient's legal representative", adding a specific functionality: "Upload document for digital signature"; therefore, only the actor "Healthcare Professional" can insert documents for digital signature. It should also be noted that use cases require, as a precondition, a valid login, which for easy reading is not included in this diagram.

Three Use Cases are now described: Upload document for digital signature; Digitally sign the documents; View documents. A template with the following fields is used: name of the use case; description; precondition; main path; alternative paths; post-condition; adornments and principles of sustainability that will be applied. An approach is used in which the story is written as a simple scenario without considering possible flaws, called the main path. Then, fragments of history are placed that show the alternative conditions that may occur, calling it alternative paths. The "Principles of sustainability" field is an innovative measure used to test its applicability within the scope of this study.

When the actor "Healthcare Professional" interacts with the SoftDigital application, it will trigger a sequence of events that allow the development of this use case. Table 5 describes the process that the health professional produces when inserting a document for digital signature. This table presents an example of a template to describe use cases.

The template used in the description of the use case "Upload document for digital signature", shows the sequence of steps when everything goes well - without errors - in the "Main Path"; it shows the possible flaws in the "Alternative Paths"; shows a notification in the "Post-Condition"; and also what is important to test in the "Adornments". Creating additional fields in the use case template, outside the text describing the main path, containing supplementary information that is useful to associate with the use cases, is a good practice collected from the Adornments standard (Adolph & Bramble, 2003).

In this context, the reuse of templates and specifications is advocated as an advantage for systematic documentation of requirements (Silveira, et al., 2005).

Figure 4. Activity diagram for digitally sign the documents

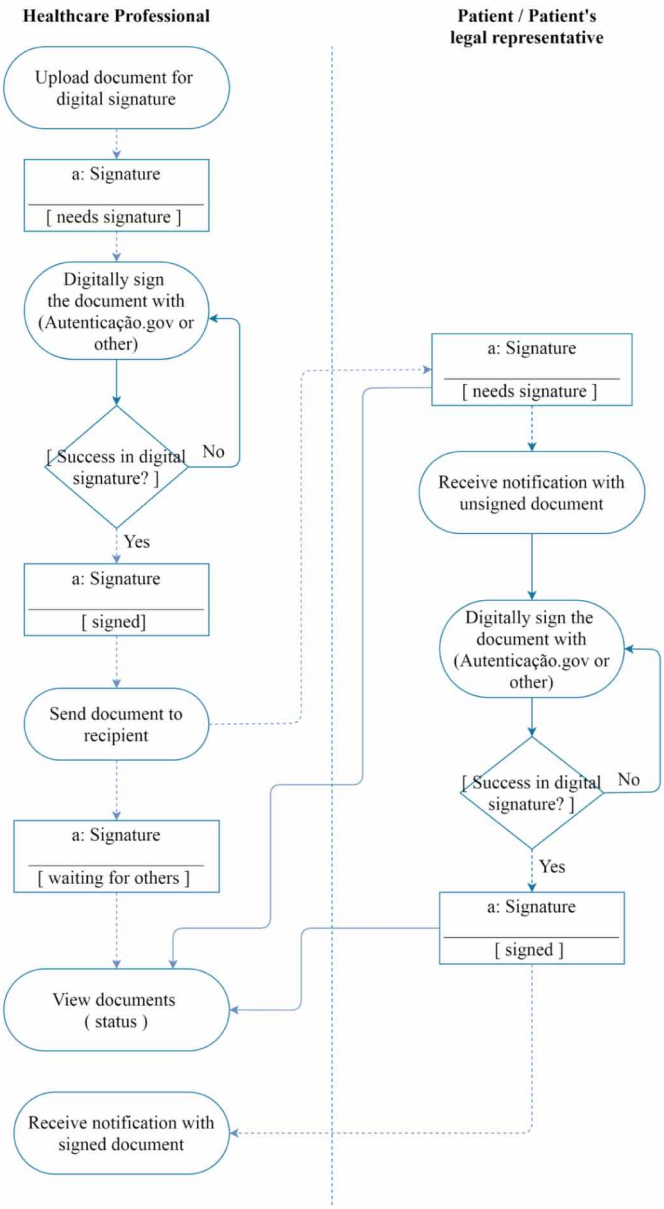
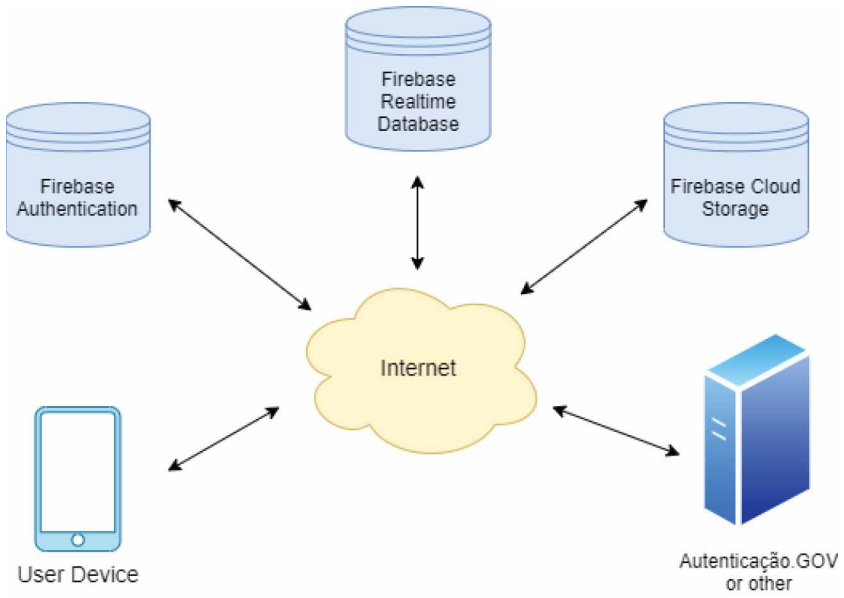


Table 6 describes the Use Case for digitally signing a PDF document.
Table 7 presents the description of the Use Case “View documents”, reusing the previous template.
Table 7 also shows the sequence of steps to view documents and their status. Possible states are:

- "Needs signature"
- "Waiting for others"
- "Signed"

Figure 5. Architecture diagram



The status "Needs signature" happens when the actor "Health Professional" inserts a document in the SoftDigital application, or when the actor "Patient/Patient's legal representative" receives the document to sign. The status "Waiting for others" occurs when an actor has already signed and sends the document to another actor to sign. The document with the status "Signed" happens when any of the actors signs the document. These states are also illustrated in Figure 3.

The activity diagram is used to represent the various processes that an activity goes through in order to be completely performed, which may include the flow of control. Figure 4 shows the activities represented by rounded rectangles. Activities are typically states of action - states that automatically transition to the next state after the action is complete.

One of the aspects that can be shown with the activity diagram are the swimlanes that represent the responsibility tracks of each actor (vertically), showing who is responsible for something. This way, it is clearly shown to all parties which actor is responsible for each activity. Dashed lines mean connection to the status, and full lines mean normal flow.

Architecture

The SoftDigital architecture, in Figure 5, shows the infrastructures used. This includes Firebase Authentication (Firebase, 2019a) that authenticates users, Firebase Realtime Database (Firebase, 2019b) and Firebase Cloud Storage, which are the databases that store all data from the SoftDigital application.

The User Device represents the actor of the SoftDigital application that communicates with the infrastructure through a mobile device. The Autenticação.GOV or other infrastructure is responsible for the qualified digital signature. The Autenticação.GOV has a mobile application that allows the reception of the security code of the Chave Móvel Digital (AMA, 2019). The Chave Móvel Digital is a simple and secure means of authenticating citizens on public administration portals and websites, with two security factors: a keyword and a code received by SMS (AMA, 2019).

It should also be noted that the application was developed in Android Studio (Android Studio, 2019), an Integrated Development Environment (IDE). This platform contains all the code that communicates with the Firebase infrastructures so that everything works.

The process for making a digital signature is illustrated in Figure 6, where it is possible to observe the sequence of steps for a digital signature in the SoftDigital application. The system actor, "Healthcare Professional", through a mobile device (Document Creator Device), inserts a document for signature in the application and also signs it. The Signer Device is the actor of the system that, through a mobile device, signs the document - this is made by the Patient/Patient's Legal Representative.

Figure 6. Process for digital signature

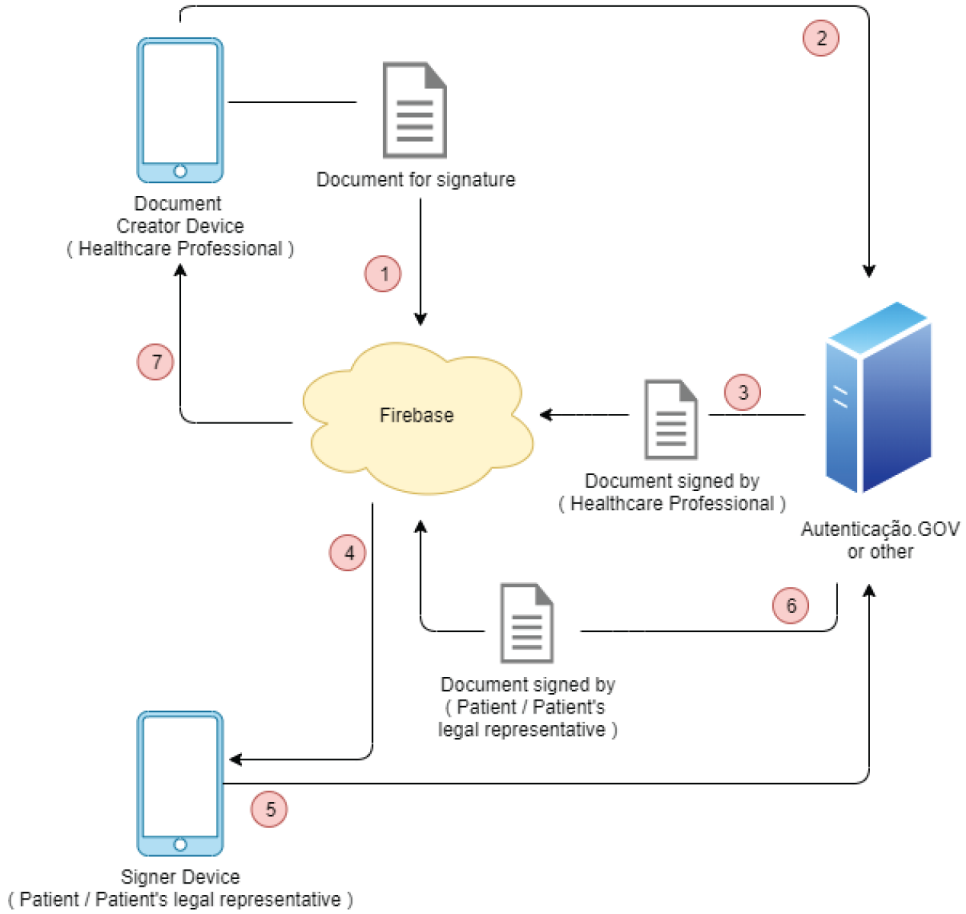
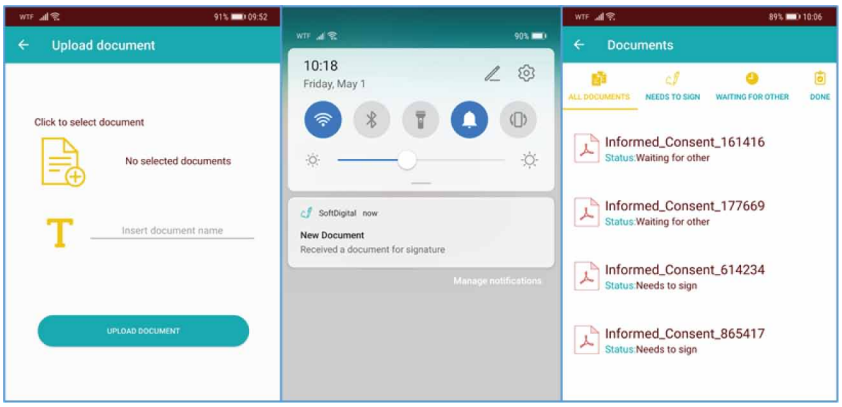


Figure 7. Screenshots of the SoftDigital mobile application



It should be noted that this process of supporting the digital signature will enhance better speed and security for users and health professionals. In this context, it is considered essential to emphasize that the digital signature will provide added value in order to improve the waiting time for signing documents and avoiding waste of paper, therefore, promoting sustainability (Becker, et al., 2016).

The steps for making a digital signature are described in the sequential order of events: from inserting the document using the mobile device, to receiving the signed document on the same device.

The sequence of steps is as follows:

1. The Health Professional inserts the document in the application;
2. The Health Professional signs the document with Autenticação.GOV or another and sends it signed to the User;
3. Firebase stores the signed document;
4. The User receives the document to sign on the application;
5. The User signs the document with Autenticação.GOV or another and sends it to the Health Professional;
6. Firebase stores the signed document;
7. The Health Professional receives the signed document in the application.

Table 8. "View documents" test case

ID	Input	Comments	Expected Results	Current Results	V	X
1	View documents	The user selected the option to view documents	Display all documents	Displayed all documents	V	
2	Status "waiting for others"	The user selected the status "waiting for others"	Display document status "waiting for others"	Displayed document status "waiting for others"	V	
3	Status "Needs signature"	The user selected the Status "Needs signature"	Display document Status "Needs signature"	Displayed document Status "Needs signature"	V	
4	All documents	The user selected all documents	Display all documents and status	Displayed all documents and status	V	

Table 9. "Digitally sign the document" test case

ID	Input	Comments	Expected Results	Current Results	V	X
1	Button Sign document	The user selected the option Sign document	Display all documents that need a signature	Displayed all documents that need a signature	V	
2	Document to sign	The user selected the document to sign	Open selected document	Opened selected document	V	
3	Sign icon	The user selected sign icon	Interaction with *software* Autenticação.GOV	Any interaction with *software*		X
4	Submit document	The user selected share icon	Redirect to the Contacts Interface	Redirected to the Contacts Interface	V	

Figure 7 shows three screenshots related to the SoftDigital mobile application on an Android device, namely, from left to right:

- The "Upload document" interface in the SoftDigital application;
- A notification received on the mobile device stating that it has received a document for digital signature;
- A list of documents and their status.

In this context, it is possible to know which documents are for signature or waiting for others through the attribute "Document Status".

VALIDATION AND RESULTS

This section presents the results underlying the verification and validation of the application created in order to streamline the digital signature process in a hospital environment.

Verification and validation are independent processes that are used together to verify that a product, service or system meets the defined requirements and specifications. The verification confirms the tests and with objective evidence that the specified requirements have been implemented. Validation confirms through tests and with objective evidence that the developer software is in accordance with what the Health Professional/User wants (Sommerville, 2015).

Thus, it is considered that verification and validation are of particular interest, (Reis et al., 2020), advocating that the added value of the design of a prototype that includes the various valences under study should be tested.

In fact, at the end of the development phase, each use case was tested in order to ensure that all features were implemented. To perform the tests performed, an Android smartphone was used: Software development kit version 28; central process unit - Kirin 980; random access memory - 6.0 Gigabyte. The results of the tests on the use cases are shown below: insert document for digital signature, and digitally sign the document. The tests performed can only have two results: passed - marked with a V in the test case tables; did not pass - marked with X in the test case tables.

Table 8 presents the test case View documents.

When executing the test case "View documents" it is possible to verify that all passed successfully. Table 9 shows the test case "Digitally sign the document".

When executing this test case it is possible to observe that there is one of them that failed (ID3). This is due to the fact that there is still no integration with the software Autenticação.GOV. The rest has been tested successfully. It should be noted that during the development of the SoftDigital application code, several tests were carried out and for reasons of simplicity are not presented here. However, it should be noted that the performance of the tests was approximately 99% successful.

Thus, it is considered that the results underlying the developed application took into account sustainability concerns, namely by replacing the current paper based workflow with the digital format. The application allows you to view the document's signature status, view activity history and receive notifications with unsigned documents. The application also has the value of allowing users to be created with different permissions. During the requirements engineering process, several actors (health professionals, users and other end users) were involved. Similar applications were also analyzed, contributing to a better identification of real needs. On the other hand, requirements reviews and tests were also carried out for the verification and validation of the application by end users.

Applying the principles of sustainability throughout the software development process, the interconnection between sustainability and its dimensions was analyzed. In view of the specificity of the project, the following results were obtained:

- **Individual Sustainability:** The SoftDigital application was designed to streamline the process of signing documents for those who need medical treatments (for example surgeries) and nursing. Improving individual sustainability was the main focus, as it refers to the well-being of the human being as an individual. The most relevant contribution, in this dimension, concerns the speed of the subscription process and consequent user satisfaction. The developed application has the assumptions to be a friendly user interface in order to promote efficiency between health professionals and users, as well as leading to sustainable behavior. Within this scope, SDGs 3, 5 and 10 are promoted;
- **Economic Sustainability:** In this dimension, the reduction of paper costs is highlighted (there is no more paper and it becomes a digital procedure); reduction of energy costs (not printing documents); reduction of costs underlying transport (the user does not have to go to the Hospital Unit to sign the documents); reduction in the costs of resources and consumer goods needed for travel (involving caregivers, adequate means of transportation, time for all people involved, among others). In this sense, we are contributing to the implementation of SDGs 8 and 12;
- **Environmental Sustainability:** In the scope of the environmental dimension, the contribution focuses on: reducing energy consumption (not printing documents); decreased carbon emissions and fuel consumption (due to the fact that there is no need to travel); paper reduction. This avoids wasting resources and promotes SDGs 12 and 15;
- **Technical Sustainability:** The developed application takes into account information security, and it will be available on several platforms making it compatible with different mobile and desktop devices. It thus contributes to promoting the sharing of information and knowledge. It is also mentioned that the maintenance and evolution of the application will be facilitated by making the source code available. SDGs 9 and 12 are promoted;
- **Social Sustainability:** The main focus was the integration of the digitally signed document flow and personal satisfaction due to the resolution of a problem in the community. Communication

between health professionals and users is promoted. Social equity was also one of the concerns that guided the development of the application. It is also considered important to encourage users to join the digital signature and therefore be aware of saving the planet's resources. In this way, SDGs 3 and 15 are promoted.

In view of the concerns mentioned above, conditions are created to improve the existing process, in order to provide a better service to users, and contributing to the implementation of SDGs 3, 5, 8, 9, 10, 12, 15 and 17.

CONCLUSION

The process of implementing a mobile application in an organizational context that allows users to follow the flow of documents supported by digital signatures is an important challenge in order to contribute to the optimization of the current processes.

The objective of designing a mobile application supported on an Android smartphone that allows the upload of documents for digital signature, sending documents to the recipient and viewing documents, constituted the challenge, not only in terms of process improvement, but also in dematerialization. In addition to saving a significant amount of resources.

The use of the agile methodology, Scrum, allowed the planning of project tasks and the integration of the principles and commitments of the Karlskrona Manifesto. With the case study, it is shown that it is possible to apply the principles of sustainability, the interconnection between its dimensions and the promotion of the SDGs. The introduction of the new field "Principles of sustainability" in the use-case template made it possible to explain to developers and stakeholders which sustainability principles to apply when implementing the use case.

In this sense, the Android application SoftDigital, that allows the user to follow the document flow for subsequent automatic integration with the Autenticação.GOV of qualified digital signature, allows for the reduction of paper waste. It is therefore considered that dematerialization in terms of paper use represents, in itself, an added value in the optimization of processes and an important reinforcement in sustainability and economy. It also contributes to reducing waiting time, improving the efficiency and effectiveness of the process. The solution features a workflow of digital documents in circulation that require authorization and/or informed consent, allows users to receive notifications and view the status of the document. In fact, the SoftDigital application has facilitated the process of signing documents for those who need medical treatment (for example surgery) and nursing. The main contribution of the application concerns the speed of the subscription process and consequent user satisfaction.

The developed mobile application, SoftDigital, presents concerns in the field of Information Security in the sense that access profiles have been defined so that each actor involved can access only the information they have permission to access.

Sustainability in the field of Information and Communication Technologies (ICT), and more specifically when developing software, was also one of the concerns. Thus, principles and practices were implemented to contribute to the sustainability of the solution. This way, sustainability is promoted in the economic, social, environmental, technical and individual dimensions.

With regard to future work, the mobile application, SoftDigital, should have access to the Portuguese citizen's card data on Android through the Autenticação.GOV software that will allow access to

the Digital Mobile Key for the authentication of each user and qualified digital signature. Medical data confidentiality issues will also be addressed. To simplify the flow of documents, it is also proposed to integrate all the information related to the user with the hospital software. It is advocated that the clinical software covers everything from the documents to the integration of all information related to hospital operations, so that clinical registration in real time is possible.

Regarding the incorporation of the principles and commitments of the Karlskrona Manifesto in the software development process, it is envisioned that it will continue in academic projects. It is intended that sustainability practices are taught to ICT students, contributing to the development of an approach to the teaching of Software Engineering for Sustainability (Penzenstadler et al., 2018).

REFERENCES

Adolph, S., & Bramble, P. (2003). *Patterns for Effective Use Cases*. Addison-WesleyPearson Education.

Alexander, I., & Stevens, R. (2002). *Writing Better Requirements*. Addison-Wesley.

AMA. (2019). *Autenticação.gov*. Agência Para A Modernização Administrativa, IP - Presidência Do Conselho De Ministros. Obtido em 04 de Junho de 2019, de https://www.autenticacao.gov.pt/cc-assinatura

Anacleto, R., Figueiredo, L., Almeida, A., & Novais, P. (2014). Mobile Application to provide Personalized Sightseeing Tours. *Journal of Network and Computer Applications*, *41*, 56–64. doi:10.1016/j.jnca.2013.10.005

Android Studio. (2019). *Android Studio release notes*. Android Developers. Retrieved from: https://developer.android.com/studio/releases/index.html

Becker, C., Betz, S., Chitchyan, R., Duboc, L., Easterbrook, S. M., Penzenstadler, B., Seyff, N., & Venters, C. (2016). Requirements: The Key to Sustainability. *IEEE Software*, *33*(1), 56–65. doi:10.1109/MS.2015.158

Berry, D., & Lawrence, B. (1998). Requirements Engineering. *IEEE Software*, *15*(2), 26–29. doi:10.1109/MS.1998.663780

Biddle, R., Noble, J., & Tempero, E. (2000). *Patterns for Essential Use Cases*. School of Mathematical and Computing Sciences, Victoria University of Wellington, New Zealand, Technical Report CS-TR-01/02.

Booch, G., Jacobson, I., & Rumbaugh, J. (1999). *The Unified Modeling Language User Guide*. Addison-Wesley.

CNPD. (2018). *O que é a CNPD, Comissão Nacional de Proteção de Dados*. Retrieved from: https://www.cnpd.pt/bin/cnpd/acnpd.htm

CollabNet. (2019). 13th Annual State of Agile Survey. *CollabNet VersionOne Inc*. Retrieved from: www.stateofagile.com/#ufh-c-473508-state-of-agile-report

Daneva, M. (2000). Establishing Reuse Measurement Practices in SAP Requirements Engineering. *ICRE 2000: 4th IEEE International Conference*. 10.1109/ICRE.2000.855607

Davenport, T., & Prusak, L. (1998). *Conhecimento Empresarial*. Campus.

DeMarco, T., & Lister, T. (2003). Risk Management During Requirements. *IEEE Software*, *20*(5), 99–101. doi:10.1109/MS.2003.1231163

DocuSign. (2019). *Quem Somos*. Obtido em 05 de Junho de 2019, de https://www.docusign.com.br/quem-somos

Firebase. (2019a). *Firebase Authentication*. Retrieved from: https://firebase.google.com/docs/auth

Firebase. (2019b). *Firebase Realtime Database*. Retrieved from: https://firebase.google.com/docs/database?authuser=0

Fortunato, J. P. (2018). Assinatura de documentos em terminais móveis. Departamento de Engenharia Informática da Faculdade de Ciências e Tecnologia da Universidade de Coimbra.

Gottesdiener, E. (2003). Requirements by Collaboration: Getting It Right the First Time. *IEEE Software*, *20*(2), 52–55. doi:10.1109/MS.2003.1184167

Hehn, J., & Uebernickel, F. (2018). The Use of Design Thinking for Requirements Engineering: An Ongoing Case Study in the Field of Innovative Software-Intensive Systems. *IEEE 26th International Requirements Engineering Conference (RE)*, 400-405.

Hettrick, S. (2016). *Research Software Sustainability: Report on a Knowledge Exchange Workshop*. The Software Sustainability Institute.

Hierons, R., Bogdanov, K., Bowen, J., Cleaveland, R., Derrick, J., Dick, J., Gheorghe, M., Harman, M., Kapoor, K., Krause, P., Luttgen, G., Simons, A. J. H., Vilkomir, S., Woodward, M., & Zedan, H. (2009). Using formal specifications to support testing. *ACM Computing Surveys*, *41*(2), 2. doi:10.1145/1459352.1459354

Husni, E. (2017). *Dynamic rule encryption for mobile payment*. Security and Communication Networks. doi:10.1155/2017/4975302

Husni, E., Leksono, B., & Rosa, M. (2015). Digital Signature for Contract Signing in Service Commerce. *International Conference on Technology, Informatics, Management, Engineering & Environment*, *6*, 7-9. 10.1109/TIME-E.2015.7389757

ISO/IEC 27002. (2013). ISO/IEC 27002:2013 - *Information technology -- Security techniques -- Code of practice for information security controls*, Retrieved from https://www.iso.org/standard/54533.html

ISO/IEC/IEEE 29119 (2013). *ISO/IEC/IEEE 29119 Software Testing*. Retrieved from: https://software-testingstandard.org/

ISO/IEC/IEEE 29119-4. (2015). *ISO/IEC/IEEE 29119 Software Testing*, ISO/IEC/IEEE 29119-4: Test Techniques, Retrieved from: https://softwaretestingstandard.org/

Jacobson, I. (2004). Use Cases – Yesterday, Today, and Tomorrow. *Software & Systems Modeling*, *3*(3), 210–220. doi:10.100710270-004-0060-3

Jacobson, I., Lawson, B., McMahon, P., & Goedicke, M. (2017). *Software Engineering Essentialized*. Retrieved from www.software-engineering-essentialized.com/

Jacobson, I., & Seidewitz, E. (2014). A new software engineering. *Communications of the ACM*, *57*(12), 49–54. doi:10.1145/2677034

Kotonya, G., & Sommerville, I. (1998). *Requirements Engineering: Processes and Techniques*. John Wiley & Sons Ltd.

Kumar, V. S. (2006). *Effective requirements management*. Paper presented at PMI® Global Congress 2006—EMEA, Madrid, Spain.

Maiden, N., & Gizikis, A. (2001). Where Do Requirements Come From? *IEEE Software*, *18*(5), 10–12. doi:10.1109/52.951486

Mamede, H. (2006). *Segurança Informática nas Organizações*. FCA.

Nunes, M., & O'Neill, H. (2007). *Fundamental de UML* (5th ed.). FCA Editora.

Ovelheiro, B. (2019). SOFTDIGITAL – Fluxo Digital de Documentos. Relatório de Projeto de Informática, Escola Superior de Tecnologia e Gestão, Polytechnic Institute of Guarda.

Ovelheiro, B., & Silveira, C. (2020). *SoftDigital - Contributo para a Transformação Digital. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Polytechnic Institute of Bragança.

Oyedeji, S., Seffah, A., & Penzenstadler, B. (2018). A Catalogue Supporting Software Sustainability Design. *Sustainability*, *2018*(10), 2296. doi:10.3390u10072296

Penzenstadler, B., Betz, S., Venters, C. C., Chitchyan, R., Porras, J., Seyff, N., Duboc, L., & Becker, C. (2018). Everything is Interrelated: Teaching Software Engineering for Sustainability. *IEEE/ACM 40th International Conference on Software Engineering: Software Engineering Education and Training (ICSE-SEET)*, 153-162.

Quatrani, T. (2001). *Introduction to the Unified Modeling Language*. IBM Rational.

Reinhartz-Berger, I., & Kemelman, M. (2019). Extracting Core Requirements for Software Product Lines. *Requirements Engineering*, *2019*, 1–9.

Reis, L., & Silveira, C. (2020). *Sustentabilidade Multidimensional em Sistemas de Informação. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Polytechnic Institute of Bragança.

Reis, L., Silveira, C., Carvalho, L., & Mata, C. (2020). Digitalization as a key issue of the Circular Economy to promote Sustainability: Prototyping Design for Homeless People. In S. Rodrigues, P. Almeida, & N. Almeida (Eds.), *Mapping, Managing, and Crafting Sustainable Business Strategies for the Circular Economy*. IGI Global. doi:10.4018/978-1-5225-9885-5.ch007

Reis, L., Silveira, C., Carvalho, L., Mata, C., & Madeira, R. (2020). Design de Protótipo para Pessoa sem-abrigo - Contributos de Sustentabilidade. In *IV International Forum on Management*. Universidade Aberta, Lisbon.

ReQtest. (2018). *Requirements Analysis – Understanding the Basics*. Retrieved from: https://reqtest.com/requirements-blog/requirements-analysis/

RGPD. (2018). *Regulamento Geral de Proteção de Dados*. Diário da República n.º 231/2018, Série II de 2018-11-30. Retrieved from: www.cnpd.pt/bin/rgpd/rgpd.htm

Roher, K., & Richardson, D. (2013). Sustainability requirement patterns. *3rd International Workshop on Requirements Patterns*, 8-11.

Russo, N., & Reis, L. (2019). Análise da Problemática Subjacente à Certificação de Programas Informáticos de Faturação. *CISTI'2019 - 14th Iberian Conference on Information Systems and Technologies*.

Santos, V. (2018). *Criatividade em Sistemas de Informação*. FCA.

Seki, Y., Hayashi, S., & Saeki, M. (2019). Detecting Bad Smells in Use Case Descriptions. *27th IEEE International Requirements Engineering Conference (RE'19)*, 98-108. 10.1109/RE.2019.00021

SignEasy. (2019). *Company Profile SignEasy*. Obtido em 17 de Junho de 2019, Retrieved from https://signeasy.com/company-profile/

Silveira, C., Faria, J., Aguiar, A., & Vidal, R. (2005). Wiki Based Requirements Documentation of Generic Software Products. *Proceedings of The Tenth Australian Workshop on Requirements Engineering*, 42-51.

Silveira, C., & Vidal, R. (2002). Software Reuse with Use Case Patterns. OOIS 2002, Reuse in Object-Oriented Information Systems Design, Proceedings, Lecture Notes in Computer Science, Springer-Verlag, 2426, 96-100.

Silveira, J. (2019). *A Browser-based Anonymous Questionnaire System with User-controlled Linkability* (Master Thesis). University of Lisbon.

Silveira, M. C. (2006). *A Reutilização de Requisitos no Desenvolvimento e Adaptação de Produtos de Software*. Faculdade de Engenharia da Universidade do Porto.

Sommerville, I. (2005). Integrated Requirements Engineering: A Tutorial. *IEEE Software*, *22*(1), 16–23. doi:10.1109/MS.2005.13

Sommerville, I. (2015). *Software Engineering* (10th ed.). Addison-Wesley Pearson Education.

SustainAbility. (2018). *Sustainability: Can our society endure?* Retrieved from: SustainAbility an ERM Group company: sustainability.com/sustainability/.

Tarlinder, A. (2016). *Developer Testing: Building Quality into Software*. Addison-Wesley Signature.

Thew, S., & Sutcliffe, A. (2018). Value-based requirements engineering: Method and experience. *Requirements Engineering*, *23*(4), 443–464. doi:10.100700766-017-0273-y PMID:31258257

UNDP. (2015). *Sustainable Development Goals*. Retrieved from United Nations Development Programme: www.undp.org/content/undp/en/home/sustainable-development-goals.html

Wang, T., Duong, T., & Chen, C. (2016). Intention to disclose personal information via mobile applications: A privacy calculus perspective. *International Journal of Information Management*, *36*(4), 531–542. doi:10.1016/j.ijinfomgt.2016.03.003

KEY TERMS AND DEFINITIONS

Agile Software Development: Software development process that favors direct communication between all stakeholders and simplifies documentation.

Digital Signature: From the Citizen Card it is possible to make the electronic signature through the Digital Mobile Key, speeding up the process of signing documents.

Information Systems: Is the organized set of components such as people, processes of collection and transmission of data and material resources, automated or manual. The interaction of components enhances the processing and dissemination of information.

Karlskrona Manifesto: Establishes the principles and dimensions for the design of sustainable software systems.

Requirements Analysis: Iterative process to identify features and restrictions with a view to developing or changing a software product. Use Cases are commonly used here.

Software Systems Development: Set of activities involved in the production of software. These activities are related to each other in an iterative and incremental process.

Sustainability: Ability to sustain life on the planet, considering the five dimensions: individual, social, economic, technical, and environmental.

