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Cases on Research Support Services in Academic Libraries

Viviana Fernández-Marcial and Llarina González-Solar

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EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 2/9/2023 5:27 PM via
AN: 2569987 ; Viviana Fernndez-Marcial, Llarina Gonzlez-Solar.; Cases on Research Support Services in Academic Libraries
Account: ns335141

Cases on Research Support Services in Academic Libraries

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A volume in the Advances in Library and Information Science (ALIS) Book Series

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Published in the United States of America by
IGI Global
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA, USA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com

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Library of Congress Cataloging-in-Publication Data

Names: Fernández-Marcial, Viviana, 1969- editor. | González-Solar, Llarina, 1979- editor.
Title: Cases on research support services in academic libraries / Viviana Fernández-Marcial and Llarina González-Solar, editors.
Description: Hershey, PA : Information Science Reference, [2021] | Includes bibliographical references and index. | Summary: "This book explores cases on research support services in academic libraries"-- Provided by publisher.
Identifiers: LCCN 2020009645 (print) | LCCN 2020009646 (ebook) | ISBN 9781799845461 (hardcover) | ISBN 9781799855965 (paperback) | ISBN 9781799845478 (ebook)
Subjects: LCSH: Academic libraries--Reference services. | Academic libraries--Reference services--Case studies. | Academic libraries--Relations with faculty and curriculum. | Research--Data processing--Management. | Database management in libraries. | Data curation in libraries.
Classification: LCC Z675.U5 C325 2021 (print) | LCC Z675.U5 (ebook) | DDC 025.5/2777--dc23
LC record available at https://lccn.loc.gov/2020009645
LC ebook record available at https://lccn.loc.gov/2020009646

This book is published in the IGI Global book series Advances in Library and Information Science (ALIS) (ISSN: 2326-4136; eISSN: 2326-4144)

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this book is new, previously-unpublished material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

For electronic access to this publication, please contact: eresources@igi-global.com.

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ISSN:2326-4136
EISSN:2326-4144

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Information Science Reference • © 2020 • 639pp • H/C (ISBN: 9781799814719) • US $275.00

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Tel: 717-533-8845 x100 • Fax: 717-533-8661
E-Mail: cust@igi-global.com • www.igi-global.com

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The academic landscape of the Netherlands has been influenced in recent years by new governmental policies regarding open access and open science, national and European legal guidelines, developments in ICT, and changes in how researchers are assessed. The University of Groningen Library (UB) has seized the opportunity in these developments, providing research support in the domains of registration and archiving of research output, open access publishing, research data management, and research analytics. Increased efficiency in traditional library procedures and the introduction of project-based funding have provided staff capacity for these developments. Full-service customization, to meet the needs of researchers and alleviate their time and work pressure, lies at the heart of the UB's research support.

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UCL (University College London) strongly supports the implementation of Open Science policies and practices. The library has taken the lead in the university across all eight areas of Open Science: the Future of Scholarly Communication, the EOSC, FAIR data, Skills, Research Integrity, Rewards, Altmetrics, and Citizen Science. UCL has modified these themes slightly to better fit its academic requirements, developing ambitious programmes and services to support the change of culture which is required. From the future of scholarly publishing, with the formation of UCL Press as the UK's first fully open access university press, to research data management, rewards, research integrity and next-generation metrics, UCL has become a leader in Open Science. This chapter analyses the success of UCL to date, describes the challenges, shows the benefits, and indicates what future steps are being planned to deliver a culture where Open Science is the default, thus delivering on the prophecy of Mahatma Ghandi, one of UCL's most illustrious alumni, 'The future depends on what you do today'.

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Kaunas University of Technology is one of the largest technical universities in the Baltic region. The university staff has been involved in different Open Access- and Open Science-related activities for more than a decade. Different initiatives have been implemented: stand-alone and series of training and awareness-raising events, promotion of Open Access and Open Science ideas so that institutions develop their Open Access policies and make their repositories compliant with larger research infrastructures. Within the institution, the initiatives of Open Science are implemented as a result of joint effort of the library, the departments of research, studies, and doctoral school. The current tasks involve revising the institutional Open Access guidelines and facilitating the implementation of data management plans in doctoral studies. In this chapter, the aim is to provide an overview of the efforts highlighting the successes and failures on the way to best practice in research data management support both institutionally and on the national level.

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This chapter addresses library research services at the Universitat Politècnica de Catalunya · BarcelonaTech (UPC), an institution engaged with science and technology that clearly emerges as a research university. Due to the attributes of the UPC, its library, publications, and archives services differ from traditional libraries and have been transformed over its lifetime to offer services to researchers that fit their current and future needs. Librarians are actively seeking personalized solutions to meet researchers' needs. The Research Service Charter of the UPC libraries includes a range of assets related to UPC researchers as producers of new scientific output and as primary agents of its dissemination.

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The Writing Center is the newest, innovative service, established as a project-based initiative within the organization of the Library of Corvinus University Budapest. The present and future goals of the Writing Center require a wide spectrum of services if wanting to cater for the needs of doctoral students and faculty members. This includes traditional and novel tasks, such as fostering publication activities, combating information overload, being familiar with abstract writing, and Open Access offered to experienced and to early career researchers. The goal in this chapter is to demonstrate how the learning and research support activities of a library, comprising curricular and extra-curricular courses, trainings, and consultations can be integrated into the knowledge structures of the university as a whole. The authors place special emphasis on the role of group-based and individual mentoring throughout a university career, spanning from student to researcher, and on the development of transversal skills through the training programs of the Writing Center.

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This case study describes the research support services provided by the libraries of the University of Porto (U.Porto). The university is composed of 14 teaching units (each with its faculty library), and each faculty has a wide range of research units. U.Porto has a high research activity, which compels libraries to keep pace with the evolving researcher needs, adapting and creating new services that respond to those requirements. From a global perspective, the overall mission of these libraries is to ensure and promote access to information resources made available by U.Porto to the academic and scientific community, both in physical and electronic supports. More specifically, this case will detail the services already provided in the context of research support, ranging from specialized training sessions in scientific publishing, reference management software, or search in bibliographic databases to the creation of thematic guides, support on the publication of scientific journals from within the university, and bibliometric studies.

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The objective of the Research Support Services of the Universidad Pablo de Olavide Learning and Research Resource Center is to contribute to the improvement of the research processes as well as to maximize the results obtained and their evaluation. To this end, it offers bibliographic information and reference services, advice on the processes of publication, and evaluation, both individual and collective; standardization and digital academic identity; and, of course, training in all these areas within the

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context of the intensive use of digital media. For some years now, the LRRC's training of researchers has focused on the use of digital media as a part of the research process and has also integrated into the research staff training plan of the university that manages the corresponding service with which the LRRC collaborates very actively.

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The purpose of this chapter is to examine how the provision of research support services by the Law Library at Universidade Federal do Paraná (UFPR) in Brazil contributes to achieve the university research goals. The chapter develops a case study taking a qualitative, exploratory, and descriptive approach. The UFPR Law Library provides research support services such as classes on research support, bibliographic research support, orientation on research tools. Those research support services are not part of a formal and strategic program. It is recognized that the existence of a data repository, the UFPR Scientific Database, is an opportunity to provide scientific research data management support services at UFPR libraries. The chapter concludes that the existing research support services have an impact on research at UFPR Law School. However, there is an opportunity to create other services that will meet the user's expectations, considering the new research trends at the university.

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This case study discusses the importance of building initial trust in the relationship between researcher and academic library. Primary coverage serves the experience of two small humanities-based colleges serving approximately 125 faculty members within a larger university campus by providing the personal document delivery service of InfoExpress. The trust built through this initial research support service creates avenues for further support from the library and the wider university library system. As every relationship has challenges, the ones occurring here are opportunities to improve the relationship in favour of the researcher and library. If the researcher is unaware of what support the library provides, establishing a personal relationship will immediately provide productive research time and create an opportunity for future support through additional personalized services. The researcher, their research, and their library benefit by this trusted partnership.

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As a discipline-neutral entity, knowledge exchange, and nexus of the university, the National University of Singapore (NUS) Libraries is the ideal conduit for bringing together faculties and departments to facilitate cross-disciplinary education and research. This case study gives a detailed walkthrough on the creation and design of the Research Skills Framework (RSF), which forms the backbone for all information literacy programmes (ILPs), specifically the flagship Researcher Unbound (RU) programme and RU Symposium, and shares challenges faced and future improvement plans. The exploration, design, and continual improvement of the programme ensured that NUS Libraries provides relevant and timely research support and enhances the digital information literacy skills of the NUS community. This programme continues to be a work in progress drawn from participants' feedback, attendance, experience, and insights from seven semestral runs and cumulative total of 172 workshop sessions.

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Peking University Library (the Library) conducts organizational restructuring in 2019, and the Collaborative Service Center (CCS) is designated as the provider of research support services, which is operated in interaction with the talent training system and the process of comprehensive reform. A string of innovations in research support services are implemented by CCS's two teams in an overall manner. This chapter introduces status of research support services in China and the Library's practices in research support services. This chapter introduces the new framework of the research support services from four aspects—service object, service provider, service content, and service strategy—and outlines its plans and visions for further efforts in this regard.

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Griffith University provides advice and services to researchers around research grants, ethics and integrity, research performance, and publications and outputs. A broad-based researcher education and development program helps inform and upskill researchers and research students. From 2019, Griffith

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University Library has developed new services to support data-driven, data-intensive research and assist researchers through the entire research lifecycle. This chapter describes the staffing structure and the ideas underpinning a new service catalogue based around key areas, such as data management, open scholarship, and data wrangling. Methods to achieve this included a collaboratively developed knowledge base, the development of new workshops, mapping of research environments and referral pathways, and developing support for researchers for whom there is no established tool for the kinds of research they want to do. A push to establish the library as a vital and valued partner in research projects was a key driver for change.

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Katy Miller, Te Herenga Waka, Victoria University of Wellington, New Zealand
Marcus R. Harvey, Te Herenga Waka, Victoria University of Wellington, New Zealand

The key strategic goal for research at Te Herenga Waka - Victoria University of Wellington is to create a culture of ambitious research for transformative impact. To support this goal, a library restructure and investment in library teams supporting research has enabled a detailed understanding of the university's research output and how to increase its visibility. New working relationships and clearly defined research initiatives have demonstrated the diverse value of the library. New services and tools are outlined that help create value for schools, academics, and postgraduates; benchmark university performance; develop tailored services; enhance research profiles; and foster collaboration. Challenges and opportunities remain, including developing a university policy to support open access (OA) research and a new OA research repository to aid the promotion of, and access to, university research. The library continues to change perceptions of its services and works collaboratively to enhance individual and university research reputations.

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Foreword

Academic libraries have traditionally served the dual purpose of supporting the teaching and research of their parent institutions, but the balance between the two core missions has shifted over time. In the 1990s developments in information and communication technologies transformed the higher education environment by juxtaposing access to networked electronic resources with use of onsite printed materials, which led to the significant expansion of information skills provision to help students navigate the complex hybrid library and information landscape. Paradoxically, the progressive switch from print to e-journals resulted in an apparent contraction of the library research contribution as many researchers stopped visiting periodicals collections and started relying on online services, with scientists and engineers often claiming they no longer used or needed the library as they failed to appreciate the role of librarians in enabling the convenient access to journal literature they now enjoyed. The success of the information literacy movement also fuelled an emerging perception that the library was primarily concerned with supporting teaching and learning.