Chapter 17
Sustainability in Information and Communication Technologies

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ABSTRACT

Information and communication technologies (ICT) can provide added value in an organizational context in order to enhance the definition of business support strategies. The purpose of the chapter is to focus on the contribution of ICT to implement a sustainability policy in the organizations, in the context of the sustainable development goals to improve cooperation and promote development. In this context, the principles of the Karlskrona Manifesto are applied to the development of software systems. The methodology focused on the literature review of the domain and on a case study, in order to analyze the impact of ICT as an engine of sustainability in organizations. The main conclusions focus on the analysis of the impact of established practices in organizations to design and develop sustainable software systems. The results point to a greater consciousness of the potential effects of software systems on sustainability, which will improve management practices, reducing the quantity of material to be recycled, and aligning organizational strategies with Green IT.

INTRODUCTION

Taking sustainability into consideration can have significant impact in the development of new technologies. The study of sustainability in the field of Information Systems (IS) and Information and Communication Technologies (ICT) is of the utmost importance in order to promote the integration of the 17 Sustainable Development Goals (SDGs) outlined by the United Nations (UNDP, 2015).

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By taking advantage of systemic approaches, the integration of the SDGs connects issues between sectors and thematic areas and leverages the creativity and knowledge of the whole society - from national and international governments and communities to civil society, academia and the private sector - to create solutions that respond to people's needs (UNDP, 2020).

The concept of sustainability is often extrapolated to software development with the Karlskrona Manifesto (Becker et al., 2015). This manifesto serves as a guide for designing and developing more sustainable software systems. In fact, the nature of the systems we build continues to change and as they cross collectively in our lives, we must attend not only to the technical elements of software development, but also to human needs (Booch, 2015) - social, environmental, economic and cultural. In this sense, human needs must be present in the organizations' sustainability policy and in IS development.

The principles of the Karlskrona Manifesto are applied to the development of software systems, namely: sustainability is systemic, sustainability is multidimensional, sustainability is interdisciplinary, sustainability transcends the system's purpose, and sustainability applies to both a system and its wider contexts.

In the context of the specificity of the organization under study, it is considered that knowledge management refers to the creation, identification, integration, recovery, sharing and use of knowledge within the organization, and can also be understood as the art of generating value from intangible assets of the organization (Serrano & Fialho, 2003). Thus, it is argued that knowledge management techniques can and should be applied to promote IS sustainability and improve software development processes in organizations.

Based on the concerns in the field of IS and ICT sustainability, it is considered that this research can contribute to the creation of integrated solutions, in several fronts, in order to help countries tackle the world's most pressing challenges and enhance the use of IS in favor of People. Thus, the objective of the chapter focuses on the analysis of the contribution of Information and Communication Technologies to a sustainability policy in organizations, in view of the Sustainable Development Goals outlined by the United Nations World Organization in order to improve cooperation and promote development.

It is also considered that the chapter may constitute added value in the scope of ICT sustainability, due to the way it describes the institution's practices. It is also considered that ICT can contribute to the definition of sustainability strategies, allowing the improvement of management practices and reducing the amount of material to be recycled, thus aligning the organizational strategies with Green Information Technologies (IT).

This chapter is organized into five sections. The first is the introduction in which the problem is presented in order to contextualize its objective. In the second section, the theoretical framework is presented about the various themes that are addressed in the chapter. Sustainability in IS is characterized in the third section in order to present the concerns underlying the sustainability issue in its different aspects and how the interconnection with the SDGs has been achieved. The fourth section describes the case study where a social community is presented. Finally, in section five, conclusions are drawn and proposals for future work are presented.

BACKGROUND

In the current operating context, and in most organizations, it is considered that they are dependent on ICT to create added value to their business. Leveraging the different types of networks that organiza-

tions can use should be seen as a challenge in order to optimize their resources. Social organizations are faced with a set of specific challenges given the inherent characteristics. In this sense, social networks exist in companies and are responsible for the relationship between the individuals that make up the organization. It remains to be seen whether the organization's structure allows a social information system to be adopted, and whether it will bring added value to the organization about processes, motivation, productivity and knowledge transfer (Paulino & Reis, 2012). Community environments, which include social networks, have been described as having the highest volume in terms of knowledge sharing. In fact, knowledge increases in value when it is shared - characteristic of self-worth (Kluge, Stein & Licht, 2002). Mutual assistance between the various employees is seen as an essential component for an optimal and more efficient result, with a high degree of discussion and improvement of the final solution.

Information systems are strategic tools in organizations regardless of the business area in which they fall in (Moreno & Reis, 2012). The great challenges that arise nowadays are not only coming from the available ICT, but from the ability organizations must properly adapt and use ICT in their unique environment and generate benefits for both their collaborators and for themselves.

The designation of knowledge management (Figueiredo, 2003), corresponds to the way of managing the processes of social construction of knowledge. The history of knowledge management, over time, has always been built around four factors that are closely linked, namely: knowledge domains; actors (functions, roles, professions); forms of action and/or intervention; and organizational models. According to the same author, whenever the balance between these factors was disturbed, crisis situations were generated, which demanded the search for new balances. New balances have always been found, generating other domains of knowledge. As a result, new forms of action and new organizational models emerged, with new actors, new professions or new functions.

To help understand knowledge in a systematic way, (Kim & Park, 2003) presented a taxonomy of knowledge. Indeed, knowledge can be computerized or not. Computerized knowledge is what is stored in a computer system, and its processing is possible. Knowledge that is not computerized is in the human brain therefore computer processing is not possible (Kim & Park, 2003).

Successful knowledge management is a powerful lever for the company's success, and a positive correlation can be established between a greater success in knowledge management and the creation of value in the organization (Kluge, Stein & Licht, 2002). It is important to promote knowledge transfer through workshops, conferences and meetings, as well as to evaluate and reward those who share and reuse knowledge.

From the great problems that go beyond the limits of human knowledge, to the daily tasks of research, software has made an invaluable contribution to the advancement of research (Software Sustainability Institute, 2019). Good software practices will enhance the development of more optimized software, which in turn brings improvements in terms of reproducibility and reuse of research.

The sustainability of software creates reliable, reproducible and reusable software (Hettrick, 2016), namely: the results generated by reliable and well-tested software can be trusted; reusing software has the potential to save a significant amount of resources that can be invested in further research; software that continues to function allows continuous access and use of research data, aiding in reproducibility and helping to extract the greatest return on the investment made in data collection. In fact, software reuse is the reapplication of a variety of types of knowledge from one system to another similar system in order to reduce the development effort, improving productivity and software quality (Silveira & Vidal, 2002). Software Product Line Engineering is also a promising paradigm for reusing knowledge and artefacts among similar software products (Reinhartz-Berger & Kemelman, 2019).

Reusing software is not simply copying parts of a library, but also designing and implementing software components that can be used on different systems (developing artefacts to reuse). As defined by McIlroy (McIlroy, 1969), the concept that led to the idea of systematic software reuse was simple and consisted of the development of components of reasonable size that could be reused.

The theme of software and knowledge reuse was introduced in this chapter with the aim of integrating it as a sustainability practice in IS development. In this context, it is reinforced the understanding that there is a link between knowledge management and software reuse in which its study can contribute to the development of more sustainable software systems.

Among the many definitions of sustainability, the simplest and most fundamental one is: "the ability to sustain" or, in other words, "the ability to support" (SustainAbility, 2018). In this sense, the implementation of sustainability measures when developing IS and optimizing ICT can enhance the reuse of several components within the study domain.

The entire organizational context requires rigorous planning, regularity/uniformity of procedures and optimization of existing general resources (Lapa, Bernardino, & Figueiredo, 2014). These assumptions require constant and regular access to updated and relevant data, in order to decide which, enable the sustainability and growth of organizations.

Fostering ICT in an organizational context implies exploring constant technological advances (Landum & Reis, 2012). These technological advances need, at the level of the academic world and society in general, a large research component, assuming itself as an emerging and disruptive paradigm.

The standard (ISO/IEC 27004:2016, 2016), proposes the use of metrics for the management of information security, and these must address several concerns, in several areas, namely:

- **Justification:** Explains the value of the measurement, for example increasing the responsibility and the performance;
- **Characteristics:** What to measure, monitor, analyse and evaluate, when to do it and who; Types of measures - measures of performance (efficiency) and effectiveness;
- **Processes:** How to develop, implement and use metrics.

It is considered that (ISO 27004: 2016), may have applicability to most organizations. In this sense, it is considered that it provides guidelines to help organizations assess the performance of information security and the effectiveness of an information security management system, in order to meet the requirements of (ISO/IEC 27001:2013, 2013), which mentions in section 9.1: a) the importance of monitoring and measuring information security performance; b) monitoring and measuring the effectiveness of an Information Security Management System (ISMS), including its processes and controls; c) the analysis and evaluation of the results of monitoring and measurement.

Information security concerns, (Mamede, 2006), should be analyzed and developed from different perspectives. The analysis and definition of information security policies and mechanisms in an organizational context should be studied from its various perspectives. The objective is to promote the practice of developing and optimizing information security policies and practices, given its relevance in the organizational context.

The reorganization and optimization of organizational processes (Santos, 2018) has a significant impact on the IS that support them. It is, therefore, pertinent to establish a relationship between organizations, creativity, innovation and IS. In this context, the introduction of creativity techniques and strategies in the IS design process, with a view to their agile and efficient construction, appears to have enormous

potential. In (Deng & Ji, 2015), the authors claim that the global ICT sector is responsible for approximately 2% of global carbon dioxide (CO2) emissions (Gartner, 2015). On the other hand, ICT is often seen as being a solution to environmental problems. It is advocated that various ICT applications, such as e-commerce, smart grids, smart buildings, digital media, virtual mobility and intelligent transport systems, have a positive effect in reducing environmental pollution and carbon emissions in the face of current sustainability concerns (Fuchs, 2008), promoting digital transformation (Ovelheiro & Silveira, 2020). Several authors have emphasized that for the ICT sector, the challenge is to directly address 2% of emissions, improving energy efficiency and directly and indirectly address the remaining 98% through innovative IT applications in other sectors (Elliot, 2011).

The ecological practices are initiatives (Simmonds & Bhattacherjee, 2014) aimed at creating environmental value. Most organizations are conscious of the need to participate in Green IT initiatives. Thus, it is considered that Green ICT resources are able to improve the environmental performance of organizations. In this sense, it is considered that they can contribute as follows:

- Conserving the natural resources used within the organization;
- Preserving the natural environment and natural resources used outside the organization to process waste and emissions;
- Innovating with regard to products, services and practices that are more environmentally friendly.

Within the scope of the case study, concerns in the field of sustainability are being thought of in order to include measures at different levels as it is essential to structure a solution where the concerns of Green IT are also ensured. One of the relevant aspects in the context of the problem under study concerns the protection of personal data. The prototype will make it possible to provide a wide range of information for different actors to access according to their profile. In this sense, the protection of information should be a constant concern.

In the context of the case study presented, the inclusion of Green IT concerns is urgent in order to optimize the proposed solutions. Like this, it is considered essential that among the instituted practices, those underlying Green IT are highlighted as crucial (Sulaiman, Naqshbandi & Dezdar, 2016), given that most organizations use some form of IT to carry out their daily transactions. In view of the relevance of the theme, it is considered that Green IT (Meacham, Toms, Green, & Bhadauria, 2013) serve as a mediator of the relationship between information sharing and environmental issues, with the assumptions that ICT can enhance this performance.

The National Data Protection Commission is the National Personal Data Control Authority, cooperating with the data protection control authorities of other States (CNPD, 2018). It is, therefore, an independent administrative entity with authority powers, which general task is controlling and supervising the processing of personal data, rigorously respecting human rights and the freedoms and guarantees enshrined in the Constitution and the Law.

The General Data Protection Regulation establishes several fundamental principles that can be considered its core (RGPD, 2018). The principles apply to all personal data processing and it is important that companies understand and apply them. These principles must always be present when working with personal data processing. The processing of personal data must be legal, fair and characterized by transparency. For this to happen, there must be legal justifications for any processing of personal data.

SUSTAINABILITY IN INFORMATION SYSTEMS

According to the United Nations Development Programme (UNDP), the definition of the 17 Sustainable Development Goals is the new agenda until 2030, (UNDP, 2015), which is based on the progress and lessons learned from the 8 Millennium Development Goals, between 2000 and 2015. This agenda is the result of the joint work of governments and citizens around the world that aim to create a new global model to end poverty, promote prosperity and the well-being of all, protect the environment and combat climate change.

The Agenda for Sustainable Development (UNDP, 2015), defined 17 objectives (see Figure 1) and 169 goals, covering the social, economic and environmental dimensions across the world. The objectives focus on people, human rights and responding to growing social inequalities, as well as integrating central concerns such as peace, security and climate change.

Figure 1. Sustainable development goals (UNDP, 2015)
Source: (UNDP, 2015)

Within the scope of this study, the authors highlight the following SDGs:

Goal 1: End poverty in all its forms, everywhere.
Goal 2: End hunger, achieve food security and improve nutrition and promote sustainable agriculture.
Goal 3: Ensure a healthy life and promote well-being for all, at all ages.
Goal 4: Ensure inclusive, equitable and quality education, and promote opportunities for lifelong learning for all.
Goal 5: Achieve gender equality and empower all women and girls.
Goal 6: Ensure the availability and sustainable management of water and sanitation for all.
Goal 7: Ensure reliable, sustainable, modern and affordable access to energy for all.
Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
Goal 10: Reduce inequalities within and between countries.
Goal 11: Make cities and communities inclusive, safe, resilient and sustainable.
Goal 12: Ensure sustainable production and consumption patterns.

Goal 14: Conservation and sustainable use of the oceans, seas and marine resources for sustainable development.

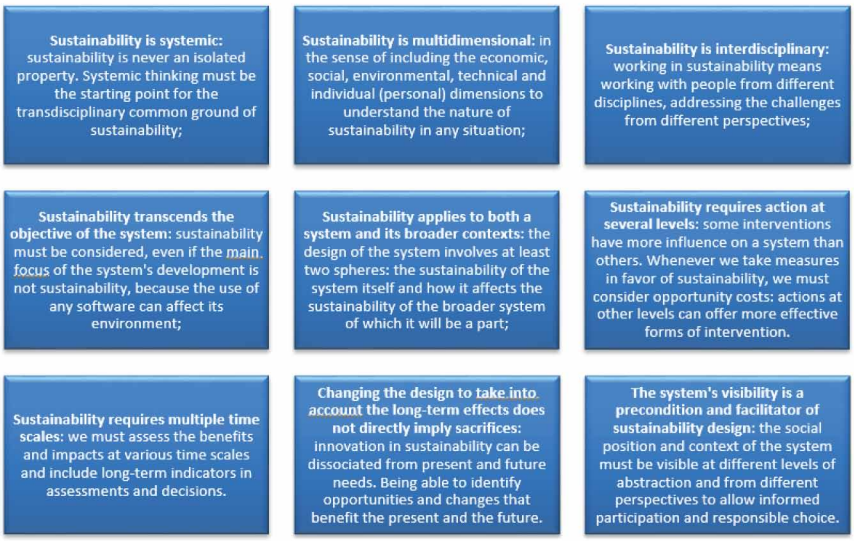
Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

It is important to note that the SDGs cannot be analyzed in isolation, since the improvement of one SDG will have positive and/or negative impacts on other SDGs (Reis et al., 2020).

The importance of sustainability is increasingly recognized, but the broader impacts of software systems on sustainability are unknown. To assist in this change, the Karlskrona Manifesto proposes the following principles and commitments, as shown in Figure 2.

Figure 2. Karlskrona manifesto principles (Becker et al., 2015, Penzenstadler, 2015)
Source: (Becker et al., 2015, Penzenstadler, 2015)



The Manifesto also proposes concrete ideas on how to start implementing these principles in different roles in the software engineering community: software professionals, researchers, professional associations, teachers, customers and users. It is suggested that an attempt be made to identify the effects of projects on technical, economic and environmental sustainability and on the social and individual dimensions.

In this sense, sustainable development is multidimensional, since it leads to the economic, social, environmental, technical and individual dimensions.

To visualize the impact of a software system taking into account the economic, environmental, social, individual and technical dimensions of sustainability, the authors (Oyedeji, Seffah, & Penzenstadler, 2017) analyzed the business sustainability data for a student car sharing system in a city, considering the content of the environment, society, economy, process, value and people. They verified that the various dimensions of sustainability influence each other. From the perspective of (Hinai & Chitchyan, 2019),

the notion of social sustainability is complex, encompassing factors such as: equality, trust, support for cultural and religious diversity, community participation. For (Oyedeji, Seffah, & Penzenstadler, 2018), social sustainability is an area that has received less attention and that involves the well-being of the community of software users and programmers, addresses the need to change the human mindset to design the perceptions and experiences of sustainability.

Other aspects to be considered in the development is the need to provide Software Engineers with solid ethics based on their own university education, which allows them to face the difficult situations that they will inevitably face in the professional environment. It turns out that sometimes responsibility is discarded for assuming that Software Engineering is ethically neutral or, simply, for distributing the responsibility over the various elements of the software production process (Caetano & Silveira, 2009). Each Software Engineer is responsible for knowing and putting codes of conduct into practice, always defending ethics as a fundamental element of social and professional relations. It is also the responsibility of each one to instill and promote compliance with the codes of ethics with fellow professionals in accordance with the dimensions and principles of sustainability. Ethics, like professional success, will always start with the individual. It corroborates the proposal to incorporate sustainability principles in codes of ethics (Oyedeji, Seffah, & Penzenstadler, 2018) and recognizes the need to consider sustainability as part of professional practice.

The development of a multidimensional prototype within the scope of information aggregation, in the context of this study, requires the incorporation of a set of concerns, namely in the field of information security. In this sense, international norms and standards can provide added value for being a set of guidelines.

Thus, and in view of the concerns underlying IS and ICT and taking into account the sustainability concerns in the various aspects, it is advocated the definition of a strategy of continuous improvement. ISO 14001: 2015 (ISO/IEC 14001:2015, 2015) proposes an approach in which environmental management is based on the Plan-Do-Check-Act (PDCA) concept. The PDCA cycle being an iterative process that powers continuous improvement. Organizations facing the specificity of their business should define strategies in order to enhance environmental management.

ISO 14001: 2015 recommends that the strategies of each organization and regarding the PDCA be:

- **Plan:** Environmental objectives must be established and the results to be achieved in accordance with the environmental policy must be defined in view of the organization's specificity;
- **Do:** Implement the processes outlined in order to carry out the planned;
- **Check:** Monitor using metrics in order to measure the evolution of the strategies defined with regard to environmental policy, including environmental objectives and operational criteria;
- **Act:** Proposing actions in the different areas in order to contribute to continuous improvement.

The PDCA described in ISO 14001: 2015 can provide added value when analyzing the contribution of ICT with regard to sustainability. Another aspect of analysis should focus on ISO 27002 (ISO/IEC 27002:2013, 2013), given its relevance for the optimization of information security practices. ISO 27001: 2013, and regarding Information Security Management, also constitutes a relevant contribution with regard to security management.

In the scope of risk management in ICT, ISO 27005:2018 (ISO/IEC 27005:2018, 2018) allows the identification of risks and vulnerabilities in order to define metrics that allow to quantify the impact of accidents to which the organization may be exposed.

It is argued that the interconnection between ISO 14001: 2015 and ISO 27001: 2013, allows the identification of the necessary requirements to enhance the use of ICT in an organizational context and in view of the specificity of each business, meeting the concerns within the scope of sustainability. It is considered that ICT sustainability is multifactorial and can be achieved by joining efforts between different areas of knowledge, in the domain of this theme.

In fact, it is considered that the sustainability of ICT can be an added value when proposing actions whose metrics are measurable. Thus, it is suggested to recommend measures to optimize operational and professional activities based on sustainability, contributing to green IT.

Concerns about the implementation of green IT policies by organizations may be a major concern to actively contribute to the sustainability of the sector. Thus, it is important that when starting a project, it has underlying sustainability policies replicable in the different departments. Achieving a balance between the environment, society and the economy is considered fundamental in order to be able to satisfy the needs of the present without compromising the ability of future generations to satisfy their needs. The objective of sustainable development is achieved by balancing these three pillars of sustainability (ISO 14001: 2015). Realizing these concerns, ISO 14001: 2015 promotes information for organizations to enhance the protection of the environment, initiating responses to the needs of changing environmental conditions in balance with socio-economic needs. The requirements emanating from the standard allow a company that has strategy concerns of this nature to achieve the results desired and defined in its environmental management system.

The commitment of top decision makers in organizations is one of the assumptions of ISO 14001: 2015, given that it proposes a systematic approach to environmental management in order to define strategies and provide information necessary to obtain long-term success and to create alternatives that contribute to sustainable development, through:

- Protection of the environment, by preventing or mitigating adverse environmental impacts;
- Mitigation of potential adverse effects of environmental conditions in the organization;
- Assistance to the organization in meeting legal and other requirements;
- Increase in environmental performance;
- Control or influence the way in which the organization's products and services are designed, manufactured, distributed, consumed and disposed of, using a life cycle perspective that can prevent the involuntary displacement of environmental impacts within the life cycle;
- Achievement of financial and operational benefits that may result from the implementation of environmental alternatives that reinforce the organization's position in the market;
- Communication of environmental information to relevant stakeholders.

It is advocated that, whether due to the investment capacity, the integrated knowledge of the requirements involved, the interpretation of the diversity of existing norms and good practices, the perception of imminent risk or simply the definition of priorities, some organizations have difficulties in the domain of optimization of ICT, (Russo & Reis, 2019). The countless emerging technologies that characterize the so-called "Industry 4.0", namely, artificial intelligence, internet of things, nanotechnology, quantum computing, augmented reality and virtual reality, drones, 3D printing, blockchain, among others, will have uses increasingly focused on sustainability (Meneses, 2019).

In this sense, sustainability can be achieved by aggregating several dimensions and areas of knowledge, in order to enhance various valences in the organizational context, namely with regard to the development and optimization of IS/ICT.

Organizations are currently dependent on IS and ICT. It is considered that this dependence should be enhanced in order to provide integrated and optimized services to the population. ICT could provide added value in a social context in order to speed up the processing and sharing of information and contribute to the increase of sustainability factors (Reis, Silveira, Carvalho & Mata, 2020).

CASE STUDY

The São Sebastião Social Community Center (CSPSS), is a Private Social Solidarity Institution (IPSS), established in 1998. It develops (CSPSS, 2019) a strong community intervention, with special focus on the São Domingos neighborhood, developing neighborhood ties and community leadership. In its daily intervention it integrates food distribution programs, namely the Operational Program to Support the Less Privileged and monthly food aid (food products donated by individuals and companies), and the distribution of clothing and hygiene products. The presented case study aims to characterize the situation of the Community of São Domingos (CSD). The characterization from the socio-cultural point of view of the Community was based on the need to optimize the IS and ICT to support the activity of a social organization, here called the Social Center.

The areas involved were analyzed in order to study the different areas supported by a comprehensive strategy, namely: psychology; family situation; social situation; medical care; nursing care; habitability conditions; life experience; education and training; volunteering.

It is also intended to involve the various official entities, namely:

- Public Security Police (PSP), in the mission of ensuring democratic legality, guaranteeing internal security and citizens' rights, under the terms of the Constitution and the Law;
- Foreigners and Borders Service (FBS), in the mission of ensuring control of people at borders, of foreigners in national territory;
- Social Security (SS), as a system that aims to ensure basic citizens' rights and equal opportunities;
- Parish Council, in the mission of guaranteeing the full satisfaction of the needs, expectations and aspirations of its citizens;
- Health Center, in the mission of providing primary health care.

To aggregate all this information, Figure 3 was elaborated, which intends to show the areas involved in a multidisciplinary logic of support to the citizen of a community, which, due to its nature, has the commitment of the various official entities.

Figure 3. CSD characterization

Figure 3 allows to list the different entities involved in the process of creating synergies for the optimization of providing services to their users. It should be noted that knowledge is creative and it should be encouraged so that it can develop (Davenport & Prusak, 1998). In this way, technology is a means to improve communication and collaboration between elements of the Community, with the possibility of sharing experience, knowledge and skills.

In order to better systematize the information underlying this study, interviews were conducted with several specialists in the fields of knowledge, namely: nurse, physiotherapist, and psychologist. The CSD Characterization will have as assumptions a multidisciplinary approach in order to characterize everyone in the different components and taking into account that several entities will collaborate with the CSD. Each of the characteristics is described below:

- **Volunteering:** Giving and receiving:
  - **Objective:** To analyze the conditions for the provision of volunteering by members of the community to involve them in the various activities and eventually analyze their receptivity to receive help; some voluntary actions are foreseen, such as: small house works, room painting, gardening, training activities, leizure, dissemination of good practices for protecting the marine environment; workshops on: cooking, electronics, sewing, composting, gardening, among many others;

- **SDG:** Volunteering actions contribute to the objectives: 4- Quality Education, 5- Gender Equality, 10- Reduce Inequality, 11- Sustainable Cities and Communities, 12- Sustainable Production and Consumption, 14- Protect Sea Life;
- **Characterization:** Analyzing the conditions to provide or receive volunteering can be important in a sharing strategy: availability to volunteer (days of the week, schedule, conditions) and availability to receive support from volunteer(s) (schedule, conditions, needs);

- **Housing:** Figure 4 describes the objective, SDGs involved and the characterization;
- **Experience:** Knowledge and skills:
  - **Objective:** Knowing the life experience of a CSD member or their caregiver can enhance collaboration with the CSD. Knowing the level of literacy of each member of the community in order to be able to enhance the skills of each one with the goal of sharing knowledge;
  - **SDG:** This knowledge sharing can develop in different actions and allow to contribute to the SDGs: 4- Quality Education, 5- Gender Equality, 10- Reduce Inequalities;
  - **Characterization:** Life Experience will allow assessment of: what one has done throughout one's life; what one likes to do; what one would like to do and share, and in what activities;
- **Health:** Physiotherapy, psychology:
  - **Objective:** It is intended to exhaustively characterize the health situation of each member in order to initiate the provision of specific services in view of the needs of CSD members. Another also relevant component to the study, given the pertinence when it comes to the elderly, is road health and safety;
  - **SDG:** The provision of services contributes to the SDG 3- Quality Health, promoting well-being and access to Health at all ages;
  - **Characterization:** In the different areas of health, the importance of adding the respective concerns by areas is emphasized. With regard to Mental Health: if one in sad and how often; how to cheer up; whether one has friends or not; if one goes out to talk (with the neighbor or someone else); if one takes the medication that was prescribed by the doctor; if one has a social network account; how one lives their day; what concerns one has, what would one like to do; what care one has for oneself. Road health and safety: crosses on crosswalks; respects light signals and walks to circulate safely. Other aspects: number of falls in the last year (risk of falling); indicators (balance, strength in the limbs, gait speed); impaired vision or hearing; family clinical history; chronic diseases;
- **Training:** Basic qualifications, education:
  - **Objective:** Characterize the level of literacy and knowledge of community members, but also analyze the collaborative potential among members in order to participate more actively with the CSD. It is intended to promote opportunities for lifelong learning; guarantee full and effective participation of women and equal opportunities and reduce inequalities;
  - **SDG:** These actions make it possible to contribute to the SDGs: 4- Quality Education, 5- Gender Equality, 10- Reduce Inequalities;
  - **Characterization:** Elderly literacy level (education/training). Literacy level of caregiver (education/training), personal information of the individual: name; address; telephone; mail; birth date; gender; marital status; county; district; nationality, among others; it can also be a differentiating factor in the form of strategy definition: access to the internet; has an email account; account on social networks; communicates with family/friends through digital platforms; information research.

Figure 4. Housing (comfort, maintenance) in CSD

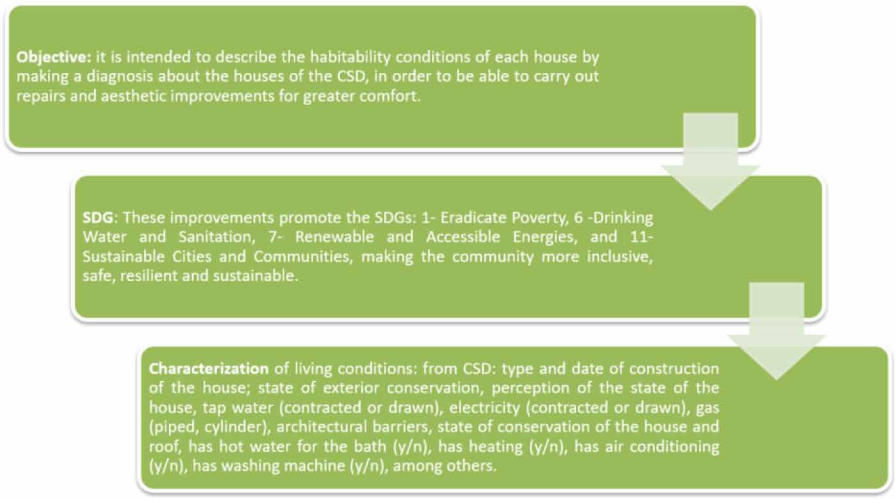
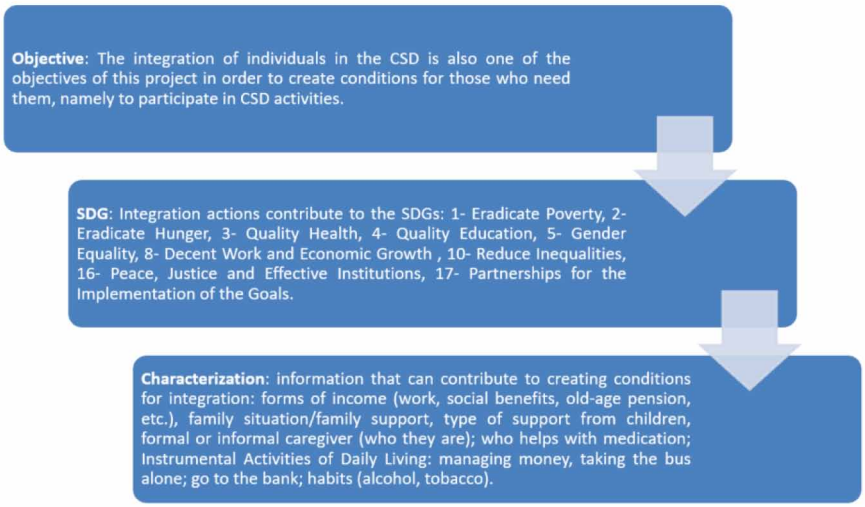
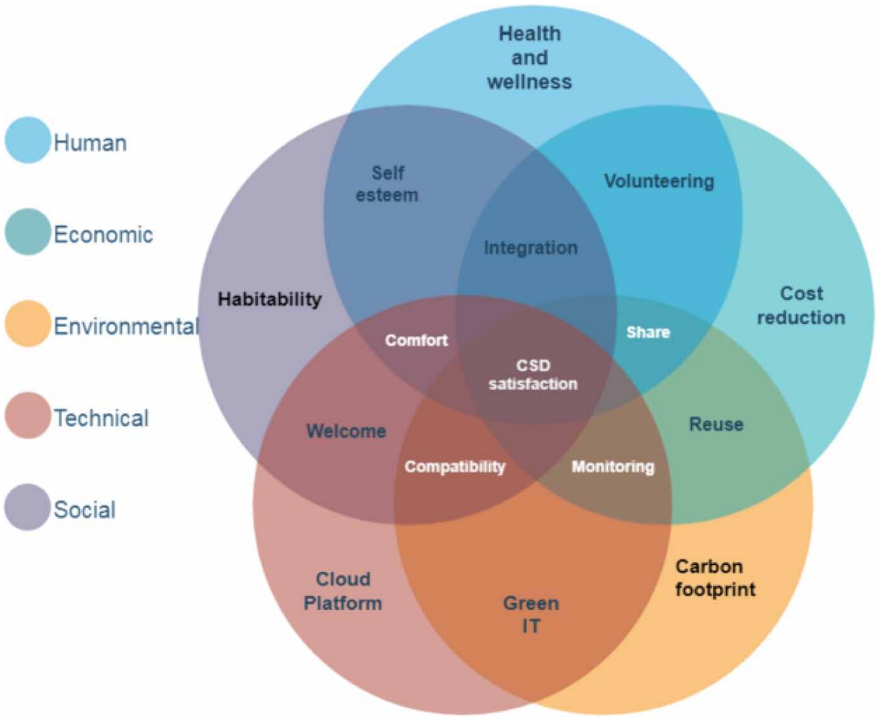


Figure 5. Social integration in CSD



The details of the citizen's social integration are illustrated in Figure 5:

Figure 6. Sustainability in CSD's IS
Source: (Reis & Silveira, 2020)



- **Partnerships:** Partnerships with other entities:
  - **Objective:** List the entities with which partnerships will be established, namely: parish council, health center, PSP, SEF - Collaboration with official entities may provide added value in order to provide more effective responses to the people of the CSD, reinforcing the means of implementing partnerships;
  - **SDG:** This is a contribution to the SDG 17- Partnerships for the Implementation of the Goals;
  - **Characterization:** Name and mission of the entity, location and contacts, type of partnership to be established, need to register the partnership, key person involved, connection to other partners;
- **Social center:** Support for activities:
  - **Objective:** The social center aims to be the aggregator of skills and knowledge in order to provide better and more integrated services, meeting the needs of the CSD. It is also intended to create a platform in which the various stakeholders can, under their access profile, access information from the CSD elements under analysis in order to optimize the services provided;
  - **SDG:** Aggregating actions and integration services makes it possible to contribute to the SDGs: 1- Eradicate Poverty, 2- Eradicate Hunger, 3- Quality Health, 4- Quality Education, 5- Gender Equality, 10- Reduce Inequalities, 11- Sustainable Cities and Communities, 16- Peace, Justice and Effective Institutions;

- **Characterization:** Platform on which the different actors can, through their profile, access: manage a citizen, volunteer, health professional profile; manage medical/nursing treatments; manage taking medications, manage physical activity; share vehicle; share goods and resources; register availability on the volunteer platform.