A decade later the pendulum began to swing back in the other direction as new social, technological, economic and political forces combined to drive radical change in scholarly communications, scientific research, performance measurement and policy mandates. Developments in networked data-driven computationally-intensive collection-based discovery (e-science), the evolution of humanities computing into digital/computational humanities, promotion of interdisciplinary and transdisciplinary research to solve global problems, growth in scholarly use of social media and social networking, proliferation of new 'alternative' methods of impact assessment (altmetrics), but above all the overarching move towards open products and open processes in research and higher education have given libraries huge opportunities to reassert and redefine their roles across the scholarly knowledge cycle. The open movement and particularly the widespread mandating of openness by research funding bodies across the globe have put libraries and librarians back at the centre of scholarly activity and made researchers much more dependent on library support, expertise and co-operation to get things done.

The virtual invisibility of the electronic library and networked access to resources has been replaced with new high-visibility services and facilities, including digital scholarship centres and visualisation studios where researchers can get help and advice on state-of-the art technologies and tools. The emergence of digital open social scholarship as mainstream practice has extended library roles beyond repository management and regulatory compliance to scholarly publishing and policy formulation, as well as systems integration and software development. Libraries are taking on activities and jobs formerly the preserve of commercial publishers, university presses, research offices and technology services as both valued partners and sole traders. As the go-to people for emergent practices in scholarly communication, they are also assuming responsibility for advising researchers on data management plans (DMPs), managing

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budgets for article processing charges (APCs), negotiating rights for text and data mining (TDM), assisting faculty with author IDs and researcher networking/profiling systems, and raising awareness among researchers, students and administrators of strengths and weaknesses of alternative research analytics.

Library support for student research and student publishing is another growth area in response to adoption of inquiry-based learning pedagogies and the identification of undergraduate research as a high-impact educational practice. Librarians are thus fulfilling roles as educators, consultants, producers, curators and evaluators of content, but across an ever widening portfolio of activities that has repositioned them as key workers and major players in the 21st century research environment. The library literature reflects this shift of interest, which is evident in the numerous surveys, case studies and edited collections published on data curation, digital scholarship, impact metrics, open practices, research support, rights literacy, and scholarly publishing in the past five years. The Association of Research Libraries (ARL) has issued relevant titles in its SPEC Kits series; journals including *Library Trends, Program* and *New Review of Academic Librarianship* have published themed issues on such subjects; and leading professional publishers like ACRL, ALA and Facet have produced edited collections, introductory guides, and substantial handbooks, all underlining how research support has now become the signature service for academic libraries.

The collection of cases in this book augments this literature by providing a snapshot of the current state of research support in a variety of academic libraries around the world, including contributions representing leading-edge practice at large research universities as well as studies from much smaller institutions that demonstrate the imperative of tailoring services to local contexts. With contributors from 12 countries spanning four continents, the volume offers a range of perspectives seldom found in a body of literature that tends to be dominated by the United States, United Kingdom and Australia, and to focus unduly on larger institutions. The diversity of institutions featured here provides confirmation that size isn't everything. Despite the disparities in resourcing, these cases illustrate several common themes that characterise effective library support for research in a fast-moving landscape: notably, the vital role played by librarians in educating and training researchers on new policies, practices, systems, and technologies; the key requirement to work alongside researchers on developing customised and personalised support in novel situations where ready-made solutions don't exist; and above all the critical importance of forging strong relationships with researchers and other stakeholders that build trust as the foundation for new service models predicated on collaboration and partnership.

Sheila Corrall
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Foreword

Sheila Corrall *worked in public and national libraries before moving into higher education where she directed library, information, and technology services at three UK universities. In 2004 she became Professor of Librarianship and Information Management at the University of Sheffield, where she served as head of the Information School and chaired the Information Literacy Network. In 2012 she moved to the University of Pittsburgh in the USA as chair of the Library and Information Science program and was involved in developing Digital Scholarship Services in the university library via an innovative research-practice partnership with the iSchool. Sheila has served on the committees and boards of national and international organisations, conferences and journals, and won many awards for her work including the 2003 International Information Industries Lifetime Achievement Award for outstanding contribution to the development of the information profession. Her professional mission is to advance information literacy, scholarly communication, and reflective practice in information work and to improve public understanding of library work. Sheila officially retired in 2019 and now divides her time between research, writing and outdoor pursuits in the Malvern Hills and North Wales.*

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Preface

Almost a decade ago, we began investigating on research support services in academic libraries. Back then, the development level of these services was at a very early stage, and they were beginning to emerge as a differentiated reality of other services in some libraries. Since then, progress has been made at the theoretical and practical level, but there is still a long way to go.

Throughout our research, it was evident that the efforts made by libraries were not always reflected in the scientific literature. Analyzing their websites allows us to conclude that the way in which these services are presented is not always a faithful depiction of the reality and even less of the perception the librarians who offer them have about these services.

Research support services are considered under a broad approach, it means all those that are oriented to support the various processes of scientific communication. It is impossible to find two identical university research strategies and two identical university libraries, which is why their research support services are unique and sui generis.

The very concept of research support services implies plurality. Each library interprets and adopts a way to do it, always in line with their university's research strategy in addition to the very socio-economic conditions and scientific policy of each country. All this highlights this heterogeneous character.

Reflecting this variety is a central element of this book that aims to overcome that literature gap. Its purpose is to provide an overview of the current state of research support services, and a glimpse and reflection from the libraries' perspective. This intends to provide an understanding of the know-how, philosophy, organizational models and resources of university libraries located in different countries.

In order to provide this accurate and close snapshot, the case study format was chosen to value this reality. This practical approach, however, does not make us lose perspective of the importance of the theoretical one. The information dispersion in the academic libraries' websites, in itself, points to the need for a greater and better conceptualization of these services.

The truth is that research support services include a variety of services that serve different stages of scientific communication. Its plural use has to do with its evolution. Over time, services were created to meet different researchers' needs and the designation and grouping of these benefits happens later by using an umbrella designation.

Each academic library presents its own services catalogue and organizes it according to its own vision, which is not the case with other library services that have a more global and standard conception. There are two other distinct traits to add:

1. A service can be part of this umbrella designation or be managed independently.
2. Some of the services involve other university services, thus creating a double affiliation.

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This situation requires an in-context reading, that is, the offering of research support service in libraries are a reflection of a university's research strategy and policy, its organizational culture and the social, economic, and scientific environment in which a higher education institution is inserted.

In the search for an appropriate balance between the singular and the general, a work scheme complementary to the formal structure of the case study was prepared. This scheme was intended as a flexible model to allow authors to have a logical reference in their reflection process, ready to adapt to multiple library environments, with variable order and with the ability to include new sections whenever necessary.

The editors considered that, beyond formal issues, it was essential that texts reflect the identity of its authors and their libraries. The crucial factor was to persevere in the purpose of the book. That is, to acknowledge the various ways in which libraries have addressed the need for these services and to answer a crucial question: How library research support services contribute to the quality of university research results because, in fact, the main focus is to value these services concerning their users, their institution, and their country.

The work scheme served three aspects.

1. The context in which the service is developed by seeking, precisely, the alignment of the work done with the strategies and values of the university and the library itself.
2. The different elements of research support services appear, as it is evident in many texts, as a star service.
3. The projection into the future.

In detail:

Context

- The university.
  - Brief history of the university.
  - General description of its mission, organizational structure, academic offer, etc.
  - Research.
  - Highlight of university values, particularly those related to research.
  - Any other relevant information.
- The library.
  - General features, mission, vision, values, objectives, history.
  - Facilities.
  - Staff, organigram, organization structure.
  - The library system(s) or network in the organization.
  - Users (number, typology, etc.)
  - Library services provided.
  - Any other relevant information.

Research support service

- Background.
  - What are the milestones that establish a paradigm shift between traditional research support activities and a new conception of service?
  - When does this change occur?
  - How do these services respond to a strategy of the university and the country?

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- Definition.
  - What are research support services based upon your academic library experience?
  - What services are included?
  - Brief description.
  - How traditional services are integrated with new ones (i.e. reference services and data management)?
  - If there are several libraries in your system, describe whether services are centralized, decentralized, or mixed. A general overview is sought.
- Strategic planning of the research support service.
  - Is there a global conception of service or is it a set of services that are organized on the website for easier finding?
  - Does it have a person responsible for this service (director, head of unit or area...)?
  - Is there a unit or department clearly defined and named as such?
  - Does it have allocated resources?
  - Does it have a place or office?
  - Does it have its planning documents?
  - Is there a mission or goal defined for the service?
- Target.
  - Who are the users?
  - Potential and actual users.
  - Is it addressed only to academics or it also includes other groups?
  - Are there different features for different types of users within the service?
- Spaces and infrastructures.
  - Did service involve or will it require a redesign of the physical space of the library?
  - Do services occur only in a virtual space?
- Staff.
  - How many members?
  - Are there library profiles in your library such as liaison librarian, embedded librarian, advanced research assistant, research librarian, expert librarian or research data librarian?
  - Have these profiles been developed as a result of the research support service?
  - Reflect on their functions and usefulness.
  - Overview.
- Relations with other areas of the university.
  - Are research support services in the library connected to or dependent from, an organizational level, on other university offices or services?
  - What activities are shared among them?
  - Is there a strategic collaboration?
- Evaluation of service performance.
  - Is there any research support service evaluation activity?
  - If this evaluation has not been developed, it can be dealt with in the item on challenges.

Future and Conclusion

- General assessment.
  - Strengths and weaknesses of your research support library.

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- Prospect.
  - How is the future planned?
  - Short and long term changes.
  - New strategies.
  - New features.
  - Challenges.
- Main conclusion.
  - Consideration of how your library contributes to the research activity at the university.
  - Is the academic library a key factor in research success?
  - Do the academic library research support services have evidence of their impact on the university's research activity?

Each of the case studies has been written by those who know best its reality, those who make decisions, and those who provide the service. These intra-stories are perceived in the texts; quality has also been guaranteed with a double-blind peer review. In the assignment of reviewers, it has been tried to combine, as much as possible, a complementary evaluation of library professionals and faculty members.

An element that transcends throughout is its marked international character with 13 contributions from a variety of regions: America (Canada and Brazil), Oceania (Australia and New Zealand), Asia (China and Singapore), and Europe (Hungary, Lithuania, the Netherlands, Portugal, the United Kingdom, and Spain). The work aims to show this diversity of realities by offering visions from different world areas. Texts are a combination of pioneering libraries but also from libraries with newer experiences that move towards finding solutions.

This international approach is maintained for reviewers and Editorial Advisory Board members. There have been a total of 15 reviewers from Bosnia, Brazil, Serbia, Spain, Mexico, the Netherlands, Portugal, Lithuania and the United States. To which must be added the members of the editorial board, from Australia, Portugal, South Africa, Spain, and the United Kingdom.

The volume is organized into four sections that group its 13 chapters. These sections are a representation of the continents covered in the book, starting with Europe, as the region with the largest number of contributions. In order to facilitate the search, each section has been arranged in alphabetical order by the last name of the first author.

An approach to each chapter is presented here, in the order in which they will be found. Each country, university, library, research service has its own particular value. We aim to reflect the main idea to encourage readers to "visit" all of them.

Europe

Chapter 1: A rich group of authors composed by Shaghayegh Abdolahzadeh, Peter G. Braun, Christina Elsenga, Marijke Folgering-van der Vliet, Babette Knauer, Ane W. van der Leij, Fareeba Sheedfar, Giulia Trentacosti and Kathryn O. Weber-Boer presents the case of the University of Groningen Library. Policies from the new government in the Netherlands offer libraries opportunities for change and improvement. The University of Groningen, founded in the 17th century, is the alma mater of two Nobel Prize recipients, of the first Dutch astronaut, the first female student and the first female lecturer in the Netherlands.