Within this project, concerns about data protection were one of the aspects of analysis. In this sense, an identification code will be created for each individual in order to ensure the privacy (Silveira, 2019) of the information.

Based on the principles and commitments of the Karlskrona Manifesto (Becker et al., 2015), which provide an overview of the various dimensions of sustainability and their relationships, the corresponding scheme for the CSD was constructed, as shown in Figure 6. It is intended to show the impact that sustainability concerns can have when optimizing an information system. In this way, it was possible to list new requirements, namely in the design of the application for the creation of volunteer programs (e.g., within the community in small repairs to housing or outside the community in protecting the marine environment); sharing of consumer goods (e.g., food too good to be discarded) and vehicle sharing (application with the schedules of people with cars to share).

The applications of the various dimensions of sustainability are described below:

- **Human/Individual Sustainability:** The information system was designed to promote integration, and general improvement in the health of those receiving medical and nursing treatments. As this system is multidisciplinary, improving individual sustainability is the main focus of the system. Thus, it will allow personal satisfaction in terms of health, comfort in housing, performance of volunteer tasks (giving and receiving), car sharing, and knowledge sharing;
- **Economic Sustainability:** Reduction in energy costs, in consumer goods (donated and shared), volunteer services (housing maintenance, training, among others), reuse of non-perishable goods, car sharing among others;
- **Environmental Sustainability:** Reduction of energy costs (cloud platform system), reduction of carbon emissions and gasoline consumption (car sharing). Reuse of non-perishable goods, avoiding the waste of perishable goods (donation of goods). Within the scope of volunteering, an action to protect the marine environment was identified, inspired by the good practices of the Guardians of the Sea (OceanAlive, 2020);
- **Technical Sustainability:** The system will be available on a cloud platform, making it compatible with many mobile and desktop devices, without paying for licenses, and reducing the need for application users to stop using their older devices. Additionally, it is argued that reusing software has the potential to save a significant amount of resources;
- **Social Sustainability:** Satisfaction of CSD people due to social integration, welcoming, solving housing problems (aesthetic improvement of housing, for example); sharing resources and artifacts; community physical activity; available psychologist (improved self-esteem).

In view of the previously mentioned concerns, a non-functional prototype is presented in the scope of the requirements analysis in order to allow a multidisciplinary view of the information regarding the CSD.

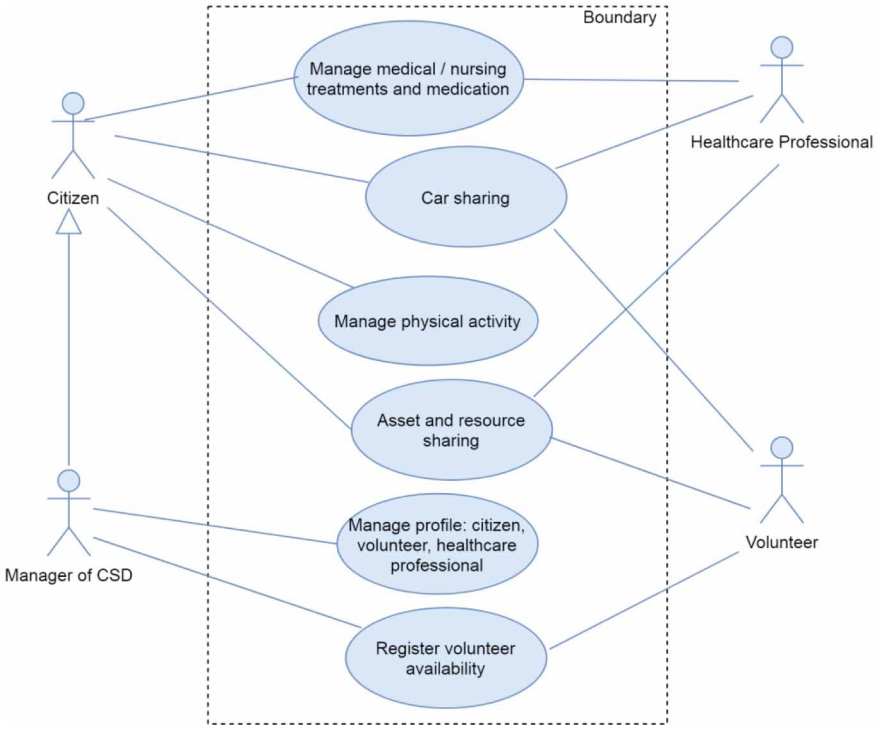
The important services that the system must deliver to the actors (users of the system) to satisfy the CSD objectives are identified, taking into account the dimensions of sustainability.

The actors that interact with the system and the role that each of them plays were identified:

- **Manager of CSD:** Person Responsible for the CSD who will manage the access profiles of: citizens, volunteers, healthcare professionals; has access to: Manage medical/nursing treatments and medication; Manage physical activity; Car sharing; Asset and resource sharing; Register volunteer availability;
- **Healthcare Professional:** Manage medical/nursing treatments and medication; Car sharing;
- **Citizen:** A CSD person who has access to: Manage medical/nursing treatments and medication; Manage physical activity; Car sharing; Asset and resource sharing. Can also play the role of volunteer;
- **Volunteer:** A person who registers as a volunteer. Has access to: Register volunteer availability; Car sharing.

Each use case describes the essential services that are important to at least one user. A Use Case is a sequence of related transactions that are performed by a system actor in a dialogue process. The Use Cases shown in the diagram in the Figure 7 correspond to the objectives of CSD actors.

Figure 7. CSD use case diagram



The Use Case Diagram in Figure 7 shows the set of use cases capturing the important services that users and stakeholders need in the CSD system. These represent the essential services bounded by the boundary, clearly showing what is included. Users can easily see how the system reflects their goals. This set of use cases form the "anchor point" for the rest of the CSD system development process.

DISCUSSION

The specificity of the organization under study and the financial constraints implied in this type of institutions requires the development of a prototype to include software sustainability concerns. In this sense, (Reis et al., 2020) advocate that the added value of the design of a prototype that aggregates information from the CSD, including the various valences under study, should be developed under the assumption of use in an organizational context by a multidisciplinary team to allow the cooperation of the various entities involved in a process of this nature.

The development of the prototype of the CSD system can be carried out on the Salesforce platform (Salesforce, 2019a), starting from a package already developed by Salesforce, for non-profit organizations. The package, Nonprofit Success Pack (NPSP), is an open source application that starts with an industry standard data architecture and adds pre-built donor management and constituent components to support programs and outreach. This flexible platform allows non-profit organizations of any size, to better manage their activities and become more involved with donors. It provides eligible nonprofits with access to Salesforce products and resources. The program includes 10 donated subscriptions, with discounts on Salesforce subscriptions, as well as additional products and services (Salesforce, 2019b).

On the Salesforce platform it is possible to work with applications provided by several service providers, and these applications can be used together or separately from the Customer Relationship Management (CRM) solution on this platform. Leimeister (Leimester, Riedl, Böhm & Krcmar, 2010), states that Salesforce is both a platform provider and an application provider. This platform has made operating costs more flexible, allowing for faster application development. When trying to define the requirements of a business, Force.com has a solution that provides a basis for defining the requirements with the customer. Thus, the development process can start much earlier. This solution consists of packages already developed, which contain basic and very general functionalities, which best adapt to the client's business model (Ramos, Silveira, & Pinheiro, 2013).

The implementation of software products in any organization requires reflection (Duarte, Reis & Silveira, 2020). These authors consider that the implementation of generic software products raises a set of challenges and problems that must be taken into account in order to be successful. Thus, it is considered that a strategy should be defined to constitute an efficient and effective project team prepared to deal with the inherent complexity, in order to reduce risks.

The case study, now presented, is still under development, demonstrating that the inclusion of sustainability factors since the beginning of the process is an asset and promotes the Sustainable Development Goals (UNDP, 2015), especially with regard to Objective 16 (Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels), goal 16.10: ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements (UNB, 2019). Achieving the SDGs requires the partnership of governments, the private sector, civil society and citizens to ensure that we leave a better planet for future generations (UNDP, 2015).

Therefore, the goal is to use scientific knowledge, addressing the challenges in various perspectives, to help CSD to improve the global satisfaction of people and internalize the nature of sustainability in any situation.

CONCLUSION

Most organizations express concerns in the field of SDGs and sustainability. Despite being sensitive to these topics, social organizations are confronted with a set of constraints in their routines that severely limits them when defining strategies in this field.

The challenge of characterizing a community was of particular interest since it gave the opportunity to analyze its current state of operation and its context. Understanding the specificity of the organization under study and its methods of operation was also particularly interesting because it allowed proposing the optimization of CSD's IS.

To carry out this study a literature review was performed and included the five dimensions of sustainability: individual, social, economic, technical, and environmental. With these dimensions in mind, the CSD's IS sustainability scheme was built. This scheme allowed showing the possible impact that the concerns emanated from the various manifestos/SDGs may have on the current organizational practices, in the field of sustainability.

This case study identified a set of concerns when optimizing the IS of a social organization allowing for the definition of aspects at the level of several sustainability factors, namely: carbon emissions, ICT costs, energy costs, resource sharing, recycling, software licensing costs, reusing procedures when developing software, among others. In this way, it is possible to establish a sustainability promotion program at CSD, identifying opportunities and changes beneficial for the present and the future.

Therefore, the implementation of sustainability concerns when optimizing an IS and ICT can bring added value by contributing to numerous gains in different areas.

The project is ongoing and at this stage the focus is on finding the best approach to develop a software prototype given the specificity of the organization being studied. The solution should address concerns in the field of application hosting, programming language, and software licensing costs.

The sustainability in ICT should be a strategic objective for most organizations to contribute actively and assertively to global implementation of the SDGs and sustainability.

For future work, it is relevant to continue the analysis and implementation of sustainability policies and strategies in social organizations. It is also intended to address the concerns about underlying information security in terms of services and access profiles, information availability and ubiquity. On the other hand, ICT have an impact on the sustainability of the people and the world, therefore there is an urgent need to transmit sustainability and commitment principles to students in this field of knowledge. This will be a mission to be implemented in higher education institutions, following examples such as EPFL Showcase 2030 (EPFL, 2019) or UWE Bristol (Gough & Longhurst, 2018).

REFERENCES

Becker, C., Chitchyan, R., Duboc, L., Easterbrook, S., Penzenstadler, B., Seyff, N., & Venters, C. (2015). Sustainability Design and Software: The Karlskrona Manifesto. *Proc. 37th International Conference on Software Engineering (ICSE 15)*. 10.1109/ICSE.2015.179

Booch, G. (2015). The future of software engineering: keynote. *Proc. 37th International Conference on Software Engineering (ICSE 15)*.

Caetano, D., & Silveira, M.C. (2009). A problemática da Ética na Engenharia de Software. *9ª Conferência da Associação Portuguesa de Sistemas de Informação (CAPSI 2009)*.

CNPD. (2018). *O que é a CNPD*. Comissão Nacional de Proteção de Dados. https://www.cnpd.pt/bin/cnpd/acnpd.htm

CSPSS (2019). *Centro Social Paroquial de São Sebastião*. Documento interno.

Davenport, T., & Prusak, L. (1998). *Conhecimento Empresarial*. Campus.

Deng, Q., & Shaobo, J. (2015). Organizational Green IT Adoption: Concept and Evidence. *Sustainability, 7(12), 16737-16755*. doi:10.3390u71215843

Duarte, R., Reis, L., & Silveira, C. (2020). Team Members Evaluation - International Project Management. In R. Babo, N. Dey, & A. Ashour (Eds.), *Workgroups eAssessment Planning, Implementing and Analyzing Frameworks*. Springer.

Elliot, S. (2011). Transdisciplinary Perspectives on Environmental Sustainability: A Resource Base and Framework for IT–Enabled Business Transformation. *Management Information Systems Quarterly*, *35*(1), 197–236. doi:10.2307/23043495

EPFL. (2019). *Tech4Impact Presents: EPFL's Contribution to the Sustainable Development Goals*. EPFL Showcase 2030 Report. Retrieved from: www.epfl.ch/innovation/domains/wp-content/uploads/2019/04/EPFL-SDG-Report.pdf

Figueiredo, D. (2003). In R. Silva & A. Neves (Eds.), *Gestão do Conhecimento e Economias de Inovação Intensiva; Gestão de Empresas na Era do Conhecimento* (pp. 435–441). Edições Sílabo.

Fuchs, C. (2008). The Implications of New Information and Communication Technologies for Sustainability. *Environment, Development and Sustainability*, *10*(3), 291–309. doi:10.100710668-006-9065-0

Gartner. (2015). *Gartner Estimates ICT Industry Accounts for 2 Percent of Global CO2 Emissions*. Gartner. Retrieved from: https://www.gartner.com/newsroom/id/503867

Gough, G., & Longhurst, J. (2018). Monitoring Progress Towards Implementing Sustainability and Representing the UN Sustainable Development Goals (SDGs) in the Curriculum at UWE Bristol. In W. Leal Filho (Ed.), *Implementing Sustainability in the Curriculum of Universities: Approaches, Methods and Projects*. Springer. doi:10.1007/978-3-319-70281-0_17

Hettrick, S. (2016). *Research Software Sustainability: Report on a Knowledge Exchange Workshop*. The Software Sustainability Institute.

Hinai, M., & Chitchyan, R. (2019). Equality Requirements for Software Systems: A Survey. *Proceedings of the 6th International Conference on ICT for Sustainability - ICT4S 2019*.

ISO/IEC 14001:2015. (2015). *Environment Management Systems – Requirements with Guidance for use.* International Organization for Standardization.

ISO/IEC 27001:2013. (2013). *Information Technology – Security techniques – Information security management systems - Requirements.* International Organization for Standardization.

ISO/IEC 27002:2013. (2013). *Information technology -- Security techniques -- Code of practice for information security controls*. International Organization for Standardization.

ISO/IEC 27004:2016. (2016). *Information technology — Security techniques — Information security management — Monitoring, measurement, analysis and evaluation*. International Organization for Standardization.

ISO/IEC 27005:2018. (2018). *Information Technology – Security techniques – Information security Risk management.* International Organization for Standardization.

Kim, W., & Seung-Soo, K. (2003). Knowledge Management: A Careful Look. *Journal of Object Technology*, *2*(1), 29–38. doi:10.5381/jot.2003.2.1.c4

Kluge, J., Stein, W., & Licht, T. (2002). *Gestão do Conhecimento: Segundo um Estudo de McKinsey & Company* (S. B. Leitão, Trans.). Principia-Publicações Universitárias e Científicas.

Landum, M., & Reis, L. (2012). *Cloud na Administração Local – Estudo de caso. In 12ª Conferência da Associação Portuguesa de Sistemas de Informação (CAPSI 2012)*. Universidade do Minho.

Lapa, J., Bernardino, J., & Figueiredo, A. (2014). A comparative analysis of open source business intelligence platforms. *ACM International Conference Proceeding Series*. 10.1145/2618168.2618182

Leimester, S., Riedl, C., Böhm, M., & Krcmar, H. (2010). The Business Perspective of Cloud Computing: Actors, Roles, and Value Networks. *18th European Conference on Information Systems (ECIS 2010)*.

Mamede, H. (2006). *Segurança Informática nas Organizações*. FCA.

McIlroy, M. (1969). Mass produced software components. *Proc. NATO, Software Engineering Conference*, 138-155.

Meacham, J., Toms, L., Green, & Bhadauria, V. (2013). Impact of information sharing and green information systems. *Management Research Review*, *36*(5), 478-494.

Meneses, J. (2019). *A sustentabilidade em 2019.* BCSD Portugal. Retrieved from: www.bcsdportugal.org/noticias/a-sustentabilidade-em-2019

Moreno, J., & Reis, L. (2012). *Proposta de Implementação de um Portal Corporativo – Caso ANA Aeroportos de Portugal, SA. In XXII Jornadas Luso-Espanholas de Gestão Científica*. Universidade de Trás-os-Montes e Alto Douro.

OceanAlive. (2020). *Guardiãs do Mar: mulheres da comunidade piscatória protegem as pradarias marinhas*. Ocean Alive. Retrieved from: www.ocean-alive.org/guardias-do-mar

Ovelheiro, B., & Silveira, C. (2020). *SoftDigital - Contributo para a Transformação Digital. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Polytechnic Institute of Bragança.

Oyedeji, S., Seffah, A., & Penzenstadler, B. (2017). Sustainability Quantification in Requirements Informing Design. *RE4SuSy2017.*

Oyedeji, S., Seffah, A., & Penzenstadler, B. (2018). A Catalogue Supporting Software Sustainability Design. *Sustainability*, *10*(7), 2296. doi:10.3390u10072296

Paulino, S., & Reis, L. (2012). *Importância das Redes Sociais – Ambientes Comunitários como canal de transferência de Conhecimento nas organizações – estudo de caso. In XXII Jornadas Luso-Espanholas de Gestão Científica*. Universidade de Trás-os-Montes e Alto Douro.

Penzenstadler, B. (2015). Sustainability and Requirements: A Manifesto. *IEEE Software*, *32*(5), 90-92.

Ramos, A., Silveira, M. C., & Pinheiro, C. (2013). *SolGlobal - Gestão de organizações sem fins lucrativos com Salesforce. In XXIII Jornadas Hispano-Lusas de Gestión Científica*. Espanha.

Reinhartz-Berger, I., & Kemelman, M. (2019). Extracting Core Requirements for Software Product Lines. *Requirements Engineering*, *2019*, 1–9.

Reis, L., & Silveira, C. (2020). *Sustentabilidade Multidimensional em Sistemas de Informação. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Instituto Politécnico de Bragança.

Reis, L., Silveira, C., Carvalho, L., & Mata, C. (2020). Digitalization as a key issue of the Circular Economy to promote Sustainability: Prototyping Design for Homeless People. In S. Rodrigues, P. Almeida, & N. Almeida (Eds.), *Mapping, Managing, and Crafting Sustainable Business Strategies for the Circular Economy*. IGI Global. doi:10.4018/978-1-5225-9885-5.ch007

Reis, L., Silveira, C., Carvalho, L., Mata, C., & Madeira, R. (2020). Design de Protótipo para Pessoa sem-abrigo - Contributos de Sustentabilidade. In *IV International Forum on Management*. Universidade Aberta.

RGPD. (2018). *Regulamento Geral de Proteção de Dados*. Diário da República n.º 231/2018, Série II de 2018-11-30, www.cnpd.pt/bin/rgpd/rgpd.htm

Russo, N., & Reis, L. (2019). *Análise da problemática subjacente à certificação de programas informáticos de faturação. In 14ª Conferência Ibérica de Sistemas e Tecnologias de Informação (CISTI 2019)*. Universidade de Coimbra.

Salesforce. (2019a). *Use the power of social, mobile, cloud, and analytics to become a Connected Nonprofit*. Salesforce. Retrieved from: www.salesforce.com/eu/solutions/industries/nonprofit/overview/

Salesforce. (2019b). *Salesforce for Nonprofits Free Trial.* Salesforce. Retrieved from: www.salesforce.org/nonprofit/get-started/

Santos, V. (2018). *Criatividade em Sistemas de Informação*. FCA.

Serrano, A., & Fialho, C. (2003). *Gestão do conhecimento: o novo paradigma das organizações*. FCA Editora de Informática.

Silveira, C., & Vidal, R. (2002). Software Reuse with Use Case Patterns. OOIS 2002, Reuse in Object-Oriented Information Systems Design, Proceedings, Lecture Notes in Computer Science, Springer-Verlag, 2426, 96-100.

Silveira, J. (2019). *A Browser-based Anonymous Questionnaire System with User-controlled Linkability* (Master Thesis). University of Lisbon.

Simmonds, D., & Bhattacherjee, A. (2014). Green IT Adoption and Sustainable Value Creation, Research-in-Progress. *Twentieth Americas Conference on Information Systems*.

Software Sustainability Institute. (2019). *Manifesto*. Software Sustainability Institute. Retrieved from: www.software.ac.uk/about/manifesto

Sulaiman, A., Naqshbandi, M., & Dezdar, S. (2016, September). Impact of adoption of Green IT practices on organizational performance. *Quality & Quantity*, *50*(5), 1929–1948. doi:10.100711135-015-0244-7

SustainAbility. (2018). *Sustainability: Can our society endure?* SustainAbility an ERM Group Company. Retrieved from://sustainability.com/sustainability/.

UNB. (2019). *16 Paz, Justiça e Instituições Eficazes*. United Nations Brasil. Retrieved from nacoesunidas.org/pos2015/ods16/

UNDP. (2015). *Sustainable Development Goals*. United Nations Development Programme. Retrieved from: www.undp.org/content/undp/en/home/sustainable-development-goals.html

UNDP. (2020). *Integrated Solutions for Sustainable Development*. United Nations Development Programme. Retrieved from: sdgintegration.undp.org/

KEY TERMS AND DEFINITIONS

Green IT: Practices in the domain of the use of Information and Communication Technologies in order to enhance sustainability.

Information and Communication Technologies: A technological resource set used to process information and ensure communication. When used in an integrated way it enhances information transmission and communication processes.

Information Systems: Is the organized set of components such as people, processes of collection and transmission of data and material resources, automated or manual. The interaction of components enhances the processing and dissemination of information.

Karlskrona Manifesto: Establishes the principles and dimensions for the design of sustainable software systems.

Requirements Analysis: Iterative process to identify features and restrictions with a view to developing or changing a software product. Usually use cases are used.

Software Systems Development: Set of activities involved in the production of software. These activities are related to each other in an iterative and incremental process.

Sustainability: Ability to sustain life on the planet, considering the five dimensions: individual, social, economic, technical, and environmental.

Compilation of References

Abreu, J. (2007). *Design de Serviços e Interfaces num Contexto de Televisão Interactiva* (Doctoral Thesis). Aveiro University.

Abreu, J., Santos, R., Silva, T., Marques, T., & Cardoso, B. (2019). Towards Proactivity Behaviours in Voice Assistants for the TV Ecosystem. *Proc. of JAUTI 2019 - VIII Conferência Iberoamericana sobre Aplicações e Usabilidade da TV Interativa*, 165-173.

Adolph, S., & Bramble, P. (2003). *Patterns for Effective Use Cases*. Addison-WesleyPearson Education.

Afsar, B., Badir, Y. F., & Saeed, B. B. (2014). Transformational leadership and innovative work behavior. *Industrial Management & Data Systems*, *114*(8), 1270–1300. doi:10.1108/IMDS-05-2014-0152

Afsar, B., & Umrani, W. A. (2019). Transformational leadership and innovative work behavior. *European Journal of Innovation Management*, *23*(3), 402–428. doi:10.1108/EJIM-12-2018-0257

Agile Alliance. (2001). *Agile manifesto*. http://agilemanifesto.org/

Agrawal, S., & Gupta, R. (2017). Web GIS and its architecture: A review. *Arabian Journal of Geosciences*, *10*(23), 518. doi:10.100712517-017-3296-2

Ahmad, M., & Cuenca, R. (2013). Critical success factors for ERP impleme. *Robotics and Computer-integrated Manufacturing*, *29*(3), 104–111. doi:10.1016/j.rcim.2012.04.019

Ahmad, N., Rextin, A., & Kulsoom, U. E. (2017). Perspectives on usability guidelines for smartphone applications: An empirical investigation and systematic literature review. *Information and Software Technology*, *94*, 130–149. doi:10.1016/j.infsof.2017.10.005

Aidis, R., & Van Praag, M. (2007). Illegal entrepreneurship experience: Does it make a difference for business performance and motivation? *Journal of Business Venturing*, *22*(2), 283–310. doi:10.1016/j.jbusvent.2006.02.002

Albert, M., Spang, K., & Balve, P. (2018). Project success assessment – business and individual perspectives. *International Project Management Association Research Conference 2017, UTS ePRESS, Sydney: NSW*, 1-17. 10.5130/pmrp.ipmarc2017.5580

Alec, J. A., Branscomb, L. M., Brooks, H., Carter, A. B., & Epstein, G. L. (1992). *Beyond spinoff: Military and commercial technologies in a changing world*. Harvard Business School Press.

Al-edenat, M. (2018). Reinforcing innovation through transformational leadership: Mediating role of job satisfaction. *Journal of Organizational Change Management*, *31*(4), 810–883. doi:10.1108/JOCM-05-2017-0181

Alexander, I., & Stevens, R. (2002). *Writing Better Requirements*. Addison-Wesley.

Ali Khan, Z., & Adnan, M. (2010). *Usability Evaluation of Web-based GIS Applications a Comparative Study of Google Maps and MapQues*t (M.Sc Thesis). Blekinge Institute of Technology.

Ali, A., & Lamont, S. (2000). Interactive Television Programs: Current Challenges and Solutions. *Proceedings of the 8th Annual Usability Professional's Association Conference.*

Allen, J. (2019). *Account Suspended*. Retrieved 22 October 2019, from https://www.learndigitalentrepreneurship.com/2019/02/16/what-is-digital-entrepreneurship/

Allen, J. C., & Malin, S. (2008). Green entrepreneurship: A method for managing natural resources? *Society & Natural Resources*, *21*(9), 828–844. doi:10.1080/08941920701612917

Alsanoosy, T., Spichkova, M., & Harland, J. (2018). Cultural Influences on Requirements Engineering Process in the Context of Saudi Arabia. In *13th International Conference on Evaluation of Novel Approaches to Software Engineering*. Funchal: Springer. 10.5220/0006770701590168

Alsanoosy, T., Spichkova, M., & Harland, J. (2019). Cultural influence on requirements engineering ac-tivities: A systematic literature review and analysis. *Requirements Engineering*, 1–24.

Alsos, G. A., Clausen, T. H., Mauer, R., Read, S., & Sarasvathy, S. D. (2019). Effectual exchange: From entrepreneurship to the disciplines and beyond. *Small Business Economics*, 1–15. doi:10.100711187-019-00146-9

AMA. (2019). *Autenticação.gov*. Agência Para A Modernização Administrativa, IP - Presidência Do Conselho De Ministros. Obtido em 04 de Junho de 2019, de https://www.autenticacao.gov.pt/cc-assinatura

Amabile, T.M. (1996). *Creativity and Innovation in Organizations.* Harvard Business School Background Note 396-239.

Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in Organizational Behavior*, *36*, 157–183. doi:10.1016/j.riob.2016.10.001

Amabile, T. M., Schatzel, E. A., Moneta, G. B., & Kramer, S. J. (2004). Leader behaviors, perceived, leader support, and subordinate creativity. *The Leadership Quarterly*, *15*(5), 32.

Ambler, S. W. (2018). *Agile Analysis. Agile Modeling*. Available at: http://www.agilemodeling.com/essays/agileAnalysis.htm#AgileAnalysis

Anacleto, R., Figueiredo, L., Almeida, A., & Novais, P. (2014). Mobile Application to provide Personalized Sightseeing Tours. *Journal of Network and Computer Applications*, *41*, 56–64. doi:10.1016/j.jnca.2013.10.005

Anderson, B. S., Wennberg, K., & McMullen, J. S. (2019). Enhancing quantitative theory-testing entrepreneurship research. *Journal of Business Venturing*, *34*(5), 105928. doi:10.1016/j.jbusvent.2019.02.001

Anderson, N., De Dreu, C. K., & Nijstad, B. A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science. *Journal of Organizational Behavior*, *25*(2), 147–173. doi:10.1002/job.236

Android Studio. (2019). *Android Studio release notes*. Android Developers. Retrieved from: https://developer.android.com/studio/releases/index.html

Ansoff, H. I. (1977). *Estratégia empresarial* (A. Z. Sanvicente, Trans.). McGraw-Hill.

APCER. (2018, november 16). *A nova versão da ISO/IEC 27001:2013*. Retrieved from Apcer - Associação Portuguesa de Certificação: https://www.apcergroup.com/brasil/index.php/pt/artigos-apcer/661/a-nova-versao-da-iso-iec-27001-2013

Appel, G., Grewal, L., Hadi, R., & Stephen, A. T. (2020). The future of social media in marketing. *Journal of the Academy of Marketing Science*, *48*(1), 79–95. doi:10.100711747-019-00695-1 PMID:32431463

Apple. (2020). *Apple TV App User Guide – Use VoiceOver in the Apple TV app*. Retrieved from https://support.apple.com/en-am/guide/tvapp/atvbfa4ff6cd/web

APPLE. (2020). *Human Interface Guidelines*. Retrieved February 08, 2020 from https://developer.apple.com/design/human-interface-guidelines/

Araújo, C. A. (2006). Bibliometria: evolução histórica e questões atuais. Em Questão, 12(1), 11-32.

Argilés, R. O., Potters, L., & Vivarelli, M. (2008). The productivity impact of R&D investment: evidence from European Microdata. *Jena Economic Research Papers*. Retrieved from: https://www.researchgate.net/publication/45133802_The_productivity_impact_of_RD_investment_evidence_from_European_microdata

Armit, T. (2011). BC plan testing. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Arnaud, A. (2009). *Valorization of information dedicated to regional events in risk. An application on the Grenoble crown* (Doctoral thesis). Joseph Fourier University.

Arundel, A., Bloch, C., & Ferguson, B. (2019). *Advancing innovation in the public sector: Aligning innovation measurement with policy goals.* Obtido em 14 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0048733318302956

Asadi, S., Yadegaridehkordi, E., Nilashi, M., & Samad, S. (2019). Green Information Technology Adoption: A Systematic Literature Review. *Journal of Soft Computing and Decision Support Systems*, *6*(3), 8–17.

Atesoglu, H. S. (2002). Defense spending promotes aggregate output in the United States: Evidence from cointegration analysis. *Defence and Peace Economics*, *13*(1), 55–60. doi:10.1080/10242690210963

Audretsch, D. B., Belitski, M., & Desai, S. (2019). National business regulations and city entrepreneurship in Europe: A multilevel nested analysis. *Entrepreneurship Theory and Practice*, *43*(6), 1148–1165. doi:10.1177/1042258718774916

Audretsch, D. B., Lehmann, E. E., & Seitz, N. (2019). Amenities, subcultures, and entrepreneurship. *Small Business Economics*, 1–21.

Awad, M. A. (2005). A comparison between agile and traditional software development methodologies. University of Western Australia.

Ayoko, O. B., & Konrad, A. M. (2012). Leaders' transformational, conflict, and emotion management behaviours in culturally diverse workgroups. *Equality, Diversity and Inclusion*, *31*(8), 694–724. doi:10.1108/02610151211277581

BAE. (2018a). *Agile Business Analysis: Why you should start taking note of the Agile Extension to the BABOK Guide*. Available at: https://business-analysis-excellence.com/agile-business-analysis-start-taking-note-agile-extension-babok-guide/

BAE. (2018b). *Agile Business Analysis – The role of agile analysis, key principles and the planning horizons.* Available at: https://business-analysis-excellence.com/agile-business-analysis-the-role-of-agile-analysis-key-principles-and-the-planning-horizons/

Baiden, A., Price, B., & Dainty, A. (2006). The extent of team integration within construction projects. *International Journal of Project Management, 24*, 13-26. Obtido de https://s3.amazonaws.com/academia.edu.documents/43431814/The_extent_of_team_integration_within_co20160306

Baier-Fuentes, H., Merigó, J. M., Amorós, J. E., & Gaviria-Marín, M. (2019). International entrepreneurship: A bibliometric overview. *The International Entrepreneurship and Management Journal*, *15*(2), 385–429. doi:10.100711365-017-0487-y

Baiyere, A., Salmela, H., & Tapanainen, T. (2020). Digital transformation and the new logics of business process management. *European Journal of Information Systems*, 1–22. doi:10.1080/0960085X.2020.1718007

Bajdak, A. (2013). Automatyzacja komunikacji marketingowej w Internecie. *Handel Wewnętrzny, 3*, 31-32.

Balaouras, S. (2015). The State of Business Continuity Preparedness. *Disaster Recovery Journal*.

Baptista, P., Fernández, C., & Hernández, R. (2010). *Metodología de la investigación*. Editorial The McGraw-Hill.

Barney, J. B., & Arikan, A. M. (2001). The resource-based view: origins and implications. In The Blackwell handbook of strategic management. Oxford: Blackwell Publishers Ltd.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99–120. doi:10.1177/014920639101700108

Barnwell, D., Nedrick, S., Rudolph, E., Sesay, M., & Wellen, W. (2014). Leadership of International and Virtual Project Teams. *International Journal of Global Business*, *7*(2).

Bashshur, M. R., Hernández, A., & González-Romá, V. (2011). When managers and their teams disagree: A longitudinal look at the consequences of differences in perceptions of organizational support. *The Journal of Applied Psychology*, *96*(3), 558–573. doi:10.1037/a0022675 PMID:21341884

Bass, B. M., & Avolio, B. J. (1994). *Improving organizational effectiveness through transformational leadership*. Sage.

Bass, B. M., & Avolio, B. J. (1995). *The Multifactor Leadership Questionnaire*. Mind Garden.

Bass, B. M., Avolio, B. J., Jung, D. I., & Berson, Y. (2003). Predicting unit performance by assessing transformational and transactional leadership. *The Journal of Applied Psychology*, *88*(2), 207–218. doi:10.1037/0021-9010.88.2.207 PMID:12731705

Basu, R. (2019). *15 Best GIS Software in 2020 for Analysing Geospatial Data*. Retrieved from https://www.techjockey.com/blog/top-gis-software-for-analysing-geographic-data

Bates, P. (2003). *T-Learning - Final Report. Report prepared for the European Community IST Programme*. PJB Associates. Retrieved April 20, 2010 from: http://www.pjb.co.uk/t-learning/contents.htm

Batra, P. (2016). *Education in conflict: Redefining the contours of change.* In Keynote Presentation at BERA (British Educational Research Association) annual conference, Leeds University, Leeds, UK.

Baum, T., Amoah, V., & Spivack, S. (1997). Policy dimensions of human resource management in the tourism and hospitality industries. *International Journal of Contemporary Hospitality Management, 9*, 221–229.

Baum, T. (2006). Human resources issues in the tourism of extreme island destinations. In G. Baldacchino (Ed.), *Extreme tourism: Lessons from the World's Cold-Water Islands*. Elsevier.

Baum, T. (2007). Recursos humanos no turismo: Ainda à espera de mudanças. *Tourism Management*, *28*(6), 1383–1399. doi:10.1016/j.tourman.2007.04.005

Baum, T. (2015). Human resources in tourism: Still waiting for change? - A 2015 reprise. *Tourism Management*, *50*, 204–212. doi:10.1016/j.tourman.2015.02.001

Baum, T., Cheung, C., Kong, H., Kralj, A., Mooney, S., Thi Thanh, H. N., Ramachandran, S., Ružic, M. D., & Siow, M. L. (2016). Sustainability and the tourism and hospitality workforce: A thematic analysis. *Sustainability*, *8*(8), 809. doi:10.3390u8080809

BCI. (2019, May 5). *GPG Lite 2018 Edition.* Retrieved from Business Continuity Institute: https://www.thebci.org/resource/gpg-lite-2018-edition.html

Be My Eyes. (2020). *Be My Eyes – Portal*. Retrieved from https://www.bemyeyes.com/

Becker, C., Betz, S., Chitchyan, R., Duboc, L., Easterbrook, S. M., Penzenstadler, B., Seyff, N., & Venters, C. (2016). Requirements: The Key to Sustainability. *IEEE Software*, *33*(1), 56–65. doi:10.1109/MS.2015.158

Becker, C., Chitchyan, R., Duboc, L., Easterbrook, S., Penzenstadler, B., Seyff, N., & Venters, C. (2015). Sustainability Design and Software: The Karlskrona Manifesto. *Proc. 37th International Conference on Software Engineering (ICSE 15)*. 10.1109/ICSE.2015.179

Beck, N., & Rygl, D. (2015). Categorization of multiple channel retailing in Multi-, Cross-, and Omni-Channel Retailing for retailers and retailing. *Journal of Retailing and Consumer Services*, *27*, 170–178. doi:10.1016/j.jretconser.2015.08.001

Bednall, T. C., & Rafferty, A., Shipton, H., Sanders, K., & Jackson, C. (2018). Innovative behaviour: How much transformational leadership do you need? *British Journal of Management*, *29*(4), 796–816. doi:10.1111/1467-8551.12275

Beheshtifar, M., & Zare, E. (2013). Interpersonal conflict: A substantial factor to organizational failure. *International Journal of Academic Research in Business and Social Sciences*, *3*(5), 400.

Berman, S. J. (2012). Digital transformation: Opportunities to create new business models. *Strategy and Leadership*, *40*(2), 16–24. doi:10.1108/10878571211209314

Berry, D., & Lawrence, B. (1998). Requirements Engineering. *IEEE Software*, *15*(2), 26–29. doi:10.1109/MS.1998.663780

Bessant, J., & Tidd, J. (2007). *Innovation and entrepreneurship*. John Wiley & Sons.

Beyari, H., & Abareshi, A. (2018). Consumer satisfaction in social commerce: An exploration of its antecedents and consequences. *Journal of Developing Areas*, *52*(2), 55–72. doi:10.1353/jda.2018.0022

Beyene, K. T., Shi, C. S., & Wu, W. W. (2016). Linking culture, organizational learning orientation and product innovation performnace: The case of Ethiopian manufacturing firms. *South African Journal of Industrial Engineering*, *27*(1), 88–101. doi:10.7166/27-1-1334

Bianchi, I., & Sousa, D. (2015). *Governança de TI em universidades públicas: Proposta de um modelo*. Obtido de CAPSI'2015: http://hdl.handle.net/1822/39467

Biblioteca Nacional de Portugal (BNP). (2018). *Leitura para Deficientes Visuais – Recursos áudio*. Retrieved from http://www.bnportugal.gov.pt/index.php?option=com_content&view=article&id=123&Itemid=128&lang=pt

Biddle, R., Noble, J., & Tempero, E. (2000). *Patterns for Essential Use Cases*. School of Mathematical and Computing Sciences, Victoria University of Wellington, New Zealand, Technical Report CS-TR-01/02.

Binnui, A., & Cowling, M. (2016). A conceptual framework for measuring entrepreneurship of young hi-technology firms. *GSTF Journal on Business Review*, *4*(3), 32–47.

Bjarnason, E., Wnuk, K., & Regnell, B. (2011, July). A case study on benefits and side-effects of agile practices in large-scale requirements engineering. In *Proceedings of the 1st Workshop on Agile Requirements Engineering* (p. 3). ACM. 10.1145/2068783.2068786

Blind Help Project. (2020). *Envisioning a Brighter Tomorrow Through the Lens of Technology*. Retrieved from https://blindhelp.net/

Blindy.TV. (2018). *Good Bye from Blindy.TV*. Retrieved from http://blindy.tv/

Bohm, C. (2013). Cultural Flexibility in ICT Projects: A New Perspective on Managing Diversity in Project Teams. *Global Journal of Flexible Systems Managment*, *14*(2), 115–122. doi:10.100740171-013-0037-6

Bonchek, M., & Choudary, S. (2013). *Three Elements of a Successful Platform Strategy*. Retrieved 19 October 2019, from https://hbr.org/2013/01/three-elements-of-a-successful-platform

Bonnici, A. (2005). WebGIS Software Comparision Framework. Geomatics Dpt., Sir Sandford Fleming College.

Bono, J. E., Boles, T. L., Judge, T. A., & Lauver, K. J. (2002). The role of personality in task and relationship conflict. *Journal of Personality*, *70*(3), 311–344. doi:10.1111/1467-6494.05007 PMID:12049163

Booch, G., Jacobson, I., & Rumbaugh, J. (1999). *The Unified Modeling Language User Guide*. Addison-Wesley.

Booch, G. (2015). The future of software engineering: keynote. *Proc. 37th International Conference on Software Engineering (ICSE 15)*.

Borda, A., Geleilate, J. M. G., Newburry, W., & Kundu, S. K. (2017). Firm internationalization, business group diversification and firm performance: The case of Latin American firms. *Journal of Business Research*, *72*, 104–113. doi:10.1016/j.jbusres.2016.11.006

Borins, S. (2006). *The Challenge of Innovating in Governement*. IBM Center for The Business of Governement.

Borkowski, K. (2017). *Współczesne determinanty zarządzania operacyjnego w kontekście kształtowania strategii przedsiębiorstwa*. Academic Press.

Bornay-Barrachina, M. (2013). ¿Qué hace a los equipos ser más innovadores? El liderazgo desde una perspectiva de multidominio. *Cuadernos de Economía y Dirección de la Empresa*, *16*(1), 41–53. doi:10.1016/j.cede.2012.05.002

Boselie, P., Paauwe, J., & Richardson, R. (2003). Human resource management, institutionalization and organizational performance: A comparison of hospitals, hotels and local government. *International Journal of Human Resource Management*, *14*(8), 1407–1429. doi:10.1080/0958519032000145828

Bose, R., & Luo, X. (2011). Integrative framework for assessing firms' potential to undertake Green IT initiatives via virtualization—A theoretical perspective. *The Journal of Strategic Information Systems*, *20*(1), 38–54. doi:10.1016/j.jsis.2011.01.003

Boudreau, M.-C., Chen, A., & Huber, M. (2008). Green IS: Building sustainable business practices. *Information systems: A global text*, 1-17.

Bouncken, R., Brem, A., & Kraus, S. (2016). Multi-cultural teams as sources for creativity and innovation: The role of cultural diversity on team performance. *International Journal of Innovation Management*, *20*(01), 1650012. doi:10.1142/S1363919616500122

Bowser, J., Saxena, S., Fraser, H., & Marshall, A. (2017). *A Healthy Outlook: Digital Reinvention in Healthcare. IBM Institute for Business Value*. IBM Corporation. Retrieved from: https://www.ibm.com/thought-leadership/institute-business-value/report/drhealthcare

Boyd, D. M., & Ellison, N. B. (2008). Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication*, *13*(1), 210–230. doi:10.1111/j.1083-6101.2007.00393.x

Brace, J. (2018). *Bring Your Own Device (BYOD).* Obtido em 29 de janeiro de 2020, de https://static2.avg.com/20180418/web/o/pdfs/AVG-Biz-eBook-Bring-Your-Own-Device.pdf

Brame, C. J. (2015). *Effective educational videos*. Retrieved January 5, 2019 from http://cft.vanderbilt.edu/guides-sub-pages/effective-educational-videos/

Brandt, J. (2015). *Business Continuity and Disaster Recovery Planning.* Tulsa: Stinnett & Associates LLC.

Branstetten, L. G. (2001). Are knowledge spillovers international or intranational in scope?:Microeconometric evidence from the U.S. and Japan. *Journal of International Economics*, *53*(1), 53–79. doi:10.1016/S0022-1996(00)00068-4

Brem, A., & Giones, F. (2017). Digital Technology Entrepreneurship: A Definition and Research Agenda. *Technology Innovation Management Review*, *7*(5), 44–51. doi:10.22215/timreview/1076

Brennen, J. S., & Kreiss, D. (2016). Digitalization. In K. B. Jensen, E. W. Rothenbuhler, J. D. Pooley, & R. T. Craig (Eds.), *The International Encyclopedia of Communication Theory and Philosophy* (pp. 556–566). Wiley-Blackwell. doi:10.1002/9781118766804.wbiect111

Brewster, S. (2002). Overcoming the lack of screen space on mobile computers. *Personal and Ubiquitous Computing*, (6), 188-205.

Briani, V., Marrone, A., Molling, C., & Valasek, T. (2013). *The development of a European Defense and Technological Base (EDTIB) Directorate- General of For External Policies of the Union - European Parliament*. Retrieved from: https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/433838/EXPO-SEDE_ET28201329433838_EN.pdf

Briggs, B., & Kassner, E. (2017). *Enterprise Cloud Strategy* (2nd ed.). Microsoft Press.

Bronner, F., & de Hoog, R. (2010). Vacationers and eWOM: Who Posts, and Why, Where, and What? *Journal of Travel Research*, *50*(1), 15–26. doi:10.1177/0047287509355324

Bronte-Stewart, M. (2015). Beyond the Iron Triangle: Evaluating Aspects of Success and Failure using a Project Status Model. *Computing and Information Systems Journal, 19*, 19-36.

Browder, R. E., Aldrich, H. E., & Bradley, S. W. (2019). The emergence of the maker movement: Implications for entrepreneurship research. *Journal of Business Venturing*, *34*(3), 459–476. doi:10.1016/j.jbusvent.2019.01.005

Brush, C., Edelman, L. F., Manolova, T., & Welter, F. (2019). A gendered look at entrepreneurship ecosystems. *Small Business Economics*, *53*(2), 393–408. doi:10.100711187-018-9992-9

Brzoska, M. (2006). *Trends in global military and civilian research and development (R&D) and their changing interface.* Retrieved from: https://ifsh.de/pdf/aktuelles/india_brzoska.pdf

Buhalis, D. (2002). eTourism: Information Technology for Strategic Tourism Management (1st ed.). Pearson.

Burner, O. Y., Cunningham, P., & Hattar, H. S. (1990). Managing a multicultural nurse staff in a multicultural environment. *The Journal of Nursing Administration*, *20*(6), 30–34. doi:10.1097/00005110-199006000-00006 PMID:2348248

Burns, P. (2011). *Entrepreneurship and small businesses: Start-up, growth and maturity* (3rd ed.). Palgrave MacMillan. doi:10.1007/978-0-230-20848-3

Caetano, D., & Silveira, M.C. (2009). A problemática da Ética na Engenharia de Software. *9ª Conferência da Associação Portuguesa de Sistemas de Informação (CAPSI 2009)*.

Cairo, S. (2013). *Geographic information systems: Main concepts*. Lisbon. *Ed. Autor*, *2013*, 41.

Callele, D., Wnuk, K., & Penzenstadler, B. (2017). New Frontiers for Requirements Engineering. *IEEE 25th International Requirements Engineering Conference, 1*, 184-193.

Callistus, T., & Clinton, A. (2018). The Role of Monitoring and Evaluation in Construction Project Management. *Intelligent Human Systems Integration*, 571-582. doi:10.1007/978-3-319-73888-8_89

Campos, P. H., Mobarec, E. M., Soto, S. O., & Nazel, P. C. F. (2007). Cuantificación de las distancias culturales entre países: Un análisis de latinoamérica. *Cuadernos Americanos*, *20*(33), 253–272.

Camps, D., Samar, M.E., Ávila, R.E., & Recuero, Y. (2006). Estudio bibliométrico de un volumen de la revista Archivos de Medicina. *Arch Med., 2*(3).

Cao, L., & Ramesh, B. (2008). Agile requirements engineering practices: An empirical study. *IEEE Software*, *25*(1), 60–67. doi:10.1109/MS.2008.1

Capes – Coordenação de Aperfeiçoamento de pessoal de Nível Superior. (2017). Acervo.

Carberry, E. J., Bharati, P., Levy, D. L., & Chaudhury, A. (2019). Social movements as catalysts for corporate social innovation: Environmental activism and the adoption of green information systems. *Business \& Society, 58*(5), 1083-1127.

Carmo, H., & Ferreira, M. M. (2008). Metodologia da Investigação: Guia para Auto-Aprendizagem (2a). Lisboa: Universidade Aberta.

Carroll, T. (2011). Planning to Recover Your Data: More Options. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Carvalho, J., & Raposo, R. (2012). O Potencial dos Social Media como Ferramenta de Comunicação dos Museus com o seu Público através do Digital. *Revista Comunicando, 1*(1), 223–234. Retrieved from http://revistacomunicando.sopcom.pt/ficheiros/20130108-social_media.pdf

Casado-Díaz, A. B., Andreu, L., Beckmann, S. C., & Miller, C. (2020). Negative online reviews and webcare strategies in social media: Effects on hotel attitude and booking intentions. *Current Issues in Tourism*, *23*(4), 418–422. doi:10.1080/13683500.2018.1546675

Castells, M. (2009). *The Rise of the Network Society* (2nd ed., Vol. 1). Wiley-Blackwell. doi:10.1002/9781444319514

CCC Financial Report 201. (n.d.). Retrieved 11 November 2019, from https://firma.ccc.eu/pl/22,raporty.html

CCC Group Operations Report. (n.d.). Retrieved 11 November 2019, from https://firma.ccc.eu/pl/22,raporty.html

CCC Quarter Reports Years 2004 – 2006. (n.d.). Retrieved 11 November 2019, from https://firma.ccc.eu/pl/27,prezentacje.html

Centobelli, P., Cerchione, R., & Esposito, E. (2020). *Pursuing supply chain sustainable development goals through the adoption of green practices and enabling technologies: A cross-country analysis of LSPs.* Obtido em 15 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0040162519306341

Chaffey, D., Edmundson-Bird, D., & Hemphill, T. (2019). *Digital business and e-commerce management* (7th ed.). Pearson.

Chambel, T., & Guimarães, N. (2000). Aprender com Vídeo em Hipermédia. *Sistemas de Informação, 12*, 85-98.

Charters, I. (2011). Risk evaluation and control: practical guidelines for risk assessment. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Cheng, C. Y., Chua, R. Y., Morris, M. W., & Lee, L. (2012). Finding the right mix: How the composition of self-managing multicultural teams' cultural value orientation influences performance over time. *Journal of Organizational Behavior*, *33*(3), 389–411. doi:10.1002/job.1777

Chen, L., Zheng, W., Yang, B., & Bai, S. (2016). Transformational leadership, social capital and organizational innovation. *Leadership and Organization Development Journal*, *37*(7), 843–859. doi:10.1108/LODJ-07-2015-0157

Chen, P., Lee, C., & Chiu, Y. (2014). The nexus between defense expenditure and economic growth: New global evidence. *Economic Modelling*, *36*, 474–74. doi:10.1016/j.econmod.2013.10.019

Chen, S., & Lamberti, L. (2016). Multichannel marketing: The operational construct and firms' motivation to adopt. *Journal of Strategic Marketing*, *24*(7), 594–616. doi:10.1080/0965254X.2016.1148759

Chen, T. J., & Wu, C. M. (2020). Can newcomers perform better at hotels? Examining the roles of transformational leadership, supervisor-triggered positive affect, and perceived supervisor support. *Tourism Management Perspectives*, *33*, 100587. doi:10.1016/j.tmp.2019.100587

Chen, Y., Tang, G., Jin, J., Xie, Q., & Li, J. (2014). CEO s′ transformational leadership and product innovation performance: The roles of corporate entrepreneurship and technology orientation. *Journal of Product Innovation Management*, *31*, 2–17. doi:10.1111/jpim.12188

Chiang, M., Cole, R., Gupta, S., Kaiser, G., & Starren, J. (2005). Computer and World Wide Web Accessibility by Visually Disabled Patients: Problems and Solutions. *Survey of Ophthalmology*, *50*(4), 394–405. doi:10.1016/j.survophthal.2005.04.004 PMID:15967193

Chiavenato, I. (2003). *Administração de Recurso Humano: Fundamentos Básicos* (5th ed.). Atlas.

Cho, J. J. (2010). An exploratory study on issues and challenges of agile software development with scrum. *All Graduate theses and dissertations, 599*.

Choi, S. B., Kim, K., Ullah, S. E., & Kang, S. W. (2016). How transformational leadership facilitates innovative behavior of Korean workers. *Personnel Review*, *45*(3), 459–479. doi:10.1108/PR-03-2014-0058

Chorianopoulos, K., & Spinellis, D. (2006). User Interface Evaluation of Interactive TV: A Media Studies Perspective. *Universal Access in the Information Society*, *5*(2), 2006. doi:10.100710209-006-0032-1

Chou, C. J. (2014). Hotels' environmental policies and employee personal environmental beliefs: Interactions and outcomes. *Tourism Management*, *40*, 436–446. doi:10.1016/j.tourman.2013.08.001

Choudary, S. (n.d.a). *A Platform Thinking approach to building a business.* Retrieved 19 October 2019, from http://platformed.info/a-platform-thinking-approach-business-engine-scale/

Choudary, S. (n.d.b). *The Lepore-Christensen Debate: A repeatable pattern for Platforms and Disruptive Innovation*. Retrieved 19 October 2019, from http://platformed.info/lepore-christensen-disruptive-innovation-airbnb/

Chowdhury, F., Audretsch, D. B., & Belitski, M. (2019). Institutions and entrepreneurship quality. *Entrepreneurship Theory and Practice*, *43*(1), 51–81. doi:10.1177/1042258718780431

Christensen, J. (2015). *Digital business in the digital age*. Books on Demand.

Chua, R. Y., Morris, M. W., & Mor, S. (2012). Collaborating across cultures: Cultural metacognition and affect-based trust in creative collaboration. *Organizational Behavior and Human Decision Processes*, *118*(2), 116–131. doi:10.1016/j.obhdp.2012.03.009

Chung, N., Han, H., & Koo, C. (2015). Adoption of travel information in user-generated content on social media: The moderating effect of social presence. *Behaviour & Information Technology*, *34*(9), 902–919. doi:10.1080/0144929X.2015.1039060

Cibersegurança, C. N. (2017). *A Seguranaça da Informação - Informação ao Colaborador.* Obtido em 13 de fevereiro de 2020

Cisco. (2017). *Domino's Delivers Explosive Growth with Cisco-Driven Digital Transformation*. Retrieved 11 November 2019, from https://www.cisco.com/c/dam/en_us/about/case-studies-customer-success-stories/dominos-case-study.pdf

CMMI Institute. (2019b, February 2). *Introducing CMMI V2.0*. Retrieved from CMMI Institute: https://cmmiinstitute.com/cmmi

CMMI Institute. (2019c, February 18). *General Info On CMMI V2.0*. Retrieved from CMMI Institute, an ISACA Enterprise: https://cmmiinstitute.zendesk.com/hc/en-us/sections/115003724087-General-Info-on-CMMI-V2-0

CNPD. (2018). *O que é a CNPD, Comissão Nacional de Proteção de Dados*. Retrieved from: https://www.cnpd.pt/bin/cnpd/acnpd.htm

CNPD. (2018). *O que é a CNPD*. Comissão Nacional de Proteção de Dados. https://www.cnpd.pt/bin/cnpd/acnpd.htm

COBIT. (2019). *COBIT 2019 Framework - Governance and Management Objectives.* Schaumburg, IL: ISACA.

Cockburn, A. (2004). *Crystal clear: a human-powered methodology for small teams*. Pearson Education.

Coelho, P. (2017). *Internet das Coisas, introdução prática*. FCA - Editora de Informática, Lda.

Collabnet Versione. (2019). *StateofAgile Report: 13th Annual State Of Agile Report*. Available at: https://www.stateofagile.com/#ufh-i-521251909-13th-annual-state-of-agile-report/473508

CollabNet. (2019). 13th Annual State of Agile Survey. *CollabNet VersionOne Inc*. Retrieved from: www.stateofagile.com/#ufh-c-473508-state-of-agile-report

Conboy, K. (2009). Agility from first principles: Reconstructing the concept of agility in information systems development. *Information Systems Research*, *20*(3), 329–354. doi:10.1287/isre.1090.0236

Connor, P. O. (2011). An analysis of the use of Facebook by international hotel chains. International Council on Hotel, Restaurant and Institutional Education (CHRIE) Conference.

Content, J., Frenken, K., & Jordaan, J. A. (2019). Does related variety foster regional entrepreneurship? Evidence from European regions. *Regional Studies*, 1–13. doi:10.1080/00343404.2019.1680827

Cook, J., & Wall, T. (1980). New work attitude measures of trust, organizational commitment and personal need non-fulfillment. *Journal of Occupational Psychology*, *53*(1), 39–52. doi:10.1111/j.2044-8325.1980.tb00005.x

Coral, E. (2002). *Modelo de Planeamento Estratégico para a Sustentabilidade Empresarial.* Obtido em 12 de dezembro de 2019, de Tese de Doutoramento. Universidade Federal de Santa Catarina. Brasil: https://repositorio.ufsc.br/bitstream/handle/123456789/82705/189235.pdf?sequence=1&isAllowed=y

Cornish, M. (2011). Business Continuity Management Methodology. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Costa, J., Montenegro, M., & Gomes, J. (2018). What challenges and opportunities will lead to success? *Worldwide Hospitality and Tourism Themes*, *10*(6), 631–634. doi:10.1108/WHATT-08-2018-0053

CoTV. (2011). Retrieved April 20, 2015 from http://www.teleshuttle.com/cotv/default.htm

Coupey, E. (2016). *Digital business*. Routledge. doi:10.4324/9781315506418

Covey, S., & Huling, J. (2012). The 4 Disciplines of Execution: Achieving Your Wildly Important Goals. *New York Times*.

Crespo, A., Encabo, I., Chacin, C., & Diaz, M. (2018). Mobile Devices, a Complement to Television. Case Studies. In M. Abásolo, J. Abreu, P. Almeida, & T. Silva (Eds.), *Applications and Usability of Interactive Television. JAUTI 2017. Communications in Computer and Information Science* (Vol. 813). Springer.

CSPSS (2019). *Centro Social Paroquial de São Sebastião*. Documento interno.

Cuofano, G. (2019). *Digital Business Models Map: The Most Popular Digital Business Model Types - FourWeekMBA*. Retrieved 21 October 2019, from https://fourweekmba.com/digital-business-models/

Curcija, M., Breakey, N., & Driml, S. (2019). Development of a conflict management model as a tool for improved Project outcomes in community based tourism. *Tourism Management*, *70*, 341–354. doi:10.1016/j.tourman.2018.08.016

d'Agostino, G., Dunne, J. P., & Pieroni, L. (2012). Corruption, military spending and growth. *Defence and Peace Economics*, *23*(6), 591–604. doi:10.1080/10242694.2012.663579

Dakss, S., Agamanolis, S., Bove, V., & Chalom, E. (1998). Hyperlinked Video. *Proceedings of SPIE Multimedia Systems and Applications*, 3528.

Damásio, M. (2010). iDTV-HEALTH: Inclusive services to promote health and wellness via digital interactive television. Presented at National CoLab Event 2010, Lisbon, Portugal.

Daneva, M. (2000). Establishing Reuse Measurement Practices in SAP Requirements Engineering. *ICRE 2000: 4th IEEE International Conference*. 10.1109/ICRE.2000.855607

Daneva, M., & Wieringa, R. (2008). Cost estimation for cross-organizational ERP projects: research per-spectives. Software Quality Journal, 16(3), 459-481.

Daneva, M. (2004). ERP Requirements Engineering Practice: Lessons Learned. *EEE Software*, *21*(2), 26–33. doi:10.1109/MS.2004.1270758

DARPA. (n.d.). *DARPA's commitment to small businesses*. Retrieved from: https://www.darpa.mil/work-with-us/commitment-to-small-businesses

Davenport, T., & Prusak, L. (1998). *Conhecimento Empresarial*. Campus.

Davis, M. (1994). Fifteen Principles of Software Engineering. *IEEE Software*, *11*(6), 94–96, 101. doi:10.1109/52.329409

Dawson, A., Hirt, M., & Scanlan, J. (2016). *The economic essentials of digital strategy*. Retrieved 12 November 2019, from https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-economic-essentials-of-digital-strategy

De Dreu, C. K. W., & Weingart, L. R. (2003). Task Versus Relationship Conflict, Team Performance, and Team Member Satisfaction: A Meta-Analysis. *The Journal of Applied Psychology*, *88*(4), 741–749. doi:10.1037/0021-9010.88.4.741 PMID:12940412

De Jong, J., & Den Hartog, D. (2010). Measuring innovative work behaviour. *Creativity and Innovation Management*, *19*(1), 23–36. doi:10.1111/j.1467-8691.2010.00547.x

De Lucia, A., & Qusef, A. (2010). Requirements engineering in agile software development. *Journal of Emerging Technologies in Web Intelligence*, *2*(3), 212–220. doi:10.4304/jetwi.2.3.212-220

De Wit, F. R. C., Greer, L. L., & Jehn, K. A. (2012). The paradox of intragroup conflict: A meta-analysis. *The Journal of Applied Psychology*, *97*(2), 360–390. doi:10.1037/a0024844 PMID:21842974

Del Barrio, S., & Luque, T. (2000). *Técnicas de análisis de datos en investigación de mercados*. Pirámide.

DeMarco, T. (1997). *The Deadline: A Novel About Project Management*. Academic Press.

DeMarco, T., & Lister, T. (2003). Risk Management During Requirements. *IEEE Software*, *20*(5), 99–101. doi:10.1109/MS.2003.1231163

Demil, B., Lecocq, X., Ricart, J. E., & Zott, C. (2015). Introduction to the SEJ special issue on business models: Business models within the domain of strategic entrepreneurship. *Strategic Entrepreneurship Journal*, *9*(1), 1–11. doi:10.1002ej.1194

Deng, Q., & Shaobo, J. (2015). Organizational Green IT Adoption: Concept and Evidence. *Sustainability, 7(12), 16737-16755*. doi:10.3390u71215843

Desli, E., Gkoulgkoutsika, A., & Katrakilidis, C. (2017). Investigating the dynamic interaction between military spending and economic growth. *Review of Development Economics*, *21*(3), 511–526. doi:10.1111/rode.12268

Dessler, G. (2003). *Administração de recursos humanos*. Prentice Hall.

Devaney, E. (2017). *8 Guidelines for Exceptional Web Design, Usability, and User Experience*. Retrieved February 8, 2018 from https://blog.hubspot.com/blog/tabid/6307/bid/30557/6-guidelines-for-exceptional-website-design-and-usability.aspx

Diaz-Fernandez, M., Bornay-Barrachina, M., & Lopez-Cabrales, A. (2015, April). Innovation and firm performance: the role of human resource management practices. *Evidence-based HRM: a Global Forum for Empirical Scholarship, 3*(1), 64-80. 10.1108/EBHRM-10-2012-0012

Dimitrova, N., Zimmerman, J., Janevski, A., Agnihotri, L., Haas, N., & Bolle, R. (2003). Content Augmentation Aspects of Personalized Entertainment Experience. *Proceedings of the UM 2003, third Workshop on Personalization in Future TV*, 42-51.

Dingsøyr, T., Dybå, T., & Moe, N. B. (2010). *Agile software development: current research and future directions*. Springer Science & Business Media. doi:10.1007/978-3-642-12575-1

Dingsøyr, T., & Moe, N. B. (2014). Towards principles of large-scale agile development. *International Conference on Agile Software Development*, 1-8.

DocuSign. (2019). *Quem Somos*. Obtido em 05 de Junho de 2019, de https://www.docusign.com.br/quem-somos

DOD. (2020). *Small businesses strategy submitted to congress. Industrial Policy – Department of Defense.* Retrieved from: https://www.businessdefense.gov/News/News-Display/Article/2064882/dod-small-business-strategy-submitted-to-congress/

Domino's Pizza Group (DOM). (2019). *Ordinary shares. Google finance*. Retrieved 11 November 2019 from https://www.hl.co.uk/shares/shares-search-results/d/dominos-pizza-group-plc-ordinary

Domino's Pizza. (2019). *2018 Annual report*. Retrieved from http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_DPZ_2018.pdf

Domino's. (2019). *Domino's Anyware*. Retrieved 11 November 2019, from https://anyware.dominos.com/

Donati, M., Iacopetti, F., Celli, A., Roncella, R., & Fanucci, L. (2020). An Aid System for Autonomous Mobility of Visually Impaired People on the Historical City Walls in Lucca, Italy. In S., Paiva (Ed). Technological Trends in Improved Mobility of the Visually Impaired (pp. 379-411). EAI/Springer Innovations in Communication and Computing. Springer, Cham. doi:10.1007/978-3-030-16450-8_16

Donckels, R., & Miettinen, A. (2019). *Entrepreneurship and SME research: on its way to the next millennium*. Routledge. doi:10.4324/9780429422720

Dora, S. K., & Dubey, P. (2015). Software Development Life Cycle (SDLC) Analytical Comparison and Survey on Traditional and Agile Methodology. *National Monthly Referred Journal of Research Science and Technology, 2*(8).

Drobyazko, S., Hryhoruk, I., Pavlova, H., Volchanska, L., & Sergiychuk, S. (2019). Entrepreneurship innovation model for telecommunications enterprises. *Journal of Entrepreneurship Education*.

Drucker, P. (1994, Sept.). *The Theory of the Business. Harvard Business Review*.

Duarte, R., Reis, L., & Silveira, C. (2020). Team Members Evaluation - International Project Management. In R. Babo, N. Dey, & A. Ashour (Eds.), *Workgroups eAssessment Planning, Implementing and Analyzing Frameworks*. Springer.

Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2013). Introduction to business process management. In *Fundamentals of business process management* (pp. 1–31). Springer. doi:10.1007/978-3-642-33143-5_1

Dunne, J. P., & Nikolaidou, E. (2005). Military spending and economic growth in Greece, Portugal and Spain. *ResearchGate*. Retrieved from: https://www.researchgate.net/publication/228553733_Military_Spending_and_Economic_Growth_in_the_Peripheral_Economies_of_Europe_A_Causal_Analysis_for_Greece_Spain_and_Portugal

Dunne, J. P., & Tian, N. (2015). Conflict, economic growth and spillover effects in Africa. *Working Papers from Economic Research Southern Africa*, 561. Retrieved from: https://econpapers.repec.org/RePEc:rza:wpaper:561

Dutra, C. J. C., Mazza, A. A., & de Menezes, L. M. L. (2014). Innovation in Sustainable Products: Cross-Cultural Analysis of Bi-national Teams. *Revista de Gestão Ambiental e Sustentabilidade*, *3*(2), 149–164. doi:10.5585/geas.v3i2.105

Dyba, T., & Dingsoyr, T. (2009). What do we know about agile software development? *IEEE Software*, *26*(5), 6–9. doi:10.1109/MS.2009.145

Earley, C. P., & Mosakowski, E. (2000). Creating hybrid team cultures: An empirical test of transnational team functioning. *Academy of Management Journal*, *43*(1), 26–49.

Earley, P. C., & Mosakowski, E. (2004). Cultural intelligence. *Harvard Business Review*, *82*(10), 139–146. PMID:15559582

Ebert, C. (2007, June). The impacts of software product management. *Journal of Systems and Software*, *80*(6), 850–861. doi:10.1016/j.jss.2006.09.017

Edinger, S. K. (2012). *Transferring social capital from individual to team: An examination of moderators and relationships to innovative performance* (PhD thesis). Faculty of the Graduate School of the University of Maryland.

Egbreghts, A. (2017). A Literature Review of Behavior Driven Development using Grounded Theory. *27th Twente Student Conference on IT*.

Eisenberger, R., Fasolo, P., & Davis-LaMastro, V. (1990). Perceived Organizational Support and Employee Diligence, Commitment, and Innovation. *The Journal of Applied Psychology*, *75*(1), 51–59. doi:10.1037/0021-9010.75.1.51

Ekwoaba, J., Ugochukwu, I., & Ufoma, N. (2015). The Impact Of Recruitment And Selection Criteria On Organizational Performance. *Global Journal of Human Resource Management*, *3*(2), 22–33.

Elliot, S. (2011). Transdisciplinary Perspectives on Environmental Sustainability: A Resource Base and Framework for IT–Enabled Business Transformation. *Management Information Systems Quarterly*, *35*(1), 197–236. doi:10.2307/23043495

EMC Digital Universe & IDC. (2014). *Driving Data Growth in Healthcare: Challenges & Opportunities for IT.* Retrieved 2019, January 12, from https://www.emc.com/analyst-report/digital-universe-healthcare-vertical-report-ar.pdf

Enginess. (2014). *The 6 Principles of Design, a la Donald Norman*. Retrieved October 5, 2017 from https://www.enginess.io/insights/6-principles-design-la-donald-norman

EPFL. (2019). *Tech4Impact Presents: EPFL's Contribution to the Sustainable Development Goals*. EPFL Showcase 2030 Report. Retrieved from: www.epfl.ch/innovation/domains/wp-content/uploads/2019/04/EPFL-SDG-Report.pdf

Eronen, L. (2004). *User Centered Design of New and Novel Products: Case Digital Television* (Doctoral thesis). Helsinki University of Technology.

ESOP. (2011). *European Symposium on Programming*. Retrieved from https://link.springer.com/conference/esop

Estrin, S., Mickiewicz, T., Stephan, U., & Wright, M. (2019). Entrepreneurship in Emerging Markets. In *The Oxford Handbook of Management in Emerging Markets* (p. 457). Oxford University Press.

European Commision. (2017). *Industry in Europe: Facts & figures on competitiveness and innovation*. Retrieved from: http://publications.europa.eu/resource/cellar/354c1e8b-1db0-11e7-aeb3-01aa75ed71a1.0001.03/DOC_1

European Commission. (2019, June 19). *Digital Inclusion for a better EU society, Shaping Europe's digital future – Policy.* Retrieved from https://ec.europa.eu/digital-single-market/en/digital-inclusion-better-eu-society

European Union. (2016). *Official Journal of the European Union, L*, *119*. Retrieved January 9, 2019, from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&qid=1587293345463&from=EN

EUROSTAT. (2018a). *Cloud Computing - Statistics on The Use by Enterprises.* Retrieved in 2019, January 9, from https://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises

EUROSTAT. (2018b). *Proportion of population aged 65 and over*. Retrieved in 2019, January 13, from https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tps00028&plugin=1

Evans, D., & Schmalensee, R. (2016). *What Platforms Do Differently than Traditional Businesses.* Retrieved 19 October 2019, from https://hbr.org/2016/05/what-platforms-do-differently-than-traditional-businesses

Evans, G. W., Wells, N. M., & Moch, A. (2003). Housing and mental health: A review of the evidence and a methodological and conceptual critique. *The Journal of Social Issues*, *V59*(3), 475–500. doi:10.1111/1540-4560.00074

Evans, J. W., & Gabel, A. L. (2013). Legal competitive advantage and legal entrepreneurship: A preliminary international framework. *NCJ Int'l L. & Com. Reg.*, *39*, 333.

FaceGIS.com. (2020). *Geographical Data Sets*. Retrieved from http://facegis.nuarsa.info/?id=3

Fagan, L. (2014), *Salesforce. How Cloud-Based Technology is Transforming the Healthcare Industry*. Retrieved in 2019, January 11, from https://www.salesforce.com/blog/2014/06/cloud-technology-health-care.html

Fancott, T., Kamthan, P., & Shahmir, N. (2012). Towards next generation requirements engineering. *2012 IEEE International Conference on Social Informatics*, 328-33. 10.1109/SocialInformatics.2012.11

Farh, J. L., Hackett, R. D., & Liang, J. (2007). Individual-level cultural values as moderators of perceived organizational support–employee outcome relationships in China: Comparing the effects of power distance and traditionality. *Academy of Management Journal*, *50*(3), 715–729. doi:10.5465/amj.2007.25530866

Farias, C., Fernandez, P., Hjorth, D., & Holt, R. (2019). *Organizational entrepreneurship, politics and the political*. Academic Press.

Felfe, J., & Goihl, K. (2002). Transformational leadership and commitment. *Organizational Development and Leadership*, *11*, 87-124.

Ferkoun, M. (2014), *Five Ways the Healthcare Industry Benefits from Cloud Computing*. IBM Corporation. Retrieved in 2019, January 13, from https://www.ibm.com/blogs/cloud-computing/2014/05/16/five-ways-the-healthcare-industry-benefits-from-cloud-computing/

Ferreira, I., Ferreira, S., Silva, C., & Carvalho, J. (2012). *Dilemas iniciais na investigação em TSI design science e design research, uma clarificação de conceitos*. Conferência Ibérica de Sistemas y Tecnologias de Informação.

Figueira, I., Domingues, A., Caeiro, S., Painho, M., Antunes, P., Santos, R., . . . Ramos, T. (2018). *Sustainability policies and practices in public sector organisations: The case of the Portuguese Central Public Administration.* Obtido em 14 de janeiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0959652618322339#!

Figueiredo, D. (2003). In R. Silva & A. Neves (Eds.), *Gestão do Conhecimento e Economias de Inovação Intensiva; Gestão de Empresas na Era do Conhecimento* (pp. 435–441). Edições Sílabo.

Filho, H. P. (2016). Como as organizações podem sobreviver às catástrofes e desastres? *Revista Banas Qualidade*, 30-35.

Firebase. (2019a). *Firebase Authentication*. Retrieved from: https://firebase.google.com/docs/auth

Firebase. (2019b). *Firebase Realtime Database*. Retrieved from: https://firebase.google.com/docs/database?authuser=0

Fleury, M. T. L. (2002). *As Pessoas na Organização*. Gente.

Flexera. (2020). *Flexera 2020 State of the Cloud Report*. Retrieved in 2020, March 20, from https://resources.flexera.com/web/pdf/report-state-of-the-cloud-2020.pdf?elqTrackId=8e710f56b1c44fe39130b0d6168944ed&elqaid=5770&elqat=2

Flora, H. K., & Chande, S. V. (2014). A systematic study on agile software development methodologies and practices. *International Journal of Computer Science and Information Technologies*, *5*(3), 3626–3637.

Florins, M., & Vanderdonckt, J. (2004). Graceful Degradation of User Interfaces as a Design Method for Multiplatform Systems. *Proceedings of the IUI'04*. 10.1145/964442.964469

Fonseca, E. N. (Org.). (1986). Bibliometria: teoria e prática. Cultrix/EDUSP.

Forbes. (2017). Forbes Technology Council. *13 Biggest Challenges When Moving Your Business to The Cloud*. Retrieved in 2019, January 9, from https://www.forbes.com/sites/forbestechcouncil/2017/06/05/13-biggest-challenges-when-moving-your-business-to-the-cloud/#7ef07cd19b0e

Fornell, C., & Larcker, D. F. (1981). *Structural equation models with unobservable variables and measurement error: Algebra and statistics.* Academic Press.

Fortunato, J. P. (2018). Assinatura de documentos em terminais móveis. Departamento de Engenharia Informática da Faculdade de Ciências e Tecnologia da Universidade de Coimbra.

Fotopoulos, G., & Storey, D. J. (2019). Public policies to enhance regional entrepreneurship: Another programme failing to deliver? *Small Business Economics*, *53*(1), 189–209. doi:10.100711187-018-0021-9

Fowler, M., & Highsmith, J. (2001). The agile manifesto. *Software Development*, *9*(8), 28–35.

Fox, D., Byrne, V., & Rouault, F. (1999). Performance improvement: What to keep in mind. *Training & Development*, *53*, 38–54.

Fraile, I., Núñez, J., Malewski, S., Artigas, X., Fernandez, S., & Llobera, J. (2017) An end-to-end toolset for the creation and delivery of video-based multi-device content. *Proc of JAUTI 2017 - 6th Iberoamerican Conference on Applications and Usability for Interactive TV*, 154-161.

Freedman, S., & Katz, L. (2007). Critical success factors for international projects. *PM World Today, 9*(10), 1-8.

Freitas, J. C. T. (2012). *Estratégia Organizacional: Utilizando a política de Treinamento e Desenvolvimento como Vantagem Competitiva*. IX Seget – Simpósio de Excelência em Gestão Tecnologia.

Friedman, T. L. (2007). *The World is Flat: A Brief History of the Twenty-first Century* (3rd ed.). Picador.

Fuchs, C. (2008). The Implications of New Information and Communication Technologies for Sustainability. *Environment, Development and Sustainability*, *10*(3), 291–309. doi:10.100710668-006-9065-0

Furr, N. (2016). *Transitioning Your Company from Product to Platform*. Retrieved 19 October 2019, from https://hbr.org/2016/04/transitioning-your-company-from-product-to-platform

Galindo-Martín, M. A., & Méndez-Picazo, M. T. (2020). Value Creation, Innovation, and Entrepreneurship: Feedback Effects. In Analyzing the Relationship Between Innovation, Value Creation, and Entrepreneurship (pp. 1-20). IGI Global.

Gannon, J., & Johnson, K. (1995). The global hotel industry: The emergence of continental hotel companies. *Progress in Tourism and Hospitality Research*, *1*(1), 31–42.

Gartner Glossary. (2020a). Available at: https://www.gartner.com/en/information-technology/glossary/digitization

Gartner Glossary. (2020b). *Digitalization*. Available at: https://www.gartner.com/en/information-technology/glossary/digitalization

Gartner, Inc. (2017). *Cloud Strategy Leadership - Gartner Insights on How and Why Leaders Must Implement Cloud Computing.* Retrieved in 2019, January 8, from: https://www.gartner.com/en/publications/cloud-leadership

Gartner, Inc. (2019), *Advance Cloud Computing Capabilities - Create a cloud strategy to maximize the benefits of cloud computing*. Retrieved 2019, January 8, from https://www.gartner.com/en/information-technology/insights/cloud-strategy

Gartner. (2015). *Gartner Estimates ICT Industry Accounts for 2 Percent of Global CO2 Emissions*. Gartner. Retrieved from: https://www.gartner.com/newsroom/id/503867

Geerts, D., Cesar, P., & Bulterman, D. (2008). The Implications of Program Genres for the Design of Social Television Systems. *Proceedings of uxTV'08*, 71-80. 10.1145/1453805.1453822

Gianiodis, P. T., Meek, W. R., & Chen, W. (2019). Political climate and academic entrepreneurship: The case of strange bedfellows? *Journal of Business Venturing Insights*, *12*, e00135. doi:10.1016/j.jbvi.2019.e00135

Gichoya, D. (2005). Factors affecting the successful implementation of ICT projects in government. *The Electronic. Journal of E-Government*, *3*(4), 175–184.

Girardi, D. (2008). *Da seção de pessoal a gestão estratégica de pessoas: consultoria interna de recursos humanos*. Pandion.

Gisbert-López, M. C., Verdú-Jover, A. J., & Gómez-Gras, J. M. (2014). The moderating effect of relationship conflict on the creative climate–innovation association: The case of traditional sectors in Spain. *International Journal of Human Resource Management*, *25*(1), 47–67. doi:10.1080/09585192.2013.781525

Gisgeography.com. (2020). *13 Free GIS Software Options: Map the World in Open Source*. Retrieved from https://gisgeography.com/free-gis-software/

Go, F. M., & Govers, R. (2000). Integrated quality management for tourist destinations: A European perspective on achieving competitiveness. *Tourism Management*, *21*(1), 79–88. doi:10.1016/S0261-5177(99)00098-9

Goleman, D., & Boyatzis, R. M. (2002). *Os Novos Líderes: A Inteligência Emocio-nal nas Organizações*. Gradiva-Publicações, Lda.

González, A. M., & Nuria, R. L. (2013). A productivity and efficiency analysis of the security and Defense technological and industrial base in Spain. *Defence and Peace Economics*, *24*(2), 147–171. doi:10.1080/10242694.2012.663581

Good, A. (2008). *An Investigation of a Method for Improving Accessibility to Web-Based information for Users with Impairments* (Doctoral Thesis). University of Portsmouth, Portsmouth.

Goodhue, D., & Thompson, R. (1995). Task-Technology Fit and Individual Performance. *Management Information Systems Quarterly*, *19*(2), 213–236. doi:10.2307/249689

Goodwin, V. L., Whittington, J. L., Murray, B., & Nichols, T. (2011). Moderator or mediator? Examining the role of trust in the transformational leadership paradigm. *Journal of Managerial Issues*, 409–425.

Google. (2020). *TalkBack – Android Accessibility Help*. Retrieved from https://support.google.com/accessibility/android/topic/3529932?hl=en&ref_topic=9078845

Gorayeb, D. (2012). *Gestão de Continuidade de Negócios aplicada no ensino presencial mediado por recursos tecnológicos* (Master's Thesis). São Paulo.

Gottesdiener, E. (2003). Requirements by Collaboration: Getting It Right the First Time. *IEEE Software*, *20*(2), 52–55. doi:10.1109/MS.2003.1184167

Gough, G., & Longhurst, J. (2018). Monitoring Progress Towards Implementing Sustainability and Representing the UN Sustainable Development Goals (SDGs) in the Curriculum at UWE Bristol. In W. Leal Filho (Ed.), *Implementing Sustainability in the Curriculum of Universities: Approaches, Methods and Projects*. Springer. doi:10.1007/978-3-319-70281-0_17

Gracel, J., & Rodak, A. (n.d.). *Transformacja do przemysłu 4.0.* Retrieved 21 October 2019, from https://www.hbrp.pl/b/transformacja-do-przemyslu-40/PiYIsMRNo?NO_COOKIES=1

Gregory, A. (2019). *Subscription Business Model Explained*. Retrieved 21 October 2019, from https://www.thebalancesmb.com/how-a-subscription-business-model-works-4159768

Gretzel, U., Werthner, H., Koo, C., & Lamsfus, C. (2015). Conceptual foundations for understanding smart tourism ecosystems. *Computers in Human Behavior*, *50*, 558–563. doi:10.1016/j.chb.2015.03.043

Greve, P., Nielsen, S., & Ruigrok, W. (2009). Transcending borders with international top management teams: A study of European financial multinational corporations. *European Management Journal*, *27*(3), 213–224. doi:10.1016/j.emj.2008.10.001

Guellec, D., & Potterie, B. P. (2001). R&D and productivity growth: Panal data analysis of 16 OECD countries. *OECD Science, Technology and Industry Working Papers*. doi:10.1787/652870318341

Guérin, L. (2010). *Transmedia, crossmedia, multimedia, plurimedia… What if we had to describe these notions to someone working in a completely different field?* Transmedia Lab. Retrieved April 20 2015 from: http://www.transmedialab.org/en/economics/transmedia-crossmedia-multimedia-plurimedia-et-si-nous-devions-expliquer-ces-notions-a-quelquun-qui-travaille-dans-un-domaine-dactivite-completement-eloigne-2/

Guindani, A. (2008). *Gestão da Continuidade dos Negócios*. Integração.

Gundersen, G., Hellesøy, B. T., & Raeder, S. (2012). Leading international project teams: The effectiveness of transformational leadership in dynamic work environments. *Journal of Leadership & Organizational Studies*, *19*(1), 46–57. doi:10.1177/1548051811429573

Guo, R., Lv, S., Liao, T., Xi, F., Zhang, J., Zuo, X., . . . Zhang, Y. (2020). *Classifying green technologies for sustainable innovation and investment.* Obtido em 15 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0921344919304860

Gupta, V. (2019). The influencing role of social media in the consumer's hotel decision-making process. *Worldwide Hospitality and Tourism Themes*, *11*(4), 378–391. doi:10.1108/WHATT-04-2019-0019

Ha, S., Kankanhalli, A., Kishan, J. S., & Huang, K. W. (2016). *Does social media marketing really work for online SMEs? An empirical study*. Academic Press.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1999). *Análisis multivariante* (Vol. 491). Prentice Hall.

Haley, B. (2017). *Designing the public sector to promote sustainability transitions: Institutional principles and a case study of ARPA-E.* Obtido em 14 de janeiro de 2020, de https://www.sciencedirect.com/science/article/pii/S2210422416300545

Hall, M. (2011). Publish and perish? Bibliometric analysis, journal ranking and assessment of research quality in tourism. *Tourism Management*, *32*(1), 16–27. doi:10.1016/j.tourman.2010.07.001

Hamelink, C. (2000). *The ethics of cyberspace*. Sage.

Hamilton, B. H., Papageorge, N. W., & Pande, N. (2019). The right stuff? Personality and entrepreneurship. *Quantitative Economics*, *10*(2), 643–691. doi:10.3982/QE748

Han, S. J., & Beyerlein, M. (2016). Framing the effects of multinational cultural diversity on virtual team processes. *Small Group Research*, *47*(4), 351–383. doi:10.1177/1046496416653480

Harris, J., & Deacon, J. (2011). Marketing in context – the marketing authenticity of owner/entrepreneurs of small firms: Case evidence from Welsh (UK) SME food and drink producers and retailers. *Small Enterprise Research*, *18*(1), 33–50. doi:10.5172er.18.1.33

Hartson, R., & Pyla, P. (2012). *The UX Book: Process and Guidelines for Ensuring a Quality User Experience*. Elsevier.

Hasik, J. (2008). *Arms and innovation: Entrepreneurship and alliances in the twenty-first century defense industry*. The University of Chicago Press. doi:10.7208/chicago/9780226318899.001.0001

Hau, E., & Aparício, M. (2008). Software internationalization and localization in web based ERP. *Proceedings of the 26th annual ACM international conference on Design of communication*. 10.1145/1456536.1456570

Hays, S., Page, S. J., & Buhalis, D. (2013). Social media as a destination marketing tool: Its use by national tourism organisations. *Current Issues in Tourism*, *16*(3), 211–239. doi:10.1080/13683500.2012.662215

He, C., Lu, J., & Qian, H. (2019). Entrepreneurship in China. *Small Business Economics*, *52*(3), 563–572. doi:10.100711187-017-9972-5

Hechavarria, D., Bullough, A., Brush, C., & Edelman, L. (2019). High-Growth Women's Entrepreneurship: Fueling Social and Economic Development. *Journal of Small Business Management*, *57*(1), 5–13. doi:10.1111/jsbm.12503

Hehn, J., & Uebernickel, F. (2018). The Use of Design Thinking for Requirements Engineering: An Ongoing Case Study in the Field of Innovative Software-Intensive Systems. *IEEE 26th International Requirements Engineering Conference (RE)*, 400-405.

Hellmann, T., & Thiele, V. (2019). Fostering Entrepreneurship: Promoting Founding or Funding? *Management Science*, *65*(6), 2502–2521. doi:10.1287/mnsc.2018.3074

Hemsworth, D., Muterera, J., & Baregheh, A. (2013). Examining Basss Transformational Leadership In Public Sector Executives: A Psychometric Properties Review. *Journal of Applied Business Research*, *29*(3), 853–862. doi:10.19030/jabr.v29i3.7785

Heoa, B. U. & Yec, M. (2016). Defense spending and economic growth around the globe: The direct and indirect link. *International Interactions*, *42*(*5*), 774-796.

Herath, H. S., Herath, T. C., & Dunn, P. (2019). Profit-driven corporate social responsibility as a Bayesian real option in green computing. *Journal of Business Ethics*, *158*(2), 387–402. doi:10.100710551-017-3705-1

Hermansson, C., Soderstrom, M., & Johansson, D. (2014). *Developing useful mobile applications in cross media platforms*. Conference: 3rd International Workshop on Frontiers in Innovative Mobile and Internet Services (FIMIS-2014), Birmingham, UK. 10.1109/IMIS.2014.59

Hernández Sampieri, R., Collado, C. F., & Baptista, L. (1991). *Definición del tipo de investigación. Metodología de la investigación*. Mc Graw-Hill Interamericana Editores.

Herrington, M., Kew, J., Kew, P., & Monitor, G. E. (2010). *Tracking entrepreneurship in South Africa: A GEM perspective*. Graduate School of Business, University of Cape Town.

Hettrick, S. (2016). *Research Software Sustainability: Report on a Knowledge Exchange Workshop*. The Software Sustainability Institute.

He, Y., Ding, X. H., & Yang, K. (2014). Unpacking the relationships between conflicts and team innovation. *Management Decision*, *52*(8), 1533–1548. doi:10.1108/MD-03-2014-0127

Hierons, R., Bogdanov, K., Bowen, J., Cleaveland, R., Derrick, J., Dick, J., Gheorghe, M., Harman, M., Kapoor, K., Krause, P., Luttgen, G., Simons, A. J. H., Vilkomir, S., Woodward, M., & Zedan, H. (2009). Using formal specifications to support testing. *ACM Computing Surveys*, *41*(2), 2. doi:10.1145/1459352.1459354

Hiles, A. (2007). An introduction to business continuity planning. In A. Hiles (Ed.), *The Definitive Handbook of Business Continuity Planning* (2nd ed.). John Wiley & Sons, Ltd.

Hiles, A. (2011a). Awareness and training. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Hiles, A. (2011b). Developing and implementing the written plan. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Hill, A., & Hill, M. (2008). *Investigação por questionário* (2nd ed.). Edições Sílabo. Retrieved from https://books.google.pt/books?id=-6neOwAACAAJ

Hill, M. W. (1999). *The Impact of Information on Society*. Gower.

Hinai, M., & Chitchyan, R. (2019). Equality Requirements for Software Systems: A Survey. *Proceedings of the 6th International Conference on ICT for Sustainability - ICT4S 2019*.

Hisrich, R. D. (1990). Entrepreneurship/intrapreneurship. *The American Psychologist*, *45*(2), 209–222. doi:10.1037/0003-066X.45.2.209

Hoffmann, R. (2008). Speech, Text and Braille Conversion Technology. In M. Hersh & M. Johnson (Eds.), *Assistive Technology for Visually Impaired and Blind People* (pp. 497–554). Springer. doi:10.1007/978-1-84628-867-8_14

Hofmann, F., & Lehner, F. (2001). Requirements Engineering as a Success Factor in Software Projects. *IEEE Software*, *18*(4), 58–66. doi:10.1109/MS.2001.936219

Hofstede, G. (1980). Culture and organizations. *International Studies of Management & Organization*, *10*(4), 15–41. doi:10.1080/00208825.1980.11656300

Hofstede, G. (1991). *Cultures and Organizations: Software of the Mind*. McGraw-Hill.

Holland, C., & Light, B. (1999). Success Factors Model for ERP Implementation. *IEEE Software*, *16*(3), 30–36. doi:10.1109/52.765784

Horkoff, J., Aydemir, F., Cardoso, E., Tong Li, A. M., Mylopoulos, J., & Giorgini, P. (2019). Goal-oriented requirements engineering: An extended systematic mapping study. *Requirements Engineering*, *24*(2), 133–160. doi:10.100700766-017-0280-z PMID:31231153

Horverak, J. G., Sandal, G. M., Bye, H. H., & Pallesen, S. (2013). Managers' selection preferences: The role of prejudice and multicultural personality traits in the assessment of native and immigrant job candidates. Revue Européenne de Psychologie Appliquée/European. *Review of Applied Psychology*, *63*(5), 267–275. doi:10.1016/j.erap.2013.07.003

Hou, N., & Chen, B. (2013). Military expenditure and economic growth in developing countries: Evidence from system GMM estimates. *Defence and Peace Economics*, *24*(3), 183–193. doi:10.1080/10242694.2012.710813

Huang, Z., & Palvia, P. (2001). ERP Implementation Issues in Advanced and Developing Countries. *Business Process Management Journal*, *7*(3), 276–284. doi:10.1108/14637150110392773

Huda, M., Qodriah, S. L., Rismayadi, B., Hananto, A., Kardiyati, E. N., Ruskam, A., & Nasir, B. M. (2019). Towards Cooperative with Competitive Alliance: Insights into Performance Value in Social Entrepreneurship. In Creating Business Value and Competitive Advantage with Social Entrepreneurship (pp. 294-317). IGI Global.

Hu, H. H., Chen, Y. T., & Chen, H. Y. (2010). A study of Taiwanese executives selected for expatriate assignments. *Contemporary Management Research*, *6*(3). Advance online publication. doi:10.7903/cmr.1138

Hunter, W. C., Chung, N., Gretzel, U., & Koo, C. (2015). Constructivist research in smart tourism. *Asia Pacific Journal of Information Systems, 25*(1), 105–120.

Husni, E. (2017). *Dynamic rule encryption for mobile payment*. Security and Communication Networks. doi:10.1155/2017/4975302

Husni, E., Leksono, B., & Rosa, M. (2015). Digital Signature for Contract Signing in Service Commerce. *International Conference on Technology, Informatics, Management, Engineering & Environment*, *6*, 7-9. 10.1109/TIME-E.2015.7389757

Hüttermann, H., & Boerner, S. (2011). Fostering innovation in functionally diverse teams: The two faces of transformational leadership. *European Journal of Work and Organizational Psychology*, *20*(6), 833–854. doi:10.1080/1359432X.2010.524412

IBM Corporation. (2015a). *A Growth Engine for Healthcare: How Cloud Computing Can Help the Industry Navigate Change*. Retrieved 2019, January 11, from https://www.ibm.com/industries/healthcare/Growth_Engine_for_Healthcare/index.html

IBM Corporation. (2015b). *Cloud Computing Simplified: The Thoughts on Cloud Way. IBM RedBlook publication*. Retrieved 2019, January 11, from http://www.redbooks.ibm.com/abstracts/redp5179.html?Open

IBM. (2020). *IBM Releases Novel AI-Powered Technologies to Help Health and Research Community Accelerate the Discovery of Medical Insights and Treatments for COVID-19*. Retrieved 2020, April 3, from https://www.ibm.com/blogs/research/2020/04/ai-powered-technologies-accelerate-discovery-covid-19/

iDEX. (n.d.). *An ecosystem that fosters innovation and technology technology development for Defense and aerospace*. Government of India – Department of Defense Production. Retrieved from: http://idex.gov.in

IDG. (2018). Cloud Computing Survey – Executive Summary. Framingham, MA: IDG.

IIBA and Agile Alliance. (2015). *A Guide to Business Analysis Body of Knowledge*. Author.

IIBA and Agile Alliance. (2017). *Agile Extension to the BABOK®Guide*. Author.

INE – Instituto Nacional de Estatística. (2017). *Projeções de População Residente 2015-2080.* Retrieved in 2019, January 13, from https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaques&DESTAQUESdest_boui=277695619&DESTAQUESmodo=2&xlang=pt

Instituto Nacional de Estatística (INE). (2012). *Dificuldades (N.º) da população residente com dificuldades por Local de residência (à data dos Censos 2011), Sexo, Grupo etário, Tipo de dificuldade, Grau de dificuldade e Dimensão (indivíduos com dificuldades)*. Retrieved from https://censos.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=ine_censos_indicador&contexto=ind&indOcorrCod=0006369&selTab=tab10

IrisVision. (2020). *IrisVision | Wearable Low Vision Glasses for Visually Impaired*. Retrieved from https://irisvision.com/

ISACA. (2018). *COBIT 2019 Framework - Governance and Management Objectives.* Schaumburg, IL: ISACA.

ISO 22301:2012. (2012). *Societal security - Business continuity management systems - Requirements.* Switzerland: ISO.

ISO 22313:2012. (2012). *Societal security - Business continuity management systems - Guidance.* ISO.

ISO/IEC 14001:2015. (2015). *Environment Management Systems – Requirements with Guidance for use.* International Organization for Standardization.

ISO/IEC 27000:2018. (2018). *Information technology — Security techniques — Information security management systems — Overview and vocabulary.* ISO/IEC.

ISO/IEC 27001:2013. (2013). *Information Technology – Security techniques – Information security management systems - Requirements.* International Organization for Standardization.

ISO/IEC 27001:2013. (2013). *Information technology - Security techniques - Information security management systems - Requirements.* ISO/IEC.

ISO/IEC 27001:2013. (2013). *Information technology — Security techniques — Information security management systems — Requirements.* ISO/IEC.

ISO/IEC 27002. (2013). ISO/IEC 27002:2013 - *Information technology -- Security techniques -- Code of practice for information security controls*, Retrieved from https://www.iso.org/standard/54533.html

ISO/IEC 27002:2013. (2013). *Information technology -- Security techniques -- Code of practice for information security controls*. International Organization for Standardization.

ISO/IEC 27002:2013. (2013). *Information technology — Security techniques — Code of practice for information security controls.* ISO/IEC.

ISO/IEC 27004:2016. (2016). *Information technology — Security techniques — Information security management — Monitoring, measurement, analysis and evaluation*. International Organization for Standardization.

ISO/IEC 27005:2018. (2018). *Information Technology – Security techniques – Information security Risk management.* International Organization for Standardization.

ISO/IEC 27005:2018. (2018). *Information technology — Security techniques — Information security risk management.* ISO/IEC.

ISO/IEC 27013:2015. (2015). *Information technology — Security techniques — Guidance on the integrated implementation of ISO/IEC 27001 and ISO/IEC 20000-1.* ISO/IEC.

ISO/IEC 27031:2011. (2011). *Information technology - Security techniques - Guidelines for information and communication technology readiness for business continuity.* ISO/IEC.

ISO/IEC 27032:2012. (2012). *Information technology — Security techniques — Guidelines for cybersecurity.* ISO/IEC.

ISO/IEC 31000:2018. (2018). *Risk management — Guidelines.* ISO/IEC.

ISO/IEC 38500:2015. (2015). *Information technology — Governance of IT for the organization.* Obtido de ISO/IEC

ISO/IEC 38501:2015. (2015). *Information technology — Governance of IT — Implementation guide.* Obtido de ISO/IEC

ISO/IEC 38502:2017. (2017). *Information technology — Governance of IT — Framework and model.* Obtido de ISO/IEC

ISO/IEC 55000:2014. (2014). *Asset management — Overview, principles and terminology.* Obtido de ISO/IEC

ISO/IEC 55001:2014. (2014). *Improve asset management with ISO 55001.* ISO/IEC.

ISO/IEC 55002:2018. (2018). *Asset management — Management systems — Guidelines for the application of ISO 55001.* ISO/IEC.

ISO/IEC/IEEE 29119 (2013). *ISO/IEC/IEEE 29119 Software Testing*. Retrieved from: https://softwaretestingstandard.org/

ISO/IEC/IEEE 29119-4. (2015). *ISO/IEC/IEEE 29119 Software Testing*, ISO/IEC/IEEE 29119-4: Test Techniques, Retrieved from: https://softwaretestingstandard.org/

ITF. (2020). *Designing for the Mobile Environment – Some Simple Guidelines*. Interaction Design Foundation. Retrieved February 8, 2020 from: https://www.interaction-design.org/literature/article/designing-for-the-mobile-environment-some-simple-guidelines

ITIL. (2019). *ITIL Foundation ITIL* (4th ed.). AXELOS.