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Its commitment to open access and, in particular, its Research Data Services, is particularly noteworthy with its development of a Library Data Warehouse.

Chapter 2: Paul Ayris exposes the case study of the University College London Library. The UCL holds one of the top positions in several international academic rankings and is the alma mater of 29 Nobel Prize winners. It is the third oldest university in England and was founded in 1826. The UCL has a total group income of £1,450 million, of which £476.3 million come from grants and research contracts, evidence of the importance of its research facet. The library service, founded in 1829, consists of 17 libraries spread throughout London and beyond. By 2020, the Library's collection will amount to over 2 million items. The UCL is very active in supporting research, in particular the implementation of Open Science policy and practice. The Library has taken the lead in the University across all eight areas of Open Science, they are, the Future of Scholarly Communication, the EOSC, FAIR data, Skills, Research Integrity, Rewards, Altmetrics, and Citizen Science.

Chapter 3: Ieva Cesevičiūtė and Gintarė Tautkevičienė present the development experience at the Kaunas University of Technology. This Lithuanian university is one of the largest technical universities in the Baltic region. One of the main strategic lines of the university is sustainable development, which has earned it its inclusion in the Quality System of Science and Technology Universities for Sustainable Industry (QUESTE-SI) of the European Union. The University Library is one of the largest academic libraries in Lithuania. The Research Information Service was established in 2015 and focuses its activities on open science and open access, and participates in several European projects. Support to research data management is an essential component of the service, where the creation of a data management plan and the improvement of collaboration among stakeholders are the immediate challenges.

Chapter 4: The Universitat Politècnica de Catalunya specializes in science and technology, covering a wide range of fields in engineering and architecture. The quality of its research has placed it in a good position in national and international academic rankings. It has a complex library system with a staff of 120 people in 12 libraries spread throughout Catalonia. The research support services offer a wide range of products and services with a service strategy focused on customization and a strong commitment to technology and online services. Satisfaction and impact indicators confirm their success. In 2019, the UPCommons institutional repository had 3,413,386 visits and 9,944,818 downloads. This chapter was written by Miquel Codina-Vila, Ruth Íñigo, Anna Rovira-Fernàndez and Marta Serrat-Brustenga.

Chapter 5: The Writing Center is the only institution of this type in Hungary and has been developed at the Corvinus University Library in Budapest. Monika Fischer, Halm Tamás and Tibor Koltay deepen in this service that, with a renewed vision, offers support to diverse areas of scientific communication, with special emphasis in the publication of research results. Publications are the fundamental means of transmitting research results, and a scientific text requires certain elements to fulfill its function. This service puts a special focus on early career researchers. Based in Budapest with 72 years of existence, the university has a clear vocation towards internationalization.

Chapter 6: The Research Support Services of the University of Porto Libraries is presented by Augusto Ribeiro, Luís Miguel Costa and Palmira Fernandes Seixas. The University of Porto, formally founded in 1911, is one of the largest universities in Portugal, with 51 research units that become one of the leading producers of science in the country. It has 242 active patents and 245 spin-offs or start-ups. Its internationalization strategy makes it present in different international academic rankings. U.Porto Libraries are made of up to 17 units that offer a wide range of centralized and proximity services aimed at supporting the various stages of scientific communication. A closer relationship with researchers and a marketing approach are two lines of improvement.

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Chapter 7: Seville is the setting for the experience provided by Ángel M. Vázquez in his text. The Pablo de Olavide University is a young Spanish public institution founded in 1997. The Pablo de Olavide University Learning and Research Resource Center (LRRC) carries out research support activities along two different lines: the User Training Service and the Bibliographic Information Service. In the first of these services, attention to young and early career researchers stands out, being training in informational and digital skills its central axis. This chapter shows how the national policy of research and higher education defines the library's orientation and actions.

America

Chapter 8: Paraná is one of the twenty-seven states that make up the vast territory of Brazil where the Universidade Federal do Paraná (UFPR) is located. It is the oldest public university and also one of the largest in the country, with 50,000 people involved in its community. UFPR has 19 libraries on different campuses, one of which is the Law Library. Its research support services are presented in this chapter by Paula Carina de Araújo and Karolayne Costa Rodrigues de Lima. This research support service, established in 2009, offers research support courses, support for bibliographic research, and guidance on the use of research tools. This service can be considered a pioneer in its country, and its evolution is closely linked to collective and cooperative work.

Chapter 9: InfoExpress Service is a personalized service to support researchers where the human factor is the central axis. This experience from the University of Toronto, Canada, is the contribution of Manda Vrkljan and Adrienne Findley-Jones to this book. In a large decentralized library system like the one in the University of Toronto, small academic libraries, such as the John M. Kelly Library and the John W. Graham Library, have an advantage in terms of proximity between libraries and researchers. They highlight the necessary promotion of services as future actions, and also, the required collaborative relationships with other university services related to research support.

Asia

Chapter 10: Fang Chiong (Patrick) Pu, Su Yian Kho, Ke Khoon Low, and Amy Chou present the experience of the National University of Singapore. This is the oldest higher education institution in the country, founded at the beginning of the twentieth century with approximately 41,000 students, 2,500 faculty members, and 4,100 researchers. The National University of Singapore (NUS) Libraries have eight physical libraries supported by 146 staff members. The perfect alignment with the university's strategic objectives has led the NUS Libraries to create the Researcher Unbound (UK), which targets the university's early-career researchers and graduate students. This service is the NUS Libraries' flagship program, and is aimed at improving research skills and capabilities mainly through training activities. The satisfaction and impact data resulting from this program show its success. The strength of this service seems to be linked to a line of action leading towards the online context.