ITIL. (2019). *ITIL Foundation ITIL 4 Edition.* London: AXELOS. ITIL® Em Portugal. http://www.itilportugal.pt/itil-o-que-e/

ItilPortugal. (2019). *Ciclo de vida Itil*. Obtido em 20 de 12 de 2019, de http://www.itilportugal.pt/ciclo-vida-itil/

ITV. (2018). *Creative Guidelines: Content Delivery Requirements for Marketing Programme.* Retrieved February 8, 2018, from https://www.itv.com/_data/documents/pdf/itv_creative_guidelines_updated_oct2018.pdf

Jacobson, I., Lawson, B., McMahon, P., & Goedicke, M. (2017). *Software Engineering Essentialized*. Retrieved from www.software-engineering-essentialized.com/

Jacobson, I. (2004). Use Cases – Yesterday, Today, and Tomorrow. *Software & Systems Modeling*, *3*(3), 210–220. doi:10.100710270-004-0060-3

Jacobson, I., & Seidewitz, E. (2014). A new software engineering. *Communications of the ACM*, *57*(12), 49–54. doi:10.1145/2677034

James, A. (2004). *US Defense R&D Spending: An analysis of the impacts, rapporteur's report for the EURAB Working Group ERA Scope and Vision.* The University of Manchester. Retrieved from: https://research.mbs.ac.uk/innovation/Portals/0/docs/4_EURABfinalreport.pdf

Janssens, M., & Brett, J. (2006). Cultural Intelligence in global teams: A fusion model of collaboration. *Group & Organization Management*, *31*(1), 124–150. doi:10.1177/1059601105275268

Janssens, O., Van De Vliert, E., & Veenstra, C. (1999). How Task and Person Conflict Shape the Role of Positive Interdependence in Management Teams. *Journal of Management*, *25*(2), 117–141. doi:10.1177/014920639902500201

Jardim, N., & Serrano, A. (2007). *Disaster Recovery - Um Paradigma na Gestão da Continuidade*. FCA - Editora de Informática.

Javanmard, M., & Alian, M. (2015). Comparison between Agile and Traditional software development methodologies. *Cumhuriyet Science Journal*, *36*(3), 1386–1394.

Javidan, M., Dorfman, P. W., De Luque, M. S., & House, R. J. (2006). In the eye of the beholder: Cross cultural lessons in leadership from project GLOBE. *The Academy of Management Perspectives*, *20*(1), 67–90. doi:10.5465/amp.2006.19873410

Javidan, M., House, R. J., Dorfman, P. W., Hanges, P. J., & De Luque, M. S. (2006). Conceptualizing and measuring cultures and their consequences: A comparative review of GLOBE's and Hofstede's approaches. *Journal of International Business Studies*, *37*(6), 897–914. doi:10.1057/palgrave.jibs.8400234

Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Science Quarterly*, *40*(2), 256–282. doi:10.2307/2393638

Jehn, K. A., & Bezrukova, K. (2004). A field study of group diversity, workgroup context, and performance. *Journal of Organizational Behavior*, *25*(6), 703–729. doi:10.1002/job.257

Jehn, K. A., & Mannix, E. A. (2001). The dynamic nature of conflict: A longitudinal study of intragroup conflict and group performance. *Academy of Management Journal*, *44*(2), 238–251.

Jenkins, H. (2010). *Transmedia*. Retrieved on Dec. 10th, 2010 from: https://www.youtube.com/watch?v=bhGBfuyN5gg

Jiang, C., Rashid, R. M., & Wang, J. (2019). Investigating the role of social presence dimensions and information support on consumers' trust and shopping intentions. *Journal of Retailing and Consumer Services*, *51*, 263–270. doi:10.1016/j.jretconser.2019.06.007

Jiang, K., Lepak, P. D., Jia Hu, J., & Baer, J. C. (2012). How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. *Academy of Management Journal*, *55*(6), 1264–1294. doi:10.5465/amj.2011.0088

Jiang, W., Wang, L., Chu, Z., & Zheng, C. (2019). Does leader turnover intention hinder team innovation performance? The roles of leader self-sacrificial behavior and empathic concern. *Journal of Business Research*, *104*, 261–270. doi:10.1016/j.jbusres.2019.07.013

Jiang, Y., & Chen, C. C. (2018). Integrating knowledge activities for team innovation: Effects of transformational leadership. *Journal of Management*, *44*(5), 1819–1847. doi:10.1177/0149206316628641

Johnson, J., & Finn, K. (2017). *Designing User Interfaces for an Aging Population*. Retrieved January 23, 2019, from https://www.uxmatters.com/mt/archives/2017/04/designing-user-interfaces-for-an-aging-population.php

Johnsson, M. (2018). The innovation facilitator: Characteristics and importance for innovation teams. *Journal of Innovation Management*, *6*(2), 12–44. doi:10.24840/2183-0606_006.002_0004

Jonassen, D., & Henning, P. (1996). Knowledge in the Head and Knowledge in the World. *Proceedings of the 1996 International Conference on Learning Sciences*, 433-438.

Jones, C., Cline, M., & Ryan, S. (2006). Exploring Knowledge Sharing in ERP Implementation: An organizational Culture Framework. *Decision Support Systems*, *41*(2), 411–434. doi:10.1016/j.dss.2004.06.017

Jung, D. I., & Sosik, J. J. (2002). Transformational leadership in work groups: The role of empowerment, cohesiveness, and collective-efficacy on perceived group performance. *Small Group Research*, *33*(3), 313–336. doi:10.1177/10496402033003002

Kaczmarek, S., & Ruigrok, W. (2013). In at the deep end of firm internationalization. *Management International Review*, *53*(4), 513–534. doi:10.100711575-012-0159-7

Kammerhoff, J., Lauenstein, O., & Schütz, A. (2019). Leading toward harmony–Different types of conflict mediate how followers' perceptions of transformational leadership are related to job satisfaction and performance. *European Management Journal*, *37*(2), 210–221. doi:10.1016/j.emj.2018.06.003

Kanickaraj, L. (2018). *Geographic Information Systems (GIS) Defined*. Retrieved from https://www.arcweb.com/blog/geographic-information-systems-gis-defined

Kannan, P. K., & Li, H. A. (2017). Digital marketing: A framework, review and research agenda. *International Journal of Research in Marketing*, *34*(1), 22–45. doi:10.1016/j.ijresmar.2016.11.006

Käpyaho, M., & Kauppinen, M. (2015, August). Agile requirements engineering with prototyping: A case study. In *2015 IEEE 23rd International requirements engineering conference (RE)* (pp. 334-343). IEEE. 10.1109/RE.2015.7320450

Karatum, S. (2017). The Place of Digital Marketing on Turkish Small Businesses. Journal of International Trade. *Logistics and Law*, *3*(2), 36.

Kar, E. V. D., Maitland, C. F., Montalvo, U. W. D., & Bouwman, H. (2003). *Design guidelines for mobile information and entertainment services – based on the radio538 ringtunes i-mode service case study. In Proc. of ICEC*. ACM Press.

Kark, R., Van Dijk, D., & Vashdi, D. R. (2018). Motivated or demotivated to be creative: The role of self-regulatory focus in transformational and transactional leadership processes. *Applied Psychology*, *67*(1), 186–224. doi:10.1111/apps.12122

Kent, C. A., Sexton, D. L., & Vesper, K. H. (1982). *Encyclopedia of entrepreneurship*. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.

Kidder, R. L. (1974). Formal litigation and professional insecurity: Legal entrepreneurship in South India. *Law & Society Review*, *9*(1), 11. doi:10.2307/3053020

Kim, H. (2014). Transformational leadership, organizational clan culture, organizational affective commitment, and organizational citizenship behavior: A case of South Korea's public sector. *Public Organization Review*, *14*(3), 397–417. doi:10.100711115-013-0225-z

Kim, W., & Seung-Soo, K. (2003). Knowledge Management: A Careful Look. *Journal of Object Technology*, *2*(1), 29–38. doi:10.5381/jot.2003.2.1.c4

Kirkman, B. L., & Shapiro, D. L. (2005). The impact of cultural value diversity on multicultural team performance. *Advances in International Management, 18*, 33-67.

Kirkman, B. L., Shapiro, D. L., Lu, S., & McGurrin, D. P. (2016). Culture and teams. *Current Opinion in Psychology*, *8*, 137–142. doi:10.1016/j.copsyc.2015.12.001 PMID:29506789

Klamma, R., Spaniol, M., & Renzel, D. (2006). Virtual entrepreneurship Lab 2.0: Sharing entrepreneurial knowledge by non-linear story-telling. *Journal of Universal Knowledge Management*, *1*(3), 174–198.

Klironomos, I., & Abascal, J. (2010). *An Introduction to the Key Issues Relating to Accessible User Interfaces*. Cardiac Project.

Kluge, J., Stein, W., & Licht, T. (2002). *Gestão do Conhecimento: Segundo um Estudo de McKinsey & Company* (S. B. Leitão, Trans.). Principia-Publicações Universitárias e Científicas.

KMP. (2014). *KMPlayer | Multimedia Player*. Retrieved from http://www.kmplayer.com/

Kollias, C., Mylonidis, N., & Paleologou, S. (2007). A panel data analysis of the nexus between Defense spending and growth in the European Union: A reply. *Defence and Peace Economics*, *18*(6), 581–583. doi:10.1080/10242690701516853

Koo, C., Gretzel, U., Hunter, W. C., & Chung, N. (2015). The Role of IT in Tourism. *Asia Pacific Journal of Information Systems, 25*(1), 99–101.

Kost, D. (2019). *Why Airbnb Isn't Your Typical Technology Successful Story*. Retrieved 19 October 2019, from https://www.forbes.com/sites/hbsworkingknowledge/2019/08/05/why-airbnb-isnt-your-typical-technology-successful-story/#4ed249085638

Kosutic, D. (2019a, january 14). *Como implementar a análise de impacto no negócio (business impact analysis – BIA) de acordo com a ISO 22301*. Retrieved from Advisera Expert Solutions: https://advisera.com/27001academy/pt-br/knowledgebase/como-implementar-a-analise-de-impacto-no-negocio-business-impact-analysis-bia-de-acordo-com-a-iso-22301/

Kosutic, D. (2019b, January 16). *A estratégia de continuidade de negócios pode ajudá-lo a economizar dinheiro?* Retrieved from Advisera Expert Solutions: https://advisera.com/27001academy/pt-br/blog/2010/12/16/a-estrategia-de-continuidade-de-negocios-pode-ajuda-lo-a-economizar-dinheiro/

Kosutic, D. (2019c, January 16). *Como realizar exercícios e testes de continuidade de negócio de acordo com a ISO 22301*. Retrieved from Advisera Expert Solutions: https://advisera.com/27001academy/pt-br/blog/2015/02/03/como-realizar-exercicios-e-testes-de-continuidade-de-negocio-de-acordo-com-iso-22301/

Kotonya, G., & Sommerville, I. (1998). *Requirements Engineering: Processes and Techniques*. John Wiley & Sons Ltd.

Kraimer, M. L., Wayne, S. J., & Jaworski, R. A. (2001). Sources of Support and Expatriate Performance: The Mediating Role of Expatriate Adjustment. *Personnel Psychology*, *54*(1), 71–99. doi:10.1111/j.1744-6570.2001.tb00086.x

Kraus, S., Mensching, H., Calabrò, A., Cheng, C. F., & Filser, M. (2016). Family firm internationalization: A configurational approach. *Journal of Business Research*, *69*(11), 5473–5478. doi:10.1016/j.jbusres.2016.04.158

Kreiser, P. M., Kuratko, D. F., Covin, J. G., Ireland, R. D., & Hornsby, J. S. (2019). Corporate entrepreneurship strategy: Extending our knowledge boundaries through configuration theory. *Small Business Economics*, 1–20. doi:10.100711187-019-00198-x

Kulowiec, G. (2018). *I've been thinking…It is time to revisit Jenkins' Participatory Culture*. Retrieved January 5, 2019 from https://medium.com/@gkulowiec/ive-been-thinking-it-is-time-to-revisit-jenkins-participatory-culture-d375ebd34e94

Kumar, V. S. (2006). *Effective requirements management*. Paper presented at PMI® Global Congress 2006—EMEA, Madrid, Spain.

Kumari, A., Tanwar, S., Tyagi, S., & Kumar, N. (2018). Fog computing for healthcare 4.0 environment: Opportunities and challenges. *Computers & Electrical Engineering*, *72*, 1–13. doi:10.1016/j.compeleceng.2018.08.015

Kumar, S., & Babu, S. (2016). A Web GIS Based Decision Support System for Agriculture Crop Monitoring System - A Case Study from Part of Medak District. *J Remote Sensing & GIS*, *5*(04), 177. doi:10.4172/2469-4134.1000177

Kusluvan, S., Kusluvan, Z., Ilhan, I., & Buyruk, L. (2010). The Human Dimension: *A Review of Human Resources Management Issues in the Tourism and Hospitality Industry. Cornell Hospitality Quarterly*, *51*(2), 171–214. doi:10.1177/1938965510362871

Kwahk, K.-Y., & Kim, B. (2017). Effects of social media on consumers' purchase decisions: Evidence from Taobao. *Service Business*, *11*(4), 803–829. doi:10.100711628-016-0331-4

Kwapisz, A. (2019). Do government and legal barriers impede entrepreneurship in the US? An exploratory study of perceived vs. actual barriers. *Journal of Business Venturing Insights*, *11*(e00114), 1–12. doi:10.1016/j.jbvi.2019.e00114

Laffly, D. (2020). *TORUS 2 – Toward an Open Resource Using Services, Cloud Computing for Environmental Data*. ISTE.

Lam, H. K., Yeung, A. C., Lo, C. K., & Cheng, T. C. E. (2019). Should firms invest in social commerce? An integrative perspective. *Information & Management*, *56*(8), 103164. doi:10.1016/j.im.2019.04.007

Lamont, S. (2003). An 8-Step Process for Creating Compelling Enhanced Television. *Proceedings of the EuroiTV2003 the 1st European Conference on Interactive Television: from Viewers to Actors?* 133-136.

Landum, M. (2012). *Cloud na Administração Local, estudo de caso.* Obtido em 10 de janeiro de 2020, de Tese de Mestrado. Escola Superior de Ciências Empresarias. IPS. Setúbal: https://comum.rcaap.pt/handle/10400.26/3999

Landum, M., & Reis, L. (2012). *Cloud na Administração Local – Estudo de caso. In 12ª Conferência da Associação Portuguesa de Sistemas de Informação (CAPSI 2012)*. Universidade do Minho.

Lapa, J., Bernardino, J., & Figueiredo, A. (2014). A comparative analysis of open source business intelligence platforms. *ACM International Conference Proceeding Series*. 10.1145/2618168.2618182

Lawrence, C. (2020). *Is Cloud Computing the Superhero of Covid-19?* Retrieved in 2020, March 30, from https://www.codemotion.com/magazine/dev-hub/cloud-manager/cloud-computing-covid-19/

Le Roux, I., & Maree, T. (2016). Motivation, engagement, attitudes and buying intent of female Facebook users. *Acta Commercii*, *16*(1), 1–11. doi:10.4102/ac.v16i1.340

Leau, Y. B., Loo, W. K., Tham, W. Y., & Tan, S. F. (2012). Software development life cycle AGILE vs traditional approaches. In *International Conference on Information and Network Technology* (*Vol. 37*, No. 1, pp. 162-167). Academic Press.

Lederer, M., Knapp, J., & Schott, P. (2017, March). The digital future has many names—How business process management drives the digital transformation. In *2017 6th International Conference on Industrial Technology and Management (ICITM)* (pp. 22-26). IEEE.

Lee, B. K., & Sohn, Y. S. (2017). Exploring the effect of dual use on the value of military technology patents based on the renewal decision. *Scientometrics*, *112*(3), 120–127. doi:10.100711192-017-2443-6

Lee, C. C., Lin, Y. H., Huang, H. C., Huang, W. W., & Teng, H. H. (2015). The effects of task interdependence, team cooperation, and team conflict on job performance. *Social Behavior and Personality*, *43*(4), 529–536. doi:10.2224bp.2015.43.4.529

Lee, H. U., & Park, J. H. (2006). Top team diversity, internationalization and the mediating effect of international alliances. *British Journal of Management*, *17*(3), 195–213. doi:10.1111/j.1467-8551.2006.00501.x

Lee, M.-H., Yen, M. Y., & Perromat, L. (2019). Interaction between the Knowledge Sharing on Innovation Behavior Based on the Viewpoint of Team Diversity: Empirical Research from China. *Revista de Cercetare si Interventie Sociala*, *64*(97), 97–107. doi:10.33788/rcis.64.8

Leffingwell, D. (2010). *Agile software requirements: lean requirements practices for teams, programs, and the enterprise*. Addison-Wesley Professional.

Legner, C., Eymann, T., Hess, T., Matt, C., Böhmann, T., Drews, P., Mädche, A., Urbach, N., & Ahlemann, F. (2017). Digitalization: Opportunity and Challenge for the Business and Information Systems Engineering Community. *Business & Information Systems Engineering*, *59*(4), 301–308. doi:10.100712599-017-0484-2

Leimester, S., Riedl, C., Böhm, M., & Krcmar, H. (2010). The Business Perspective of Cloud Computing: Actors, Roles, and Value Networks. *18th European Conference on Information Systems (ECIS 2010)*.

Leite Filho, G. A. (2008). Padrões de produtividade de autores em periódicos e congressos na área de contabilidade no Brasil: Um estudo bibliométrico. *Revista de Administração Contemporânea, Curitiba*, *12*(2), 533–554. doi:10.1590/S1415-65552008000200011

Lepak, D., Liao, H., Chung, Y., & Harden, E. (2006). A Conceptual Review of Human Resource Management Systems in Strategic Human Resource Management Research. Research in Personnel and Human Resources Management, 25, 217-271. doi:10.1016/S0742-7301(06)25006-0

Leske, A. (2018). Uma revisão sobre a inovação em defesa: Do spin-off ao spin-in. *Brazilian Journal of Political Economy*, *38*(2), 377–391. doi:10.1590/0101-31572018v38n02a09

Leung, K., & Wang, J. (2015). Social processes and team creativity in multicultural teams: A socio-technical framework. *Journal of Organizational Behavior*, *36*(7), 1008–1025. doi:10.1002/job.2021

Leung, X. (2019). Technology-enabled service evolution in tourism: A perspective article. *Tourism Review*, *75*(1), 279–282. doi:10.1108/TR-06-2019-0229

Lexico. (2019). https://www.lexico.com/en/definition/commitment

Liao, H., Toya, K., Lepak, D. P., & Hong, Y. (2009). Do they see eye to eye? Management and employee perspectives of high-performance work systems and influence processes on service quality. *The Journal of Applied Psychology*, *94*(2), 371–391. doi:10.1037/a0013504 PMID:19271796

Librivox. (2020). *Acoustical liberation of books in the public domain*. Retrieved from https://librivox.org/

Lichtenberg, F. R., & Siegel, D. (1989). The impact of R&D investment on productivity: New evidence using linked R&D LRDATA. *National Bureau of Economic Research*. Retrieved from: https://www.nber.org/papers/w2901.pdf

Lichtenberg, F. (1984). The relationships between federal contract R&D and company R&D. *The American Economic Review*, *74*(2).

Liestøl, G. (1994). Aesthetic and Rhetorical Aspects of Linking Video in Hypermedia. *Proceedings of ACM HT*'94.

Li, H., Wu, Y., Cao, D., & Wang, Y. (2019). Organizational mindfulness towards digital transformation as a prerequisite of information processing capability to achieve market agility. *Journal of Business Research*. Advance online publication. doi:10.1016/j.jbusres.2019.10.036

Li, L., Li, D., & Shi, W. S. (2011). Internationalization, internalization and the performance of US biopharmaceutical SMEs. *Multinational Business Review*, *19*(1), 65–93. doi:10.1108/15253831111134830

Lindsey-Mullikin, J., & Borin, N. (2017). Why strategy is key for successful social media sales. *Business Horizons*, *60*(4), 473–482. doi:10.1016/j.bushor.2017.03.005

Linscott, W. B. (1999). Civil-Military Integration: The Context and Urgency. *Acquis. Ver*, 395-405. Retrieved from: https://apps.dtic.mil/docs/citations/ADA372194

Lin, X., Wang, X., & Hajli, N. (2019). Building E-commerce satisfaction and boosting sales: The role of social commerce trust and its antecedents. *International Journal of Electronic Commerce*, *23*(3), 328–363. doi:10.1080/10864415.2019.1619907

Lisak, A., Erez, M., Sui, Y., & Lee, C. (2016). The positive role of global leaders in enhancing multicultural team innovation. *Journal of International Business Studies*, *47*(6), 655–673. doi:10.105741267-016-0002-7

Liu, Z., Wang, H., & Li, P. (2019). *The antecedents of green information system and impact on environmental performance.* Available at SSRN 3377034

Liu, H., & Li, G. (2018). Linking transformational leadership and knowledge sharing: The mediating roles of perceived team goal commitment and perceived team identification. *Frontiers in Psychology*, *9*, 1331. doi:10.3389/fpsyg.2018.01331 PMID:30108540

Li, V., Mitchell, R., & Boyle, B. (2016). The divergent effects of transformational leadership on individual and team innovation. *Group & Organization Management*, *41*(1), 66–97. doi:10.1177/1059601115573792

Livaditi, J., Vassilopoulou, K., Lougos, C., & Chorianopoulos, C. (2003). Needs and gratifications for interactive TV applications: Implications for designers. *Proceedings of HICSS'03: the IEEE 36th Hawaii International Conference on System Sciences*.

Livingston, K., Dredze, M., Hammond, K., & Birnbaum, L. (2003). Beyond Broadcast. *Proceedings of ACM IUI'2003, The Seventh International Conference on Intelligent User Interfaces*, 260-262.

LogicMonitor. (2017). *Cloud Vision 2020: The Future of the Cloud. A Survey of Industry Influencers*. Retrieved in 2019, January 9, from https://www.logicmonitor.com/resource/cloud-vision-2020-future-cloud-study

Loiro, C., Castro, H., Ávila, P., Cruz-Cunha, M. M., Putnik, G. D., & Ferreira, L. (2019). Agile Project Management: A Communicational Workflow Proposal. *Procedia Computer Science*, *164*, 485–490. doi:10.1016/j.procs.2019.12.210

Lopez, D., Jaramillo, D. A., & Susaeta, D. (2019). Innovation in Corporate Organizational Culture: Diversity. *Motivation and Organizational Pressure as Possible Realities*, *2*, 63–85.

Lorenz, T. (2015). *Soon you can order a pizza by tweeting the pizza emoji at Domino's*. Retrieved 11 November 2019, from https://www.businessinsider.com/dominos-emoji-pizza-order-2015-5

Lounsbury, M., Cornelissen, J., Granqvist, N., & Grodal, S. (2019). Culture, innovation and entrepreneurship. *Innovation*, *21*(1), 1–12. doi:10.1080/14479338.2018.1537716

Loureiro, S. M. C., & Bilro, R. G. (2020). Be or Not Be Online Engaged: Exploring the Flow From Stimuli to e-WOM on Online Retail Consumers. In Exploring the Power of Electronic Word-of-Mouth in the Services Industry (pp. 18-34). IGI Global.

Lucas, A. (2019). *Domino's will launch GPS tracking for delivery orders by end of 2019.* Retrieved 11 November 2019, from https://www.cnbc.com/2019/07/16/dominos-will-launch-gps-tracking-for-delivery-orders-by-end-of-2019.html?__source=twitter%7Cmain

Luckmann, P. (2015). Towards identifying success factors for cross-cultural project customer engagement: A literature review. *Procedia Computer Science*, *64*, 324–333. doi:10.1016/j.procs.2015.08.496

Lundmark, E., Krzeminska, A., & Shepherd, D. A. (2019). Images of entrepreneurship: Exploring root metaphors and expanding upon them. *Entrepreneurship Theory and Practice*, *43*(1), 138–170. doi:10.1177/1042258717734369

Lvina, E., Matveev, A., & Grishin, G. (2019). Transforming cultural barriers into assets: Lessons learned from a clobal insurance broker. *Revista de Management Comparat International*, *20*(3), 226–240.

Ma, O., & Tanaka, K. (2003). Webtelop: Dynamic tv-content augmentation by using web pages. *Proceedings of ICME' 2003, IEEE International Conference on Multimedia & Expo*, 2, 173–176.

Magalhães, J. (2009). On-Demand Immersive-TV for Communities of Media Producers and Consumers, Project proposal, FCT UTAustin/Portugal Program on Future TV. Presented at National CoLab Event 2010, Lisbon, Portugal.

Magno, F., & Cassia, F. (2018). The impact of social media influencers in tourism. *Anatolia-International Journal of Tourism and Hospitality Research*, *29*(2), 288–290. doi:10.1080/13032917.2018.147698

Magnusson, P., Wilson, R. T., Zdravkovic, S., Zhou, J. X., & Westjohn, S. A. (2008). Breaking through the cultural clutter: A comparative assessment of multiple cultural and institutional frameworks. *International Marketing Review*, *25*(2), 183–201. doi:10.1108/02651330810866272

Maguire, D., & Longley, P. (2005). The emergence of geoportals and their role in spatial data infrastructures. *Computers, Environment and Urban Systems*, *29*(1), 3–14. doi:10.1016/S0198-9715(04)00045-6

Ma, H., & Tao, J. (2006). Key components and implications of entrepreneurship: A 4-P framework. *Journal of Business Venturing*, *21*(5), 704–725. doi:10.1016/j.jbusvent.2005.04.009

Mahmood, F., Khan, A., & Bokhari, R. (2019). ERP issues and challenges: A research synthesis. *Kybernetes*, *49*(3), 629–659. doi:10.1108/K-12-2018-0699

Mahoney, J., & Pandian, R. (1992). The resource-based view within the conversation of strategic management. *Strategic Management Journal*, *13*(5), 363–380. doi:10.1002mj.4250130505

Maiden, N., & Gizikis, A. (2001). Where Do Requirements Come From? *IEEE Software*, *18*(5), 10–12. doi:10.1109/52.951486

Mair, J., Robinson, J., & Hockerts, K. (Eds.). (2006). *Social entrepreneurship*. Palgrave Macmillan. doi:10.1057/9780230625655

Mamede, H. (2006). *Segurança Informática nas Organizações*. FCA.

Manamperi, N. (2016). Does military expenditure hinder economic growth? evidence from Greece and Turkey. *Journal of Policy Modeling*, *38*(6), 1171–1193. doi:10.1016/j.jpolmod.2016.04.003

Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. *Business Horizons*, *52*(4), 357–365. doi:10.1016/j.bushor.2009.03.002

MaptitudeG. I. S. (2020). Retrieved from https://www.caliper.com/maptitude/gis_software/default.htm

Marchioli, A., Soligo, K., Silva, L, & Fonseca, B.G. (2018). A gestão de recursos humanos como estratégia nas empresas. *Revista União das Faculdades dos Grandes lagos*, *1*(1).

Margaretta, J. (2002). Why Business Models Matter. *Harvard Business Review*, *80*(5), 86–92. PMID:12024761

Mariani, M. M., Di Felice, M., & Mura, M. (2016). Facebook as a destination marketing tool: Evidence from Italian regional Destination Management Organizations. *Tourism Management*, *54*, 321–343. doi:10.1016/j.tourman.2015.12.008

Marinho, C. R. P., Marinho, R. C. P., Carvalho, C. A. S., & Gutierrez, R. H. (2014). *Competência e Aprendizagem: Perspectivas Estratégicas orientadas à vantagem competitiva sustentável*. X Ceneg – Congresso Nacional de Excelência em Gestão.

Martin, R., & Holtzman, H. (2010). Newstream. A Multi-Device, Cross-Medium, and Socially Aware Approach to News Content. Proceedings of the ACM EuroiTV 2010, 83-90.

Martínez-Valerio, L. (2012). Estrategias de promoción turística a través de Facebook. *Palabra Clave (La Plata)*, *15*(2), 318–338.

Martin-Rojas, R., Garcia-Morales, V. J., & Gonzalez-Alvarez, N. (2019). Technological antecedents of entrepreneurship and its consequences for organizational performance. *Technological Forecasting and Social Change*, *147*, 22–35. doi:10.1016/j.techfore.2019.06.018

Martins, P. V., & Zacarias, M. (2017). An agile business process improvement methodology. *Procedia Computer Science*, *121*, 129–136. doi:10.1016/j.procs.2017.11.018

Masson, H. (2013). Defining the European Defense Technological and Industrial Base »: Debates & dilemmas (I). *Fondation pour la reserche strategique.* Retrieved from: https://www.frstrategie.org/en/publications/notes/defining-european-Defense-technological-and-industrial-base-debates-dilemmas-i-2013

Mather, T., Kumaraswamy, S., & Latif, S. (2009). *Cloud Security and Privacy*. O'Reilly.

Matveev, A. (2016). *Intercultural competence in organizations: a guide for leaders, educators and team players*. Springer.

Matveev, A. (2017). Intercultural Competence in Multicultural Teams. In *Intercultural Competence in Organizations* (pp. 77–102). Springer. doi:10.1007/978-3-319-45701-7_4

Matveev, A. V., & Milter, R. G. (2004). The value of intercultural competence for performance of multicultural teams. *Team Performance Management*, *10*(5/6), 104–111. doi:10.1108/13527590410556827

McIlroy, M. (1969). Mass produced software components. *Proc. NATO, Software Engineering Conference*, 138-155.

McIntosh, R., & Goeldner, C. (1986). *Tourism: Principles, Practices, Philosophies*. John Wiley & Sons.

McLuhan, M. (1964). *Understanding Media*. McGraw-Hill.

Meacham, J., Toms, L., Green, & Bhadauria, V. (2013). Impact of information sharing and green information systems. *Management Research Review*, *36*(5), 478-494.

Medeiros, A. (2012). *ArcGIS vs. QGIS: Comparison of 10 characteristics*. Retrieved from: http://www.clickgeo.com.br/arcgis-vs-qgis-comparativo-de-10-caracteristicas

Meiselwitz, G., Wentz, B., & Lazar, J. (2010). Universal Usability: Past, Present, and Future. *Foundations and Trends in Human Computer Interaction*, *3*(4), 213–233. doi:10.1561/1100000029

Mell, P., & Grance, T. (2011). *The NIST Definition of Cloud Computing*. NIST – Recommendations of the National Institute of Standards and Techonology – U.S. Department of Commerce - Special Publication 800-145. Retrieved in 2018, November 18, from https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf

Melo, A. C. (2019). A Cooperação Estruturada Permanente, o Fundo Europeu de Defesa, e a Lei de Programação Militar. *EuroDefense*. Retrieved form: https://www.eurodefense.pt/categoria/artigos-tematicos/

Mendes, C. (2006). *Free software and technological innovation: an analysis from the perspective of intellectual property*.

Meneses, J. (2019). *A sustentabilidade em 2019.* BCSD Portugal. Retrieved from: www.bcsdportugal.org/noticias/a-sustentabilidade-em-2019

Mensing, G. (2019). *Uber - Business Models Inc*. Retrieved 20 October 2019, from https://www.businessmodelsinc.com/exponential-business-model/uber/

MEO. (2014, February 21). *Sabe o que é Áudio Zapping?* Retrieved from https://blog.meo.pt/sabe-o-que-e-audio-zapping-113236

Meola, A. (2018). *What is the Internet of Things? What IoT means and how it works*. Obtido em 2 de fevereiro de 2020

Microsoft. (2020a). *Seeing AI App from Microsoft*. Retrieved from https://www.microsoft.com/en-us/ai/seeing-ai

Microsoft. (2020b). *Microsoft Soundscape – Microsoft Research*. Retrieved from https://www.microsoft.com/en-us/research/product/soundscape/

Milano, C. (2018). Overtourism, malestar social y turismofobia. Un debate controvertido. Escuela Universitaria de Turismo Ostelea Universidad de Lleida (España). PASOS. *Revista de Turismo y Patrimonio Cultural.*, *16*(3), 551–564. doi:10.25145/j.pasos.2018.16.041

Miller, K. W., & Larson, D. K. (2005). Agile software development: Human values and culture. *IEEE Technology and Society Magazine*, *24*(4), 36–42. doi:10.1109/MTAS.2005.1563500

Minniti, M. (2010). Female entrepreneurship and economic activity. *European Journal of Development Research*, *22*(3), 294–312. doi:10.1057/ejdr.2010.18

Mitra, J. (2019). *Entrepreneurship, innovation and regional development: an introduction*. Routledge. doi:10.4324/9781315543130

Miyamori, H., & Tanaka, K. (2005). Webified video: media conversion from tv programs to web content for cross-media information integration. In *Lecture Notes in Computer Science* (pp. 176–185). Springer-Verlag.

Mogull, R., Arlen, J., Gilbert, F., Lane, A., Mortman, D., Peterson, G., & Rothman, M. (2017). *Security Guidance for Critical Areas of Focus in Cloud Computing v4.0.* CSA - Cloud Security Alliance. Retrieved in 2019, January 11, from https://cloudsecurityalliance.org/artifacts/security-guidance-v4/

Molina, L. M., & García-Morales, V. J. (2019). Combined Influence of Absorptive Capacity and Corporate Entrepreneurship on Performance. *Sustainability*, *11*(11), 1–26.

Monge L., Torres J., López L. & Navarro C. (2010). *Comparative analysis of map servers.* GeoFocus Rev Int Cienc y Tecnol la Geographic Inf. 2010.

Morakanyane, R., Grace, A. A., & O'Reilly, P. (2017). Conceptualizing Digital Transformation in Business Organizations: A Systematic Review of Literature. In Bled eConference (p. 21). doi:10.18690/978-961-286-043-1.30

Moreira, J. M. (2009). *Questionários: Teoria e Prática*. Almedina.

Moreno, J., & Reis, L. (2012). *Proposta de Implementação de um Portal Corporativo – Caso ANA Aeroportos de Portugal, SA. In XXII Jornadas Luso-Espanholas de Gestão Científica*. Universidade de Trás-os-Montes e Alto Douro.

Moretti, E., Steinwender, C., & Van Reenen, J. (2016). *The intellectual spoils of war? Defense R&D, productivity and spillovers*. Retrieved from: https://eml.berkeley.edu/~moretti/military.pdf

Morin, E. (1999). *Une tête bien faite: Repenser la réforme, réformer la pensée*. Le Seuil.

Motta, P. R. (1991). *Gestão contemporânea: a Ciência e a arre de ser dirigente*. Record.

Mullins, J. (n.d.). *How Companies Like Airbnb Use Matchmaker Model to Grow Their Business*. Retrieved 19 October 2019, from https://blog.growthinstitute.com/funding/matchmaker-models

Nadamoto, A., & Tanaka, K. (2005). Complementing Your TV-Viewing by Web Content Automatically-Transformed into TV-program-type Content. Proceedings of the ACM Multimedia' 2005, 41-50. 10.1145/1101149.1101157

Nadeem, W., Andreini, D., Salo, J., & Laukkanen, T. (2015). Engaging consumers online through websites and social media: A gender study of Italian Generation Y clothing consumers. *International Journal of Information Management*, *35*(4), 432–442. doi:10.1016/j.ijinfomgt.2015.04.008

Nadella, S. (2017). *Hit Refresh - The Quest to Rediscover Microsoft's Soul and Imagine a Better Future for Everyone*. Harper Collins Publishers.

Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy*, *48*(8), 103773. doi:10.1016/j.respol.2019.03.018

Nam, C. S., Lyons, J. B., Hwang, H. S., & Kim, S. (2009). The process of team communication in multi-cultural contexts: An empirical study using Bales' interaction process analysis (IPA). *International Journal of Industrial Ergonomics*, *39*(5), 771–782. doi:10.1016/j.ergon.2009.03.004

Naranjo-Valencia, J. C., Jiménez-Jiménez, D., & Sanz-Valle, R. (2016). Studying the links between organizational culture, innovation, and performance in Spanish companies. *Revista Latinoamericana de Psicología*, *48*(1), 30–41. doi:10.1016/j.rlp.2015.09.009

Narayana, O. L. (2018). *An Empirical Study on Effectiveness of Digital Marketing in the New Era*. Academic Press.

National Research Council. (2009). *Aplications of social network analysis for*. The National Academies Press.

Netflix. (2020). *Help Center – Audio Descriptions for Netflix Movies and TV Shows*. Retrieved from https://help.netflix.com/en/node/25079

Netto, L. G. P. (2017). *O que é turismo*. Editora Brasileiense.

Neukam, M. N. (2017). Managing the fuzzy front-end in multicultural teams. *European Journal of Innovation Management*, *20*(4), 578–598. doi:10.1108/EJIM-11-2016-0112

Neuri ConsultingL. L. P. (n.d.). Available at: https://www.impactmapping.org

Neves, J. G. (2007). Human Resources Management: Evolution of the problem in terms of concepts and practices. In Human Resources Management: Contexts, processes and techniques. Lisbon: Editora RH.

Niazi, M., Mahmood, S., Alshayeb, M., Riaz, M., Faisal, K., & Cerpa, N. (2013). Challenges of Project Management in Global Software Development: Initial Results. *Science and Information Conference*.

Nickolett, C. (2001). *Business Continuity Planning White Paper.* Comprehensive Consulting Solutions, Inc.

Nielsen, J. (2005). *Accessibility Is Not Enough, Nielsen Norman Group*. Retrieved from https://www.nngroup.com/articles/accessibility-is-not-enough/

Nielsen, J. (2005). Website disponível em 14/12/2010 em: www.useit.com/papers/heuristics/heuristic_list.html

Nielsen, B. B., & Nielsen, S. (2011). The role of top management team international orientation in international strategic decision-making: The choice of foreign entry mode. *Journal of World Business*, *46*(2), 185–193. doi:10.1016/j.jwb.2010.05.003

Nielsen, J. (1989). *Coordinating User Interfaces for Consistency. Neuauflage* (2002 ed.). The Morgan Kaufmann Series in Interactive Technologies.

Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

Nixon, P., Harrington, M., & Parker, D. (2012). Leadership performance is significant to project success or failure: A critical analysis. *International Journal of Productivity and Performance Management*, *61*(2), 204–216. doi:10.1108/17410401211194699

Norman, D. (1993). *Things that Make us Smart*. Addison Wesley Publishing Company.

Norman, D. (2002). *The Design of Everyday Things*. Basic Books.

NuEyes. (2020). *NuEyes – Electronic Glasses for Low Vision*. Retrieved from https://nueyes.com/

Nujic, L., Palic, T., & Herak, M. (2018). The impact of social media influencers on tourism industry: A literature review. In Interdisciplinary Management Research XIV (IMR 2018) (Vol. 14, pp. 1258–1275). Univ Applied Sciences.

Nunes, M., & O'Neill, H. (2007). *Fundamental de UML* (5th ed.). FCA Editora.

O'Brien, C. (n.d.). *What are the Benefits of Digital Transformation?* Retrieved 20 October 2019, from https://digitalmarketinginstitute.com/en-eu/blog/13-03-18-what-are-the-benefits-of-digital-transformation

O'Connor, P. (1999). *Electronic Information Distribution in Tourism and Hospitality* (1st ed.). CABI.

O'Hehir, M. (2007). What is a business continuity planning (BCP) strategy? In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (2nd ed.). John Wiley & Sons, Ltd.

O'Reilly, T. (2005). *What is Web 2.0? Design patterns and business models for the next generation of software*. Retrieved April 4, 2020, from https://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html

Obrist, M., Moser, C., Tscheligi, M., & Alliez, D. (2010). Field evaluation of a Cross Platform 6 Key Navigation Model and a Unified User Interface Design. Proceedings of the ACM EuroiTV 2010, 141-144.

OceanAlive. (2020). *Guardiãs do Mar: mulheres da comunidade piscatória protegem as pradarias marinhas*. Ocean Alive. Retrieved from: www.ocean-alive.org/guardias-do-mar

Ochieng, E. G., & Price, A. D. (2009). Framework for managing multicultural project teams. *Engineering, Construction, and Architectural Management*, *16*(6), 527–543. doi:10.1108/09699980911002557

Ochieng, E. G., & Price, A. D. F. (2010). Managing cross-cultural communication in multicultural construction project teams: The case of Kenya and UK. *International Journal of Project Management*, *28*(5), 449–460. doi:10.1016/j.ijproman.2009.08.001

Odoardi, C., Battistelli, A., Montani, F., & Peiró, J. M. (2019). Affective Commitment, Participative Leadership, and Employee Innovation: A Multilevel Investigation. *Journal of Work and Organizational Psychology*, *35*(2), 103–113. doi:10.5093/jwop2019a12

OECD. (2013). *The OECD Privacy Framework*. Retrieved in 2019, January 9, from http://www.oecd.org/internet/ieconomy/privacy-guidelines.htm

OECD. (2015). *OECD Digital Economy Outlook 2015*. doi:10.1787/9789264232440-en

OGC. (2011). *About OGC | OGC (R)*. Retrieved from http://www.opengeospatial.org/ogc

Okubo, Y. (1997). *Bibliometric Indicators and Analysis of Research Systems: Methods and Examples*. OECD Science, Technology and Industry Working Papers, 1997/01. OECD Publishing.

Olanrewaju, A. S. T., Hossain, M. A., Whiteside, N., & Mercieca, P. (2020). Social media and entrepreneurship research: A literature review. *International Journal of Information Management*, *50*, 90–110. doi:10.1016/j.ijinfomgt.2019.05.011

Olaya, V. (2012). *Geographic Information Systems* (1st ed. Rev.). Retrieved from https://www.bubok.es/libros/191920/Sistemas-de-Informacion-Geografica

Oliveira, R., Abreu, J., & Almeida, M. (2017). Involving visually impaired viewers in the design of accessible solutions for audiovisual translation. *Proc. of JAUTI 2017 - 6th Iberoamerican Conference on Applications and Usability for Interactive TV*, 34-46.

Oliveira, R., de Abreu, J. F., & Almeida, A. M. (2017). *Promoting interactive television (iTV) accessibility: an adapted service for users with visual impairments. Univ Access Inf Soc, 16, 533-544*.

OrCam. (2020). *OrCam MyEye 2.0*. Retrieved from https://www.orcam.com/en/myeye2/

Organización Nacional de Ciegos Españoles (ONCE). (2014). *Audesc Mobile: la audiodescripción en nuestra mano. CIDAT (Centro de Tiflotecnología e Innovación de la ONCE).* Retrieved from http://cidat.once.es/home.cfm?id=1516&nivel=2

OTA. (1994). Assessing the potential for civil-military integration: Technologies, processes, and practices. *Office of Technology Assessment*. Retrieved from: https://www.princeton.edu/~ota/disk1/1994/9402/9402.PDF

Ovelheiro, B. (2019). SOFTDIGITAL – Fluxo Digital de Documentos. Relatório de Projeto de Informática, Escola Superior de Tecnologia e Gestão, Polytechnic Institute of Guarda.

Ovelheiro, B., & Silveira, C. (2020). *SOFTDIGITAL – Contributo para a Transformação Digital. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Instituto Politécnico da Bragança.

Ovelheiro, B., & Silveira, C. (2020). *SoftDigital - Contributo para a Transformação Digital. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Polytechnic Institute of Bragança.

Oxoby, R. (2009). Understanding social inclusion, social cohesion, and social capital. *International Journal of Social Economics*, *36*(12), 1133–1152. doi:10.1108/03068290910996963

Oyedeji, S., Seffah, A., & Penzenstadler, B. (2017). Sustainability Quantification in Requirements Informing Design. *RE4SuSy2017*.

Oyedeji, S., Seffah, A., & Penzenstadler, B. (2018). A Catalogue Supporting Software Sustainability Design. *Sustainability*, *2018*(10), 2296. doi:10.3390u10072296

Özaralli, N. (2003). Effects of transformational leadership on empowerment and team effectiveness. *Leadership and Organization Development Journal*, *24*(6), 335–344. doi:10.1108/01437730310494301

Ozdenizci Kose, B. (2019). Recent Agile Requirement Engineering Practices In It Projects: A Case Analysis. *Business & Management Studies: An International Journal*, *7*(4), 1776–1805.

Özsungur, F. (2019a). *The effects of technology acceptance and use behaviour on women's entrepreneurship motivation factors*. Asia Pacific Journal of Innovation and Entrepreneurship.

Özsungur, F. (2019b). A research on women's entrepreneurship motivation: Sample of Adana Province. *Women's Studies International Forum*, *74*, 114–126. doi:10.1016/j.wsif.2019.03.006

Özsungur, F. (2019c). Ethical leadership, intrapreneurship, service innovation performance and work engagement in chambers of commerce and industry. *Journal of Human Behavior in the Social Environment*, *29*(8), 1–23. doi:10.1080/10911359.2019.1664359

Paetsch, F., Eberlein, A., & Maurer, F. (2003, June). Requirements engineering and agile software development. In WET ICE 2003. Proceedings. Twelfth IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises, 2003 (pp. 308-313). IEEE. doi:10.1109/ENABL.2003.1231428

Paiva, S., & Gupta, N. (2020). Technologies and Systems to Improve Mobility of Visually Impaired People: A State of the Art. In Technological Trends in Improved Mobility of the Visually Impaired (pp. 105-123). EAI/Springer Innovations in Communication and Computing. Springer. doi:10.1007/978-3-030-16450-8_5

Panetta, K. (2016). *Gartner's Top 10 Security Predictions 2016*. Obtido em 12 de janeiro de 2020, de https://www.gartner.com/smarterwithgartner/top-10-security-predictions-2016/?cm_mmc=social-_-rm-_-gart-_-swg

Papenhausen, C., & Parayitam, S. (2015). Conflict Management Strategies as Moderators in the Antecedents to Affective Conflict and its Influence on Team Effectiveness. *Journal of Business and Management*, *21*(1).

Papke-Shields, K., Beise, C., & Quan, J. (2010). Do project managers practice what they preach, and does it matter to project success? *International Journal of Project Management*, *28*(7), 650–662. doi:10.1016/j.ijproman.2009.11.002

Paredes, H., Fernandes, H., Sousa, A., Fortes, R., Koch, F., Filipe, V., & Barroso, J. (2015) CanIHelp - A platform for inclusive collaboration. Universal Access in Human-Computer Interaction - Access to Interaction, 9176, 474-483.

Parker, J. (2013). *Requirements Engineering vs. Business Analysis*. Enfocus Solutions. Available at: https://enfocussolutions.com/requirements-engineering-vs-business-analysis/

Parker, C., May, A., Mitchell, V., & Burrows, A. (2013). Capturing Volunteered Information for Inclusive Service Design: Potential Benefits and Challenges. *The Design Journal*, *16*(2), 198–218. doi:10.2752/175630613X13584367984947

Parker, H. (2016). Team effectiveness and open discussion of conflict in collaborative new product development: A cross-national study. *Journal of Business Research*, *69*(11), 4757–4762. doi:10.1016/j.jbusres.2016.04.026

Parthasarathy, S., & Daneva, M. (2014). Customer requirements based ERP customization using AHP technique. *Business Process Management Journal*, *20*(5), 730–751. doi:10.1108/BPMJ-04-2013-0044

Patriarca, J. (2016). *Free and Open Source Software in Public Administration - From myths to issues of a legal, ethical and optimization of public resources* (Master's thesis). Faculty of Arts, University of Coimbra, Coimbra.

Paulino, S., & Reis, L. (2012). *Importância das Redes Sociais – Ambientes Comunitários como canal de transferência de Conhecimento nas organizações – estudo de caso. In XXII Jornadas Luso-Espanholas de Gestão Científica*. Universidade de Trás-os-Montes e Alto Douro.

Pawson, S., D'Arcy, P., & Richardson, S. (2017). The value of community-based tourism in Banteay Chhmar, Cambodia. *Tourism Geographies*, *19*(3), 378–397. doi:10.1080/14616688.2016.1183143

Pearlson, K., Saunders, C., & Galletta, D. (2019). *Managing and Using Information Systems: A Strategic Approach*. Wiley.

Peffers, K., Tuunanen, T., Rothenberger, M., & Chatterjee, S. (2007). A Design Science Research Meth-odology for Information Systems Research. *Journal of Management Information Systems, 24*(3), 45-78.

Peltz, J. (2017). *Domino's Pizza stock is up 5,000% since 2008. Here's why*. Retrieved 11 November 2019, from https://www.latimes.com/business/la-fi-agenda-dominos-20170515-story.html

Pemberton, L., & Fallahkhair, S. (2005). Design Issues for Dual Device Learning: interactive television and mobile phone. Proceedings of mLearn'2005.

Peng, Z., & Tsou, M. (2003). *Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks*. John Wiley & Sons.

Penzenstadler, B. (2015). Sustainability and Requirements: A Manifesto. *IEEE Software*, *32*(5), 90-92.

Penzenstadler, B., Betz, S., Venters, C. C., Chitchyan, R., Porras, J., Seyff, N., Duboc, L., & Becker, C. (2018). Everything is Interrelated: Teaching Software Engineering for Sustainability. *IEEE/ACM 40th International Conference on Software Engineering: Software Engineering Education and Training (ICSE-SEET)*, 153-162.

Perani, G. (1997). Military technologies and commercial applications: *Public Policies in NATO Countries*. Retrieved from: https://www.nato.int/acad/fellow/95-97/perani.pdf

Peretti, P. (2011). *Marketing digitale: scenari, strategie, strumenti.* Apogeo srl.

Perez, S., & Sanchez, Z. M. F. S. (1999). Metodología para investigación en marketing y dirección de empresas. Madrid: Editorial Pirámide.

Perry-Smith, J. E. (2006). Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, *49*(1), 85–101. doi:10.5465/amj.2006.20785503

Perry-Smith, J. E., & Mannucci, P. V. (2017). From creativity to innovation: The social network drivers of the four phases of the idea journey. *Academy of Management Review*, *42*(1), 53–79. doi:10.5465/amr.2014.0462

Pestana, J. (2019). La Era del Turista Digital. *Hosteltur*, 28–29.

Petticrew, M., & Roberts, H. (2008). *Systematic reviews in the social sciences: A practical guide*. John Wiley & Sons.

Pfeffer, J., Zorbach, T., & Carley, K. M. (2014). Understanding online firestorms: Negative word-of-mouth dynamics in social media networks. *Journal of Marketing Communications*, *20*(1-2), 117–128. doi:10.1080/13527266.2013.797778

Phil, M. (2015). Comparative analysis of different agile methodologies. *International Journal of Computer Science and Information Technology Research*, *3*(1).

Pickles, L., Bookbinder, S., & Watts, C. (1999). Building the HR value Chain. *Employment Relations Today*, *25*(1), 21-3.

Pieriegud, J. (2016). Cyfryzacja gospodarki i społeczeństwa – wymiar globalny, europejski i krajowy. In *Cyfryzacja Gospodarki i Społeczeństwa. Szanse i wyzwania dla sektorów infrastrukturalnych*. Publikacja Europejskiego Kongresu Finansowego.

Pinho, A. (2019). *Estudo de User Experience de uma interface tangível: O cubo personalizável SIX* (Master Thesis). University of Aveiro.

Pinkowska, M., & Lent, B. (2011). Evaluation of Scientific and Practice Approaches to Soft Skills Requirements in the ICT Project Management. IBIMA Business Review, 10.

Plewe, B. (1997). The Cartographic Representation of Gradation: Fuzzy Maps from Fuzzy Data. *Proceedings of AUTO-CARTO 13*.

PMI, Project Management Institute (2017a). *The PMI Guide to Business Analysis*. PMI.

PMI, Project Management Institute. (2017b). *Business Analysis: Leading Organizations to Better Outcomes*. Available at: https://www.pmi.org/business-solutions/white-papers/-/media/pmi/documents/public/pdf/white-papers/business-analysis-outcomes.pdf?v=702d20b8-6248-4f6b-b49e-bfc3ec82f560

Ponterotto, J. G., Ruckdeschel, D. E., Joseph, A. C., Tennenbaum, E. A., & Bruno, A. (2011). ¨Multicultural personality dispositions and trait emotional intelligence: An exploratory study. *The Journal of Social Psychology*, *151*(5), 556–576. doi:10.1080/00224545.2010.503718 PMID:22017073

PORDATA. (2019). *Empresas e Pessoal*. PORDATA - Base de Dados Portugal Contemporâneo: https://www.pordata.pt/Tema/Portugal/Empresas+e+Pessoal-4

Porter, M. (2006). Redefining Health Care: Creating Value-Based Competition on Results. Harvard Business Review.

Porter, M., & Lee, T. (2013). The Strategy That Will Fix Health Care. *Harvard Business Review*.

Powell, A., Piccoli, G., & Ives, B. (2004). Virtual teams: a review of current literature and directions for future research. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*. doi:10.1145/968464.968467

Prata, A. (2005). iTV Guidelines. In Encyclopedia of Multimedia Technology and Networking. Idea Group Inc.

Prata, A., & Chambel, T. (2011). Going Beyond iTV: Designing Flexible Video-Based Crossmedia Interactive Services as Informal Learning Contexts. *Proceedings of Euro iTV 2011 – 9th European Interactive TV Conference ACM Conference*, 65-74.

Prata, A., & Chambel, T. (2019). Mobility in a Crossmedia Environment Capable of Generating Personalized Informal Learning Contents from iTV, PC and Mobile Devices. *Proc. of JAUTI 2019 – VIII Conferência Iberoamericana sobre Aplicações e Usabilidade da TV Interativa,* 59-71.

Prata, A., Chambel, T. (2014). Metodologia para avaliação de soluções crossmedia geradoras de ambientes personalizados de aprendizagem informal a partir de vídeo. *Actas do seminário entre a teoria e o conhecimento – Investigar práticas em contexto*.

Prata, A., Chambel, T., & Guimarães, N. (2012). Personalized Content Access in Interactive TV-Based Cross Media Environments. In TV Content Analysis Techniques and Applications. CRC-Press.

Prata, A., Chambel, T., & Guimarães, N. (2010). Generation of Crossmedia Dynamic Learning Contexts from iTV. *Proceedings of ACM EuroiTV 2010*, 91-100. 10.1145/1809777.1809798

Projeto de Leitura Inclusiva Partilhada (PLIP). (2018). *KITS PLIP - Instituto Politécnico de Leiria*. Retrieved from https://plip.ipleiria.pt/dinamizacao

Prosci. (2020). *Change Management Process*. Obtido de Virtual Instructor-Led Change Management Program available now!: https://www.prosci.com/resources/articles/change-management-process

Pruitt, J., & Grudin, J. (2003). Personas: practice and theory. *Proceedings of the 2003 conference on Designing for user experiences*, 1-15.

Puck, J. F., Mohr, A. T., & Rygl, D. (2008). An empirical analysis of managers' adjustment to working in multi-national project teams in the pipeline and plant construction sector. *International Journal of Human Resource Management*, *19*(12), 2252–2267. doi:10.1080/09585190802479488

Puck, J., Rygl, D., & Kittler, M. (2007). Cultural antecedents and performance consequences of open communication and knowledge transfer in multicultural process-innovation teams. *Journal of Organisational Transformation & Social Change*, *3*(2), 223–241. doi:10.1386/jots.3.2.223_1

Quadro, F. (2012). *GIS Development, a New World Being Discovered*. Revista FOSSGIS Brasil. Retrieved from http://www.fossgisbrasil.com.br

Quatrani, T. (2001). *Introduction to the Unified Modeling Language*. IBM Rational.

Rádio Televisão Portuguesa (RTP). (2020). *RTP Acessibilidades - Audiodescrição*. Portal RTP. Retrieved from http://www.rtp.pt/wportal/acessibilidades/audiodescricao.php

Raisinghani, M. S., & Idemudia, E. C. (2019). Green information systems for sustainability. In Green Business: Concepts, Methodologies, Tools, and Applications (pp. 565-579). IGI Global. doi:10.4018/978-1-5225-7915-1.ch028

Rajagopalan, S., & Wagner, R. E. (2012). Legal entrepreneurship within a system of entangled political economy. *American Journal of Entrepreneurship*, *6*(1), 26–39.

Ramakrishnan, R. K., & Viswanathan, S. (2011). The importance of Business Strategy in Business Continuity Planing. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Ramos, A., Silveira, M. C., & Pinheiro, C. (2013). *SolGlobal - Gestão de organizações sem fins lucrativos com Salesforce. In XXIII Jornadas Hispano-Lusas de Gestión Científica*. Espanha.

Ranf, D. E. (2010). Cultural differences in project management. *Annales Universitatis Apulensis Series Oeconomica*, *2*(12), 1–18.

Raposo, R., Beça, P., de Figueiredo, C. M., & dos Santos, H. R. (2012). Mesh-T: An on-going project on ubiquitous and context-aware technologies in tourism. *Ereview of Tourism Research*, *10*(2), 72–75.

Rawhouser, H., Cummings, M., & Newbert, S. L. (2019). Social impact measurement: Current approaches and future directions for social entrepreneurship research. *Entrepreneurship Theory and Practice*, *43*(1), 82–115. doi:10.1177/1042258717727718

Raza, K. (2017). *How the Cloud Is Transforming Healthcare*. Forbes Technology Council. Retrieved in 2019, January 11, from https://www.forbes.com/sites/forbestechcouncil/2017/06/13/how-the-cloud-is-transforming-healthcare/#748702351fd7

Rego, A., Sousa, F., Marques, C., & Cunha, P. M. (2012). Authentic leadership promoting employees' psychological capital and creativity *Journal of Business Research, 65*, 429-437.

Rehan, F., Block, J. H., & Fisch, C. (2019). Entrepreneurship in Islamic communities: How do Islamic values and Islamic practices influence entrepreneurship intentions? *Journal of Enterprising Communities: People and Places in the Global Economy*, *13*(5), 557–583. doi:10.1108/JEC-05-2019-0041

Reinhartz-Berger, I., & Kemelman, M. (2019). Extracting Core Requirements for Software Product Lines. *Requirements Engineering*, *2019*, 1–9.

Reis, L. (2001). *Planeamento de Sistemas de Informação e da Contingência e Recuperação* (Ph.D thesis). Braga: Universidade do Minho, Escola de Engenharia.

Reis, L., Silveira, C., Carvalho, L., Mata, C., & Madeira, R. (2020). Design de Protótipo para Pessoa sem-abrigo - Contributos de Sustentabilidade. In *IV International Forum on Management*. Universidade Aberta, Lisbon.

Reis, L., Silveira, C., Carvalho, L., Mata, C., & Madeira, R. (2020). Design de Protótipo para Pessoa sem-abrigo - Contributos de Sustentabilidade. In *IV International Forum on Management.* Universidade Aberta.

Reis, L., & Silveira, C. (2020). *Sustentabilidade Multidimensional em Sistemas de Informação. In XXX Jornadas Luso-Espanholas de Gestão Científica*. Instituto Politécnico de Bragança.

Reis, L., Silveira, C., Carvalho, L., & Mata, C. (2020). Digitalization as a key issue of the Circular Economy to promote Sustainability: Prototyping Design for Homeless People. In S. Rodrigues, P. Almeida, & N. Almeida (Eds.), *Mapping, Managing, and Crafting Sustainable Business Strategies for the Circular Economy*. IGI Global. doi:10.4018/978-1-5225-9885-5.ch007

Rematisios, I., & Pollalis, Y. A. (2018). Strategic value of NATO's investment in science, technology & innovation (STI): Management of information and knowledge as intangible Assets. *Journal of Defense Resources Management*, *9*(2), 5–17.

ReQtest. (2018). *Requirements Analysis – Understanding the Basics*. Retrieved from: https://reqtest.com/requirements-blog/requirements-analysis/

Rezaei, S., Goli, M., & Dana, L. P. (2014). Beyond legal entrepreneurship: The case of Austria. *International Journal of Entrepreneurship and Small Business*, *21*(2), 202–215. doi:10.1504/IJESB.2014.059473

RGPD. (2018). *Regulamento Geral de Proteção de Dados*. Diário da República n.º 231/2018, Série II de 2018-11-30, www.cnpd.pt/bin/rgpd/rgpd.htm

RGPD. (2018). *Regulamento Geral de Proteção de Dados*. Diário da República n.º 231/2018, Série II de 2018-11-30. Retrieved from: www.cnpd.pt/bin/rgpd/rgpd.htm

Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *The Journal of Applied Psychology*, *87*(4), 698–714. doi:10.1037/0021-9010.87.4.698 PMID:12184574

Richter, C., Kraus, S., Brem, A., Durst, S., & Giselbrecht, C. (2017). Digital entrepreneurship: Innovative business models for the sharing economy. *Creativity and Innovation Management*, *26*(3), 300–310. doi:10.1111/caim.12227

Rickards, T., & Moger, S. (2006). Creative leaders: A decade of contributions from Creativity and Innovation Management Journal. *Creativity and Innovation Management*, *15*(1), 4–18. doi:10.1111/j.1467-8691.2006.00365.x

RightHear. (2020). *Right Hear: App for Visually Impaired & Blind People*. Retrieved from https://www.right-hear.com/

RNIB. (2020). *RNIB - See differently*. Retrieved from https://www.rnib.org.uk/

Roberts, N., & Grover, V. (2012). Leveraging information technology infrastructure to facilitate a firm's customer agility and competitive activity: An empirical investigation. *Journal of Management Information Systems*, *28*(4), 231–270. doi:10.2753/MIS0742-1222280409

Robertson, S., & Robertson, J. (2012). *Mastering the requirements process: Getting requirements right*. Addison-Wesley.

Robertson, S., Wharton, C., Ashworth, C., & Franzke, M. (1996). Dual Device User Interface Design: PDAs and Interactive Television. *Proceedings of ACM CHI 1996*, 79-86. 10.1145/238386.238408

Robinson, P., & Lowe, J. (2015). Literature reviews vs systematic reviews. *Australian and New Zealand Journal of Public Health*, *39*(2), 103–103. doi:10.1111/1753-6405.12393 PMID:25827181

Rodrigues, A. M. A. (2000). Desenvolvimento sustentável e atividade turística. In C. Serrano (Ed.), *Olhares contemporâneos sobre o turismo* (pp. 171–188). Papirus.

Roher, K., & Richardson, D. (2013). Sustainability requirement patterns. *3rd International Workshop on Requirements Patterns*, 8-11.

Roos, G. (2012). Manufacturing into the future. Technical Report. *Government of Australia*. Retrieved from: https://www.researchgate.net/publication/274392157_Manufacturing_into_the_Future

Roque, V. (2014). *A Integração de Media Sociais nas Organizações de Gestão de Destinos: proposta de um modelo orientador para a utilização de media sociais nas atividades de comunicação com os turistas*. Universidade de Aveiro. Retrieved from http://hdl.handle.net/10773/13649

Roque, V., & Raposo, R. (2013). Os Media Sociais como uma Ferramenta de Comunicação e Marketing no Turismo: uma análise das atividades online dos principais atores portugueses. In C. Ramos, M. Correia, F. Serra, J. Santos, & P. Águas (Eds.), *Competitividade, Marketing e Tecnologias de Informação e Comunicação no Turismo* (pp. 237–260). Faro: Universidade do Algarve, Escola Superior de Gestão, Hotelaria e Turismo.

Roque, V., & Raposo, R. (2015). A utilização de Media Sociais pelas organizações de gestão de destinos. O caso de estudo das OGD portuguesas. Dos Algarves: A Multidisciplinary e-Journal, 26(2), 87–114. doi:10.18089/DAMeJ.2015.26.2.5

Roque, V., & Raposo, R. (2016a). Avaliação da Implementação e da Utilização de Media Sociais pelas Organizações Públicas Portuguesas de Gestão de Destinos. In C. Sousa, M. Correia, P. Cascada, R. Guerreiro, & C. Henriques (Eds.), *Desafios, Estratégias e Tendências em Gestão e Novas Tecnologias de Informação e Comunicação* (pp. 499–526). Faro: Universidade do Algarve, Escola Superior de Gestão, Hotelaria e Turismo.

Roque, V., & Raposo, R. (2016b). Looking for Tourism Related Information in the Social Media Landscape: an Analysis of Portuguese Tourists' Habits. In C. Bernadas & D. Minchella (Eds.), *3rd European Conference on Social Media Research* (pp. 349–359). Caen: Academic Conferences and Publishing International Limited.

Roque, V., & Raposo, R. (2017). Uma proposta de modelo para melhorar a performance das Organizações de Gestão de Destinos na utilização de media sociais no processo de comunicação com os turistas. *Revista Turismo & Desenvolvimento, 1*(27/28), 1379–1397. Retrieved from http://revistas.ua.pt/index.php/rtd/article/view/7164/5646

Roquete, M. (2018). *Modelo de maturidade para apoio à implementação de uma filosofia de gestão ori-entada a processos numa organização*. Nova Information Management School.

Roque, V., Fernandes, G. P., Sardo, A., Martins, J. A., & Melo, A. (2013). Tourism Promotion and the (Re) Functionalization of Information Offices: The Case of Serra da Estrela. *Papers de Turisme*, (54), 70–87.

Roque, V., Fernandes, G., & Raposo, R. (2012). Identificação dos Media Sociais utilizados pelas organizações de gestão de destinos: O caso de estudo do destino turístico Serra da Estrela. *Journal of Tourism and Development*, *17/18*(1), 311–320.

Roque, V., & Raposo, R. (2016). Social media as a communication and marketing tool in tourism: An analysis of online activities from international key player DMO. *Anatolia*, *27*(1), 58–70. doi:10.1080/13032917.2015.1083209

Rössing, R. v. (2011). BC audit. In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Rousseau, R. (2001). Indicadores bibliométricos y econométricos en la evaluación de instituciones científicas. *Acimed*, *9*, 23–29.

Rousseau, V., Aubé, C., & Tremblay, S. (2013). Team coaching and innovation in work teams. *Leadership and Organization Development Journal*, *34*(4), 344–364. doi:10.1108/LODJ-08-2011-0073

Rowold, J. (2011). Relationship between leadership behaviors and performance: The moderating role of a work team's level of age, gender, and cultural heterogeneity. *Leadership and Organization Development Journal*, *32*(6), 628–647. doi:10.1108/01437731111161094

Russo, N. (2019). *Guia de Apoio à Conceção de Plano de Continuidade de Negócio nas Organizações com Programas Informáticos de Faturação* (Master's thesis). Setúbal: Instituto Politécnico de Setúbal.