Chapter 11: Yong Tang and Chunhong Zhang discuss organizational restructuring and development at the Peking University Library in 2019. The Collaborative Service Center (CCS) was established to provide research support services. The integration between theory, as an operational element, and practice is emphasized. Similarly, seven specific projects developed from the library are detailed. The interrelationship of the library's work with the research strategy of the Peking University and that of the country

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is clearly perceived. The Peking University Library is the largest university library in China and serves annually, according to data from recent years, over 2 million users in person and over 1.8 million online.

Oceania

Chapter 12: Belinda Weaver and Joanna Richardson showcase the new scenario of the Griffith University Library (Australia) after the renovation of its services in 2019. The chapter is a clear reflection of the development and how the changes in the university were the starting point for a reformulation of the research support services with a well-defined strategy that focuses on data management, research metrics, open scholarship, and data wrangling. The new professional profiles stand out. Throughout the text, there is a clear orientation towards the Higher Degree by Research (HDR) students.

Chapter 13: Trish Wilson, Aubrey Kirkpatrick, Katy Miller, and Marcus R. Harvey present the experience of the Te Herenga Waka - Victoria University of Wellington library (New Zealand), a university founded in 1897. In this chapter, a comprehensive and innovative management model is revealed. It highlights a strategy to involve library staff in research support services and how the development of specific profiles, together with staff assigned to these services, acts as a driving force for the further enhancement of the service. This chapter shows the important changes derived from the restructuring carried out since 2018 whose main challenges are research funding acquisition and internationalization.

All chapters, as well as the review process have been learning opportunities. Reading the texts helps recognize familiar and shared terms, processes and concepts but, at the same time, has the great virtue of transporting the reader to unknown scenarios in which a form of university, and a scientific culture of its own, is translucent.

This work is aimed at library professionals and is intended to be a guide to implement or to evaluate the implementation of services. The book is also conceived as a management tool so that those in charge of these services at the universities have a more accurate look at what is done in the library. Hopefully, this will provide them with higher and better criteria to make appropriate decisions and establish pertinent strategies for the libraries.

Academics and researchers are an equally important audience. The editors hope that, for them, reading these practical experiences will help to develop theory and serve as a starting point for reflection and debate. And, for students, future professionals, it will make an inspirational book because this work is a good example of how university libraries contribute to the excellence of their universities and to the development of society as a whole.

A few words should be devoted to the context of this book. We can say that it has been worked in "the time of the COVID-19". Its conception began much earlier and the first invitations were sent as early as October 2019 followed shortly after by a call for chapter. By January 2020, editors already had a list of proposals but, in mid-March, what was initially an epidemic became a pandemic, thus affecting the personal and professional lives of all participants in the project. Fortunately, this was no impediment for this finally coming to fruition.

In this period of pandemic we realized how science and research, their processes and times, were also affected in many ways. Society as a whole recognized the need for a robust science to be entrusted with this threat, but a science far from its normality, an accelerated science, focused on a clear and priority goal, with an influence on scientific communication in two fundamental aspects: the remarkable increase in publications and the variation of open access.

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In these months there has been a multiplication of papers at speeds never experienced before; new tools and databases have been developed; the review and publication processes have been accelerated; there has been an intense debate on the value of preprints and the process of double-blind peer-review; the importance of disseminating scientific results has been highlighted by temporarily opening collections of large publishers but also through the claim of open access. Perhaps most importantly, the extent to which all this, and especially open science, has reached all levels of society.

When the book is brought to life, it is very likely that we are still at some stage of this health crisis. The search for a solution is demonstrating the value of science, research and researchers as well as the need to improve communication between them and, especially, social outreach. Academic libraries reduced their activity, especially in the on-site activities, but quickly resumed online services. Their importance as enablers has been demonstrated and it has become clear that research support services will be strengthened in this context.

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Acknowledgment

A book project is an idea that can only become a reality, thanks to the contribution and effort of many people. Thus, the editors would like to thank everyone involved in this project for their support and collaboration.

First of all, we must acknowledge the authors. The chapters they wrote are the reason for this book's existence. We thank them for sharing their experiences and for doing it under the strictness of a work that was demanding in terms of deadlines and guidelines.

We express our gratitude to the reviewers who have done precious work to guarantee the final result. They ensure quality and also contribute with their knowledge and experience to enrich the work. We thank them for evaluating the chapters rigorously and exhaustively and for meeting the deadlines.

This recognition acquires an extraordinary magnitude in this time of health crisis in which we live. The authors and reviewers worked on the chapters overcoming the difficulties of their personal and professional day-to-day life to continue with the project.

Focusing on excellence, we should highlight the collaboration of Professor Sheila Corral. Her foreword constitutes invaluable support to the book. Professor Corral is a reference author in the services of research support in academic libraries, something that can be noted precisely in the references of many chapters of this book. We also express our utmost appreciation for the Editorial Advisory Board.

We would not like to overlook a special thanks to the IGI Global publishing team for the assistance we have received throughout the editorial process, with open and continuous communication and support.

Our sincere thanks to all of them.

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Section 1
Europe

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Chapter 1
From Project to Customized Service:
Research Support at the University of Groningen Library

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EXECUTIVE SUMMARY

The academic landscape of the Netherlands has been influenced in recent years by new governmental policies regarding open access and open science, national and European legal guidelines, developments in ICT, and changes in how researchers are assessed. The University of Groningen Library (UB) has seized the opportunity in these developments, providing research support in the domains of registration and archiving of research output, open access publishing, research data management, and research

DOI: 10.4018/978-1-7998-4546-1.ch001

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analytics. Increased efficiency in traditional library procedures and the introduction of project-based funding have provided staff capacity for these developments. Full-service customization, to meet the needs of researchers and alleviate their time and work pressure, lies at the heart of the UB's research support.

INTRODUCTION

This chapter describes how research support services at the University of Groningen Library (UB; *Universiteitsbibliotheek*) developed and how they are embedded in the organization—both in the library and the University of Groningen (UG; *Rijksuniversiteit Groningen*). What is UB research support, in the complex context of European (EU) and national (Dutch) science policies, the research funding ecosystem, the requirements of the university and faculties, and calls from research groups and individual researchers? What value does it add to UG research? Four specific academic support services are highlighted here: registering and archiving research output, open access publishing, research data management, and research impact analysis. The final section summarizes results and challenges, and attempts a look ahead.

Four Centuries at the Heart of Academic Groningen

Wandering through the Dutch city of Groningen, visitors quickly notice that it is a vibrant university city. One in four of its 200,000 inhabitants is a student at one of the institutes of higher education in Groningen, which makes the city the youngest in the Netherlands. The UG was founded in 1614. It is home to 30,000 students and is the alma mater of the first female student and the first female lecturer in the Netherlands, the first Dutch astronaut, as well as the first president of the European Central Bank. Astronomer Jacobus Kapteyn, historian Johan Huizinga, Nobel prize winners Frits Zernike (physics, 1953) and Ben Feringa (chemistry, 2016) are among those who have contributed to the international scientific reputation of the university (University of Groningen [UG], 2019b).

A new UG strategic plan for the coming years will soon be presented, but UG research has concentrated on the themes of healthy ageing, energy, and sustainable society. The UG mission statement emphasizes the ambition to be an international research university, with a strong regional rooting in the north of the Netherlands. The university aims for research of the highest standard, with strong core disciplines as the foundation of its cross-disciplinary research. These core disciplines and this cross-disciplinary approach are called upon in fundamental research, as well as in trying to find seeking innovative answers to today's societal challenges (UG, 2015a).

Today, the UG has eleven faculties, employs 6,100 staff (including 3,400 academic staff, of which one third is international), offers over 100 Master's degree programmes, of which 90% are taught in English, and produces 9,000 research publications a year (UG, 2020a). Along with all Dutch universities, it is a member of the Association of Universities in the Netherlands (VSNU). The UG cooperates closely with the universities of Ghent (Belgium), Göttingen (Germany), Tartu (Estonia), and Uppsala (Sweden) through the U4Society Network (U4Society, 2020); among its other European collaborations, it participates in the Coimbra Group (Coimbra, 2020). It partners with renowned universities in Asia, North and South America, Africa, and Oceania (UG, 2020b). It ranks number 65 in the Academic Ranking of World Universities (2019) and number 73 in the Times Higher Education World University Rankings (Times Higher Education, 2020).

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The UG prides itself on being a city campus with faculties spread all over Groningen. The heart of this campus (not only geographically) is the library. It is still situated at the location where it was founded in 1615, one year after the establishment of the university, as the only university library in the Netherlands. The UB was the university's very first "service unit" to support the academic community, and this mission is still at the core of UB services. The UB advises and supports individual researchers, as well as faculties and research centres at a policy level. Through existing services and the development of new research support services, the library is committed to developing innovative full-service solutions that alleviate researchers' time and work pressure, so that they may work more efficiently and effectively. To this end, the UB actively seeks partnerships with other organizational units within the university. Close and permanent partners of the UB include the Center for Information Technology (CIT); the Office of the University (the university's central administration), including the office of Legal Affairs and the Strategy Department of Education & Research (SER); and the Central Medical Library (CMB; *Centrale Medische Bibliotheek*) of the UMCG. The UB shares services (e.g., cataloguing, acquisition, and licensing) with the CMB, which serves the UG Faculty of Medicine and the University Medical Center Groningen (UMCG).[1] On a national scale, the UB collaborates with other university libraries, in the task forces and projects of the Dutch Consortium of University Libraries and the National Library of the Netherlands (UKB). A "no wrong door" policy ensures that contact with any library staff provides access to any service. In addition to its standard services, the UB customizes services and support by faculty (University of Groningen Library [UB], 2019).

The organization of the UG is a constellation of faculties which maintain a high degree of independence in terms of policy and practice. Therefore the collaboration between library and academic staff is fundamental for the success of UB services. These users are of utmost importance to the UB, notwithstanding that they are physically less visible than students in the library building. It is important to strengthen the relationship between the UB and academic staff, not only in order to support the university's education and research, but also to create a broad support base for the library's services within the faculties. To ensure its services are innovative and to keep the requirements of the research community in mind, the UB took up a project structure six years ago. Each project is headed by a supervisory board comprising, among others, representatives of the group directly impacted by the new service or product.

TAKING ON RESEARCH SUPPORT SERVICES

External Causes and Internal Development

This section broadly outlines developments in the library's organization, to clarify choices in taking on new research support services or adapting existing ones. From traditional collection development to (subject) cataloguing, to providing access to print and online research collections, the UB has a proud reputation of being the information hub for the UG academic community. In recent years, new tasks, challenges, and needs have arisen; the UB has responded by establishing new services to meet them.

The centralization of the UG's faculty libraries into one organization, which began in the early 1990s in the sphere of IT and management, culminated in the faculty libraries physically moving into the central library between 2014 and 2016. This brought together both collections and library staff in one central library, in physical proximity to the Faculties of Arts, Religious Studies, Philosophy, Law and Behavioural and Social Sciences. Only one branch library with some printed reference collections