Russo, N., & Reis, L. (2019). Análise da Problemática Subjacente à Certificação de Programas Informáticos de Faturação. *CISTI'2019 - 14th Iberian Conference on Information Systems and Technologies*.

Russo, N., & Reis, L. (2019a). Análise da problemática subjacente à certificação de programas informáticos de faturação. CISTI'2019 - 14ª Conferência Ibérica de Sistemas e Tecnologias de Informação.

Russo, N., & Reis, L. (2019b). Caracterização da Faturação em Portugal: sob a perspetiva da certificação de programas informáticos de faturação. *Revista de Ciências da Computação, 14*.

Russo, N., & Reis, L. (2019). *Análise da problemática subjacente à certificação de programas informáticos de faturação. In 14ª Conferência Ibérica de Sistemas e Tecnologias de Informação (CISTI 2019)*. Universidade de Coimbra.

Ryan, J., Doster, B., Daily, S., & Lewis, C. (2019). *Business Process Redesign in the Perioperative Process: A Case Perspective for Digital Transformation*. Academic Press.

Ryff, C. D. (2019). Entrepreneurship and eudaimonic well-being: Five venues for new science. *Journal of Business Venturing*, *34*(4), 646–663. doi:10.1016/j.jbusvent.2018.09.003 PMID:31105380

Saebi, T., Foss, N. J., & Linder, S. (2019). Social entrepreneurship research: Past achievements and future promises. *Journal of Management*, *45*(1), 70–95. doi:10.1177/0149206318793196

Salesforce. (2019a). *Use the power of social, mobile, cloud, and analytics to become a Connected Nonprofit*. Salesforce. Retrieved from: www.salesforce.com/eu/solutions/industries/nonprofit/overview/

Salesforce. (2019b). *Salesforce for Nonprofits Free Trial.* Salesforce. Retrieved from: www.salesforce.org/nonprofit/get-started/

Sambhanthan, A., & Good, A. (2012). Implications for improving accessibility to e-commerce websites in developing countries: A study of hotel websites. *International Journal of Knowledge-Based Organizations*, *2*(2), 1–20. doi:10.4018/ijkbo.2012040101

Sánchez, J., Starostenko, O., Castillo, E., & González, M. (2005). Generation of usable interfaces for mobile devices. *Proc. of CLICH'05*, 348. 10.1145/1111360.1111408

Santos, R. (2017). O direito das pessoas a verem televisão. *Revista Louis Braille*, *20*, 21-23.

Santos, C. M., Uitdewilligen, S., & Passos, A. M. (2015). Why is your team more creative than mine? The influence of shared mental models on intra-group conflict, team creativity and effectiveness. *Creativity and Innovation Management*, *24*(4), 645–658. doi:10.1111/caim.12129

Santos, V. (2018). *Criatividade em Sistemas de Informação*. FCA, Editora de Informática, Lda.

Sauerwein, E., Bailom, F., Matzler, K., & Hinterhuber, H. H. (1996). The Kano model: How to delight your customers. *International Working Seminar on Production Economics, 1*(4), 313-327.

Sayegh, E. (2020). *As COVID-19 Pushes Businesses To Their Limit, The Cloud Rises Above*. Forbes. Retrieved 2020, March 26, from https://www.forbes.com/sites/emilsayegh/2020/03/26/as-covid-19-pushes-businesses-to-their-limit-the-cloud-rises-above/#3c6e162b7851

Scaled Agile. (2020). *Value Streams*. Available at: https://www.scaledagileframework.com/value-streams/

Schenkel, M. T., Farmer, S., & Maslyn, J. M. (2019). Process improvement in SMEs: The impact of harmonious passion for entrepreneurship, employee creative self-efficacy, and time spent innovating. *Journal of Small Business Strategy*, *29*(1), 64–77.

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.

Schibi, O., & Lee, C. (2015). Project sponsorship: senior management's role in the successful outcome of projects. *EMEA, PA: Project Management Institute*. Obtido de https://www.pmi.org/learning/library/importance-of-project-sponsorship-9946

Schön, E. M., Thomaschewski, J., & Escalona, M. J. (2017). Agile Requirements Engineering: A systematic literature review. *Computer Standards & Interfaces*, *49*, 79–91. doi:10.1016/j.csi.2016.08.011

Schulze, A., & Seuffert, V. (2014). Conflicts, cooperation, and competition in the field of science and technology. Handbook of the Psychology of Science, 303-30.

SecondSight. (2019). *Argus II: the life-changing retinitis pigmentosa treatment*. Retrieved from https://secondsight.com/discover-argus/

Segerståhl, K. (2009). Crossmedia Systems Constructed around Human Activities: A Field Study and Implications for Design. Proc. of the Interact 2009, 354-367. doi:10.1007/978-3-642-03658-3_41

Segerståhl, K. (2008). Utilization of Pervasive IT Compromised? Understanding the Adoption and Use of a Cross Media System. *Proceedings of MUM'2008*, 168-175.

Segerståhl, K., & Oinas-Kukkonen, H. (2007). Distributed User Experience in Persuasive Technology Environments. In Lecture notes in Computer Science: Vol. 4744. *Persuasive 2007*. Springer-Verlag. doi:10.1007/978-3-540-77006-0_10

Seki, Y., Hayashi, S., & Saeki, M. (2019). Detecting Bad Smells in Use Case Descriptions. *27th IEEE International Requirements Engineering Conference (RE'19)*, 98-108. 10.1109/RE.2019.00021

Serrano, A., & Fialho, C. (2003). *Gestão do conhecimento: o novo paradigma das organizações*. FCA Editora de Informática.

Sexton, D. L., & Bowman-Upton, N. B. (1991). *Entrepreneurship: Creativity and growth*. Macmillan.

Shahbaz, M., Leitão, N. C., & Uddin, G. S. (2012). *Should Portuguese Economy Invest in Defense Spending? A Revisit*. Munich Personal RePEc Archive. Retrieved from: https://mpra.ub.uni-muenchen.de/42289/

Shanock, L. R., & Eisenberger, R. (2006). When supervisors feel supported: Relationships with subordinates' perceived supervisor support, perceived organizational support, and performance. *The Journal of Applied Psychology*, *91*(3), 689–695. doi:10.1037/0021-9010.91.3.689 PMID:16737364

Sharma, S., Chen, K., & Sheth, A. (2018, March/April). Toward Practical Privacy-Preserving Analytics for IoT and Cloud-Based Healthcare Systems. *IEEE Internet Computing*, *22*(2), 42–51. doi:10.1109/MIC.2018.112102519

Sharmila, R., Kumar, D., Kumar, P., & Ashok, A. (2020). Introduction to Multimedia Big Data Computing for IoT. In S. Tanwar, S. Tyagi & N. Kumar (Eds.), Multimedia Big Data Computing for IoT Applications - Concepts, Paradigms and Solutions (pp. 3-36). Springer Nature Singapore. doi:10.1007/978-981-13-8759-3_1

Shepherd, D. A., Wennberg, K., Suddaby, R., & Wiklund, J. (2019). What are we explaining? A review and agenda on initiating, engaging, performing, and contextualizing entrepreneurship. *Journal of Management*, *45*(1), 159–196. doi:10.1177/0149206318799443

Shin, S. J., & Zhou, J. (2003). Transformational leadership, conservation, and creativity: Evidence from Korea. *Academy of Management Journal*, *46*(6), 703–714. doi:10.5465/30040662

Shklar, J. N. (1986). *Legalism: Law, morals, and political trials*. Harvard University Press.

Sida, P., & Zhe, L. (2018). Comparative study of the impact of defense expenditure on economic growth in China and US. *Journal of Discrete Mathematical Sciences and Cryptography*, *21*(6), 1323–1328. doi:10.1080/09720529.2018.1529720

Siddiqui, S., Alam, M., & Bokhari, M. (2012). Software Tools Required to Develop GIS Applications: An Overview. *2012 Second International Conference on Advanced Computing & Communication Technologies*, 51-56. 10.1109/ACCT.2012.106

Sigala, M. (2012). Social networks and customer involvement in new service development (NSD): The case of www.mystarbucksidea.com. International Journal of Contemporary Hospitality Management, 24(7), 966–990. doi:10.1108/09596111211258874

SignEasy. (2019). *Company Profile SignEasy*. Obtido em 17 de Junho de 2019, Retrieved from https://signeasy.com/company-profile/

Sigurdsson, V., Larsen, N. M., Sigfusdottir, A. D., Fagerstrøm, A., Alemu, M. H., Folwarczny, M., & Foxall, G. (2020). The relationship between the firm's social media strategy and the consumers' engagement behavior in aviation. *Managerial and Decision Economics*, *41*(2), 234–249. doi:10.1002/mde.3052

Silva, M. R. (2004). *Análise bibliométrica da produção científica docente do programa de pós-graduação em educação especial/UFSCar.* Dissertação (Mestrado em Educação Especial) - Universidade Federal de São Carlos, São Carlos, Brasil.

Silva, T., Reis, L., Hernández, C., & Caravau, H. (2017). Building informative audio-visual content automatically: a process to define the key aspects. *Proc. of JAUTI 2017 - 6th Iberoamerican Conference on Applications and Usability for Interactive TV*, 130-141.

Silva, A. (2011). *Implementation of a geographic information system in a municipality using free and open source software*. New University of Lisbon. Retrieved from https://run.unl.pt/handle/10362/5161

Silva, R. O. (2002). *Teorias da Administração*. Pioneira Thomson Learning.

Silveira, C., & Vidal, R. (2002). Software Reuse with Use Case Patterns. OOIS 2002, Reuse in Object-Oriented Information Systems Design, Proceedings, Lecture Notes in Computer Science, Springer-Verlag, 2426, 96-100.

Silveira, J. (2019). *A Browser-based Anonymous Questionnaire System with User-controlled Linkability* (Master Thesis). University of Lisbon.

Silveira, C., Faria, J., Aguiar, A., & Vidal, R. (2005). Wiki Based Requirements Documentation of Generic Software Products. *Proceedings of The Tenth Australian Workshop on Requirements Engineering*, 42-51.

Silveira, C., Faria, P., Aguiar, A., & Vidal, R. (2005). Wiki Based Requirements Documentation of Generic Software Products. *Proceedings of The Tenth Australian Workshop on Requirements Engineering.*

Silveira, M. C. (2006). *A Reutilização de Requisitos no Desenvolvimento e Adaptação de Produtos de Software*. FEUP.

Silveira, M., & Vidal, R. (2002). *Software Reuse with Use Case Patterns. In OOIS 2002, Reuse in Object-Oriented Information Systems Design, Proceedings*. Springer-Verlag.

Simmonds, D., & Bhattacherjee, A. (2014). Green IT Adoption and Sustainable Value Creation, Research-in-Progress. *Twentieth Americas Conference on Information Systems*.

Simonova, V., Popov, E., & Komarova, O. (2020, January). Social Networks as a Tool for Leadership in Entrepreneurship Ecosystem. In *5th International Conference on Social, Economic, and Academic Leadership (ICSEALV 2019)* (pp. 58-62). Atlantis Press.

Sky. (2020). *Products & Packages – Sky Q*. Retrieved from https://www.sky.com/shop/tv/sky-q/

Smith, D., Bruyns, M., & Evans, S. (2011). project manager's optimism and stress management and IT project success. *International Journal of Managing Projects in Business*, *4*(1), 10–27. Advance online publication. doi:10.1108/17538371111096863

Smith, M., & Shields, P.-A. (2011). Strategies for Continuity and Availability for Information and Communications Technology (ICT). In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (3rd ed.). John Wiley & Sons, Ltd.

Snell, S. A., Snow, C. C., Davison, S. C., & Hambrick, D. C. (1998). Designing and supporting transnational teams: The human resource agenda. *Human Resource Management: Published in Cooperation with the School of Business Administration*, *37*(2), 147-158.

Sobel, R. S. (2008). Testing Baumol: Institutional quality and the productivity of entrepreneurship. *Journal of Business Venturing*, *23*(6), 641–655. doi:10.1016/j.jbusvent.2008.01.004

Software Sustainability Institute. (2019). *Manifesto*. Software Sustainability Institute. Retrieved from: www.software.ac.uk/about/manifesto

Sommerville, I. (2005). Integrated Requirements Engineering: A Tutorial. *IEEE Software*, *22*(1), 16–23. doi:10.1109/MS.2005.13

Sommerville, I. (2015). *Software Engineering* (10th ed.). Addison-Wesley Pearson Education.

Song, Y. (2015). From offline social networks to online social networks: Changes in entrepreneurship. *Informações Econômicas*, *19*(2), 120–133. doi:10.12948/issn14531305/19.2.2015.12

Sosinsky, B. (2011). *Cloud Computing Bible*. Wiley Publishing, Inc.

Souiden, N., Ladhari, R., & Chiadmi, N. E. (2018). *New trends in retailing and services*. Academic Press.

Stahl, G. K., Maznevski, M. L., Voigt, A., & Jonsen, K. (2010). Unraveling the effects of cultural diversity in teams: A meta-analysis of research on multicultural work groups. *Journal of International Business Studies*, *41*(4), 690–709. doi:10.1057/jibs.2009.85

Stanko, T. L., & Gibson, C. (2009). *The role of cultural elements in virtual teams. In Cambridge handbook of culture, organizations, and work*. Cambridge University Press.

Stankov, U. (2010). The extent of use of basic Facebook user-generated content by the national tourism organizations in Europe. *European Journal of Tourism Research*, *3*(2), 105–113.

Steiniger, S., & Bocher, E. (2009). An overview on current free and open source desktop GIS developments. *International Journal of Geographical Information Science*, *23*(10), 1345–1370. doi:10.1080/13658810802634956

Stephanidis, C. (2001). User Interfaces for All – New perspectives into Human-Computer Interaction. In C., Stephanidis (Ed.), *User Interfaces for All - Concepts, Methods, and Tools* (pp. 3–17). Lawrence Erlbaum Associates.

Stewart, R. (2008). A framework for the life cycle management of information technology projects: ProjectIT. *International Journal of Project Management*, *26*(2), 203–212. doi:10.1016/j.ijproman.2007.05.013

Sturges, J., Conway, N., & Liefooghe, A. (2010). Organizational support, individual attributes, and the practice of career self-management behavior. *Group & Organization Management*, *35*(1), 108–141. doi:10.1177/1059601109354837

Sulaiman, A., Naqshbandi, M., & Dezdar, S. (2016, September). Impact of adoption of Green IT practices on organizational performance. *Quality & Quantity*, *50*(5), 1929–1948. doi:10.100711135-015-0244-7

Sullivan, D. (1994). Measuring the degree of internationalization of a firm. *Journal of International Business Studies*, *25*(2), 325–342. doi:10.1057/palgrave.jibs.8490203

Sumiya, K., Munisamy, M., & Tanaka, K. (2004). Tv2Web: generating and browsing web with multiple lod from video streams and their metadata. *Proceedings of ICKS2004*, 158-167. 10.1145/1013367.1013494

Sumner, M. (2018). ERP Project Retrospectives—55 Enterprise Systems: Evaluating Project Success, Lessons Learned, and Business Outcomes. Midwest Association for Information Systems, 12-23.

Suryaatmaja, K., Wibisono, D., & Ghazali, A. (2019). The Missing Framework for Adaptation of Agile Software Development Projects. In *Eurasian Business Perspectives* (pp. 113–127). Springer. doi:10.1007/978-3-030-18652-4_9

SustainAbility. (2018). *Sustainability: Can our society endure?* Retrieved from: SustainAbility an ERM Group company: sustainability.com/sustainability/.

SustainAbility. (2018). *Sustainability: Can our society endure?* SustainAbility an ERM Group Company. Retrieved from://sustainability.com/sustainability/.

Sutcliffe, A. (2002). *User-Centred Requirements Engineering: Theory and Practice*. Springer. doi:10.1007/978-1-4471-0217-5

Sutter, C., Bruton, G. D., & Chen, J. (2019). Entrepreneurship as a solution to extreme poverty: A review and future research directions. *Journal of Business Venturing*, *34*(1), 197–214. doi:10.1016/j.jbusvent.2018.06.003

Syed, A., & Syed, A. (2004). *Business Continuity Planning Methodology*. Sentryx.

Szczepaniuk, E., Szczepaniuk, H., Rokicki, T., & Klepacki, B. (2019). *Information security assessment in public administration.* Obtido em 13 de fevereiro de 2020, de https://www.sciencedirect.com/science/article/pii/S0167404819302469

Tabrizi, B., Lam, E., & Irvin, V. (2019). *Digital Transformation Is Not About Technology*. Retrieved 22 October 2019, from https://hbr.org/2019/03/digital-transformation-is-not-about-technology

Takeuchi, R., Wang, M., Marinova, S. V., & Yao, X. (2009). Role of domain-specific facets of perceived organizational support during expatriation and implications for performance. *Organization Science*, *20*(3), 621–634. doi:10.1287/orsc.1080.0403

Tangen, S., & Austin, D. (2019, February 12). *Business continuity - ISO 22301 when things go seriously wrong*. Retrieved from International Organization for Standardization: https://www.iso.org/news/2012/06/Ref1602.html

Tarlinder, A. (2016). *Developer Testing: Building Quality into Software*. Addison-Wesley Signature.

Taspinara, G. K. & Sadeghieh, M. (2015). Military expenditure and economic growth: The case of Turkey. *Procedia Economics and Finance*, *25*, 445-462.

Taylor, A. and Harper, R. (2002). Switching On to Switch Off: An analysis of Routine TV Watching Habits and their Implications for Electronic Programme Design. *UsableiTV, 3*, 7-13.

Taylor, B. (2016). *How Domino's Pizza Reinvented Itself.* Retrieved 11 November 2019, from https://hbr.org/2016/11/how-dominos-pizza-reinvented-itself

TdP. (2017). *Estratégia Turismo 2027 - Liderar o Turismo do Futuro*. Retrieved from https://estrategia.turismodeportugal.pt/sites/default/files/Estrategia_Turismo_Portugal_ET27.pdf

TechSilver. (2020). *Smartphone for the Visually Impaired / Blind – Portal TechSilver*. Retrieved from https://www.techsilver.co.uk/product/smartphone-mobile-blind-visually-sight-impaired/

Tengan, C., & Aigbavboa, C. (2016). Evaluating Barriers to Effective Implementation of Pro-ject Monitoring and Evaluation in the Ghanaian Construction Industry. *Procedia Engineering*, *164*, 389–394. doi:10.1016/j.proeng.2016.11.635

Thew, S., & Sutcliffe, A. (2018). Value-based requirements engineering: Method and experience. *Requirements Engineering*, *23*(4), 443–464. doi:10.100700766-017-0273-y PMID:31258257

Thornhill, J. (2016). *Platform businesses may wipe out classic 20th century companies | Financial Times.* Retrieved 19 October 2019, from https://www.ft.com/content/67705108-580c-11e6-8d05-4eaa66292c32

Tjosvold, D. (2008). The conflict-positive organization: It depends upon us. *Journal of Organizational Behavior*, *29*(1), 19–28. doi:10.1002/job.473

Tjosvold, D., Law, K. S., & Sun, H. (2006). Effectiveness of Chinese teams: The role of conflict types and conflict management approaches. *Management and Organization Review*, *2*(2), 231–252. doi:10.1111/j.1740-8784.2006.00040.x

Torfing, J. (2018). Collaborative innovation in the public sector: the argument. *Public Management Review*, 1-11.

Trabula, J. (2010). *Plano de Continuidade de serviços, no âmbito dos Sistemas de Informação da FAP*. Pedrouços: FAP.

Travelport. (2017). *The Global Digital Traveler Research*. Retrieved from https://img06.en25.com/Web/Travelport/%7Bed15e0a6-2592-4fe0-9110-339d047aae6e%7D_Travelport_The_Global_Digital_Traveler_Research.pdf?elqTrackId=82111c8593fa46f9a9b078cd418b76a6&elqaid=1800&elqat=2

Trello by Atlassian. (2020). Available at: https://trello.com/en

Trindade, J. (2008). *Plano de Continuidade de Negócio da Sociedade Interbancária de Serviços (sibs) - Estudo de caso numa perspectiva de gestão de benefícios* (Master's Thesis). Lisbon: ISCTE.

Tsaur, S.-H., & Lin, Y.-C. (2004). Promoting service quality in tourist hotels: The role of HRM practices and service behavior. *Tourism Management*, *25*(4), 471–481. doi:10.1016/S0261-5177(03)00117-1

Ulrich, D. (2000). *Recursos humanos estratégicos: novas perspectivas para os profissionais de RH*. Futura.

Uman, L. S., Chambers, C. T., McGrath, P. J., & Kisely, S. (2008). A systematic review of randomized controlled trials examining psychological interventions for needle-related procedural pain and distress in children and adolescents: An abbreviated Cochrane review. *Journal of Pediatric Psychology*, *33*(8), 842–854. doi:10.1093/jpepsy/jsn031 PMID:18387963

UNB. (2019). *16 Paz, Justiça e Instituições Eficazes*. United Nations Brasil. Retrieved from nacoesunidas.org/pos2015/ods16/

UNCTAD. (2019). *Digital Economy Report 2019*. United Nations. Available on: https://unctad.org/en/PublicationsLibrary/der2019_overview_en.pdf

UNDP. (2015). *Sustainable Development Goals*. Obtido de United Nations Development Programme: www.undp.org/content/undp/en/home/sustainable-development-goals.html

UNDP. (2015). *Sustainable Development Goals*. Retrieved from United Nations Development Programme: www.undp.org/content/undp/en/home/sustainable-development-goals.html

UNDP. (2015). *Sustainable Development Goals*. United Nations Development Programme. Retrieved from: www.undp.org/content/undp/en/home/sustainable-development-goals.html

UNDP. (2020). *Integrated Solutions for Sustainable Development*. United Nations Development Programme. Retrieved from: sdgintegration.undp.org/

Unearth Labs. (2020). *GIS Software*. Retrieved from: https://unearthlabs.com/gis-software-comparison/

UNWTO. (2019). *International Tourism Highlights, 2019 Edition*. Madrid: UNWTO.

Van Der Zee, K. I., & Van Oudenhoven, J. P. (2000). The Multicultural Personality Questionnaire: A multidimensional instrument of multicultural effectiveness. *European Journal of Personality*, *14*(4), 291–309. doi:10.1002/1099-0984(200007/08)14:4<291::AID-PER377>3.0.CO;2-6

Van Knippenberg, D. (2017). Team innovation. *Annual Review of Organizational Psychology and Organizational Behavior*, *4*(1), 211–233. doi:10.1146/annurev-orgpsych-032516-113240

Vancoppenolle, G. (2007). What are we planning for? In A. Hiles (Ed.), *The definitive handbook of Business Continuity Management* (2nd ed.). John Wiley & Sons, Ltd.

Veal, A. J. (2011). Research methodology in leisure and tourism. Sao Paulo: Aleph.

Velte, T., Velte, A., & Elsenpeter, R. (2008). *Green IT: reduce your information system's environmental impact while adding to the bottom line*. McGraw-Hill.

Venkataraman, S. (2019). The distinctive domain of entrepreneurship research. In *Seminal Ideas for the Next Twenty-Five Years of Advances* (pp. 5–20). Emerald Publishing Limited. doi:10.1108/S1074-754020190000021009

Venkatraman, N. (1994). IT-enabled business transformation: From automation to business scope redefinition. *Sloan Management Review*, *35*, 73–73.

Vera, D., & Crossan, M. (2005). Improvisation and innovative performance in teams. *Organization Science*, *16*(3), 203–224. doi:10.1287/orsc.1050.0126

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2019). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*. Advance online publication. doi:10.1016/j.jbusres.2019.09.022

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118–144. doi:10.1016/j.jsis.2019.01.003

von Bloh, J., Broekel, T., Özgun, B., & Sternberg, R. (2019). New (s) data for entrepreneurship research? An innovative approach to use big data on media coverage. *Small Business Economics*, 1–22. doi:10.100711187-019-00209-x

Vrânceanu, C. A., & Iorgulescu, M. C. (2016). A Look at Hofstede's Cultural Dimensions in Two Service Sectors from Romania. *Amfiteatru Economic Journal*, *18*(10), 875–884.

W3C. (2018). *Web Content Accessibility Guidelines (WCAG) 2.1*. Retrieved from https://www.w3.org/TR/WCAG21/

Wadsworth, M., & Blanchard, A. (2015). Influence tactics in virtual teams. *Computers in Human Behavior*, *44*, 386–393. Advance online publication. doi:10.1016/j.chb.2014.11.026

Wagner, S., Méndez-Fernández, D., Kalinowski, M., & Felderer, M. (2018). Agile requirements engineering in practice: Status quo and critical problems. *CLEI Electronic Journal*, *21*(1), 15. doi:10.19153/cleiej.21.1.6

Wake, B. (2003). *INVEST in Good Stories, and SMART Tasks*. Available at: https://xp123.com/articles/invest-in-good-stories-and-smart-tasks

Wang, P., Rode, J. C., Shi, K., Luo, Z., & Chen, W. (2013). A workgroup climate perspective on the relationships among transformational leadership, workgroup diversity, and employee creativity. *Group & Organization Management*, *38*(3), 334–360. doi:10.1177/1059601113488163

Wang, T., Duong, T., & Chen, C. (2016). Intention to disclose personal information via mobile applications: A privacy calculus perspective. *International Journal of Information Management*, *36*(4), 531–542. doi:10.1016/j.ijinfomgt.2016.03.003

Wan, S. H., & Chan, Y.-H. (2008). Adoption of business continuity planning processes in IT service management. *3rd IEEE/IFIP International Workshop on Business-driven IT Management*, 21-30. 10.1109/BDIM.2008.4540071

Webster, F. (1995). *Theories of the Information Society*. Routledge. doi:10.4324/9780203991367

Werthner, H., & Klein, S. (1999). *Information Technology and Tourism — A Challenging Relationship*. Springer. doi:10.1007/978-3-7091-6363-4

West, M. A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology*, *51*(3), 355–387. doi:10.1111/1464-0597.00951

West, M. A., & Anderson, N. R. (1996). Innovation in top management teams. *The Journal of Applied Psychology*, *81*(6), 680–693. doi:10.1037/0021-9010.81.6.680

Whatscine. (2016). *Accesibilidad audiovisual en cines y television*. Retrieved from http://www.whatscine.es/

Whitman, D. G. (2002). Legal entrepreneurship and institutional change. *Journal des Economistes et des Etudes Humaines*, *12*(2), 1–13. doi:10.2202/1145-6396.1061

Wikipedia. (2020). *List of social networking websites*. Retrieved February 27, 2020, from https://en.wikipedia.org/wiki/List_of_social_networking_websites

Wiklund, J., Nikolaev, B., Shir, N., Foo, M. D., & Bradley, S. (2019). *Entrepreneurship and well-being: Past, present, and future*. Academic Press.

Wiklund, J., Wright, M., & Zahra, S. A. (2019). *Conquering relevance: Entrepreneurship research's grand challenge*. Academic Press.

Willems, K., Smolders, A., Brengman, M., Luyten, K., & Schöning, J. (2017). The path-to-purchase is paved with digital opportunities: An inventory of shopper-oriented retail technologies. *Technological Forecasting and Social Change*, *124*, 228–242. doi:10.1016/j.techfore.2016.10.066

Williams, L. K., & McGuire, S. J. (2010). Economic creativity and innovation implementation: The entrepreneurial drivers of growth? Evidence from 63 countries. *Small Business Economics*, *34*(4), 391–412. doi:10.100711187-008-9145-7

Williams, M. D. (2018). Social commerce and the mobile platform: Payment and security perceptions of potential users. *Computers in Human Behavior*. doi:10.1016/j.chb.2018.06.005

Winkler, V. A., & Bouncken, R. B. (2011). How does cultural diversity in global innovation teams affect the innovation process? *Engineering Management Journal*, *23*(4), 24–35. doi:10.1080/10429247.2011.11431917

Wiśniewski, J. B. (2012). On regime uncertainty and legal entrepreneurship. *The Independent Review, 17*(2), 253-256.

Wittbold, K. A., Carroll, C., Iansiti, M., Zhang, H. M., & Landman, A. B. (2020). How Hospitals Are Using AI to Battle Covid-19. *Harvard Business Review.* Retrieved in 2020, April 3, from https://hbr.org/2020/04/how-hospitals-are-using-ai-to-battle-covid-19

Wolton, D. (1999). *Pensar a Comunicação*. Difel.

Wong, K. (2016). *How Domino's Transformed Into An E-commerce Powerhouse Whose Product Is Pizza*. Retrieved 11 November 2019, from https://www.forbes.com/sites/kylewong/2018/01/26/how-dominos-transformed-into-an-ecommerce-powerhouse-whose-product-is-pizza/#748173507f76

WTTC. (2018). *Travel & Tourism Economic Impact 2018 - Portugal*. Retrieved from https://www.sgeconomia.gov.pt/ficheiros-externos-sg/wttc_portugal2018-pdf.aspx

Wu, W., Huang, V., Chen, X., Davison, R. M., & Hua, Z. (2018). Social value and online social shopping intention: The moderating role of experience. *Information Technology & People*, *31*(3), 688–711. doi:10.1108/ITP-10-2016-0236

Xfinity. (2020). *Xfinity X1*. Retrieved from https://www.xfinity.com/learn/digital-cable-tv/x1

Xie, X., Wu, Y., & Zeng, S. (2016). A theory of multi-dimensional organizational innovation cultures and innovation performance in transitional economies. *Chinese Management Studies*, *10*(3), 458–479. doi:10.1108/CMS-01-2016-0023

Xu, Y., & Koivumäki, T. (2019). Digital business model effectuation: An agile approach. *Computers in Human Behavior*, *95*, 307–314. doi:10.1016/j.chb.2018.10.021

Yadav, A., Kanga, S., & Chauhan, R. (2015). The Development and Customization of Desktop GIS Application with Map Window & Dot Technology. *International Journal for Scientific Research & Development*, *3*(2), 1705–1710.

Yasini, P. (2016). Specific characteristics of innovation management process. *International Journal of Organizational Leadership*, *5*(2), 162–171. doi:10.33844/ijol.2016.60406

Yildirim, J., Sezgin, S., & Öcal, N. (2005). Military expenditure and economic growth in Middle Eastern countries: A dynamic panel data analysis. *Defence and Peace Economics*, *16*(4), 283–295. doi:10.1080/10242690500114751

Yilgör, Y., Karagöl, E. T., & Saygili, C. A. (2014). Panel causality analysis between Defense expenditure and economic growth in developed countries. *Defence and Peace Economics*, *25*(2), 193–203. doi:10.1080/10242694.2012.724879

Zairi, M. (1997). Business process management: A boundaryless approach to modern competitiveness. *Business Process Management Journal*, *3*(1), 64–80. doi:10.1108/14637159710161585

Zelkowitz, M., & Wallace, D. (1998). Experimental Models for Validating Technology. *IEEE Computer*, *31*(5), 23–31. doi:10.1109/2.675630

Zeng, B., & Gerritsen, R. (2014). What do we know about social media in tourism? A review. *Tourism Management Perspectives*, *10*, 27–36. doi:10.1016/j.tmp.2014.01.001

Zhang, Z., & Sharifi, H. (2000). A methodology for achieving agility in manufacturing organisations. *International Journal of Operations & Production Management*, *20*(4), 496–513. doi:10.1108/01443570010314818

Zhao, Y., von Delft, S., Morgan-Thomas, A., & Buck, T. (2019). The evolution of platform business models: Exploring competitive battles in the world of platforms. *Long Range Planning*, 101892. Advance online publication. doi:10.1016/j.lrp.2019.101892

Zhong, M., Chang, T., Samrat, G., Rangan, G., & Lou, T. W. (2017). The nexus between military expenditures and economic growth in the BRICS and the US: An empirical note. *Defence and Peace Economics*, *28*(5), 609–620. doi:10.1080/10242694.2016.1144897

Zhou, J., Liu, S., Zhang, X., & Chen, M. (2016). Differential leadership, team conflict and new product development performance. *Chinese Management Studies*, *10*(3), 544–558. doi:10.1108/CMS-10-2015-0240

Zhu, Y., Yang, C., Wong, D., & Kafatos, M. (2005). A Distributed GIS for Managing Shanghai Landscape Resources. The International Association of Chinese Professionals in Geographic Information Science (CPGIS). doi:10.1080/10824000509480598

Zoltan, J. A., & Audretsch, D. B. (2003). Innovation and technological change. An Interdisciplinary Survey an Introduction. In Handbook of Entrepreneurship Research (pp. 57-79). Boston: Springer.

Zoltan, J. (1987). Innovation, market structure, and firm size. *The Review of Economics and Statistics*, *69*(4), 567–574. doi:10.2307/1935950

Zouganeli, S., Trihas, N., & Antonaki, M. (2011). Social media and tourism: The use of Facebook by the European national tourism organizations. *Tourism Today (Nicosia)*, *11*, 110–121.

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