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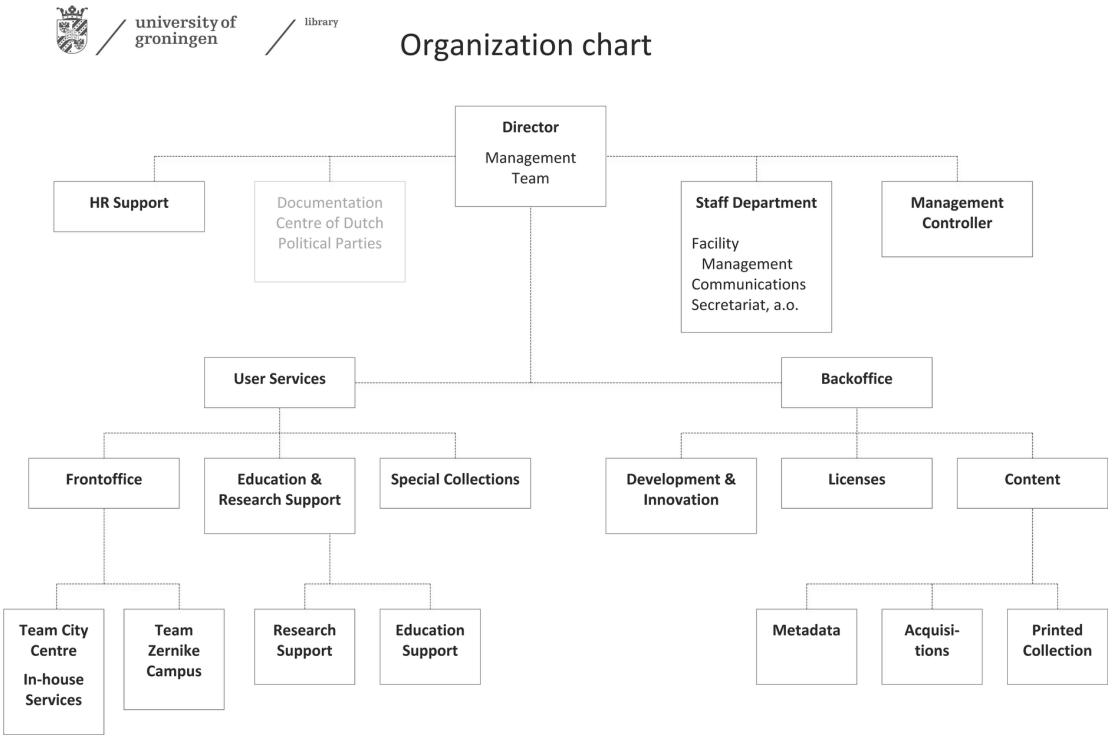
remains, serving the Faculties of Science and Engineering, Economics and Business, and Spatial Sciences on a campus on the outskirts of Groningen. As a consequence, although the library still is by far the most frequented university building, the library's management was able to scale down the number of staff for lending and information desks.

There were good reasons for the new arrangement. The library budget was under pressure and the use of the print collection had decreased over the years, whereas the use of e-journals and e-books had increased dramatically. Resources that the concentration of services made available could now be used to maintain the high quality of collections and to take on new tasks and services, specifically in support of research. A simultaneous, complementary development was a peak in the outflow of personnel reaching retirement age. Many librarians reappointed from the closed faculty libraries were given the opportunity to acquire new skills and grow professionally in new services, with new colleagues in a new working environment. To top it off, the UB building, dating from the 1980s, underwent a much-needed, drastic renovation in 2015-2017.

Although the library still has a departmental structure on paper (Figure 1), its daily operations are characterized by a matrix organization that reflects multidisciplinary project teams, with staff from different departments within and outside of the UB. The heart and soul of the UB's research support are now some 20 staff members with different disciplinary backgrounds: a historian, chemist, business administrator, psychologist, and philosopher, as well as people with a background in library studies and computer science—all appointed with the title 'academic information specialist'. Because of the cooperative character of UB services, they also involve staff from other divisions and departments within and outside the library. Those active in UB research support projects and services can be employed in

Figure 1. Organization chart of the UB (Source: University of Groningen)



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the Research Support Department, but also in Development & Innovation, Communications, Licenses, Metadata, or elsewhere.

In addition to these internal organizational developments, the academic landscape has also changed due to several external factors over the last few years: new governmental policies regarding open access and open science, national and European legal guidelines, developments in ICT, changes in how researchers are being assessed, and internationalization. The UB has taken advantage of these developments, providing research support in the registration of research output in the current research information system (CRIS) Pure, in the domains of open access publishing, research data management (RDM), and research impact services. The increased efficiency in traditional library procedures, described above, and access to internal UG project funding have provided staff capacity for these developments. The following sections will describe these services' organization, goals, and achievements.

Pure Support: Registering, Archiving, and Showcasing Research Output

Background

The emergence of the CRIS and the institutional repository was a key factor in offering researchers library support: in showcasing their research publications and datasets, in taking advantage of open access opportunities, and in using the library's read-and-publish deals. It is also the institutional source database enabling reporting facilities, research intelligence, and analytics. The UG's research output had been registered and listed in an annual (printed) scientific report until 1990 and, since the late 1980s, in a database which evolved into the first CRIS at the UG. At first, the UB had very little to do with registration or the management of that system. This changed in the course of the 2000s: first, with the adoption of the METIS system and, subsequently, when Pure was licensed both as a CRIS and as the UG's first institutional repository in 2014. The UB got involved and took a leading role in both the content management and the information management of Pure, at first in an initial project, *Etalage* [Display Window].

Organization and Activities

The Board of the University and the Board of Directors of the UMCG funded this project and consequently decided to make registration of research output in Pure mandatory for UG researchers. Once all research output that could be retrieved from other online sources and METIS had been migrated to Pure, the project team set up an extensive UG-wide training programme, to introduce Pure to researchers and support staff and to support them in using the software.

Usage of Pure increased significantly when the online research portal was launched in 2015, making the contents of Pure publicly available, and thus motivating researchers to regularly update their research profiles and output. Researchers consider it valuable, as all research output is stored in one place.

Pure registers research output in its broadest sense. In addition to publications, it contains research activities (such as conference talks and participation in peer-review committees), awards, datasets, and research-related media contributions. These rather new types of research output highlight researchers' societal impact, which is one of the UG's strategic focal points. Peculiar to the UG implementation is the close cooperation of UG and UMCG, which both use the exact same Pure environment (instead of a distinct environment for each organization), and the integration of Pure into the UG website, in the form

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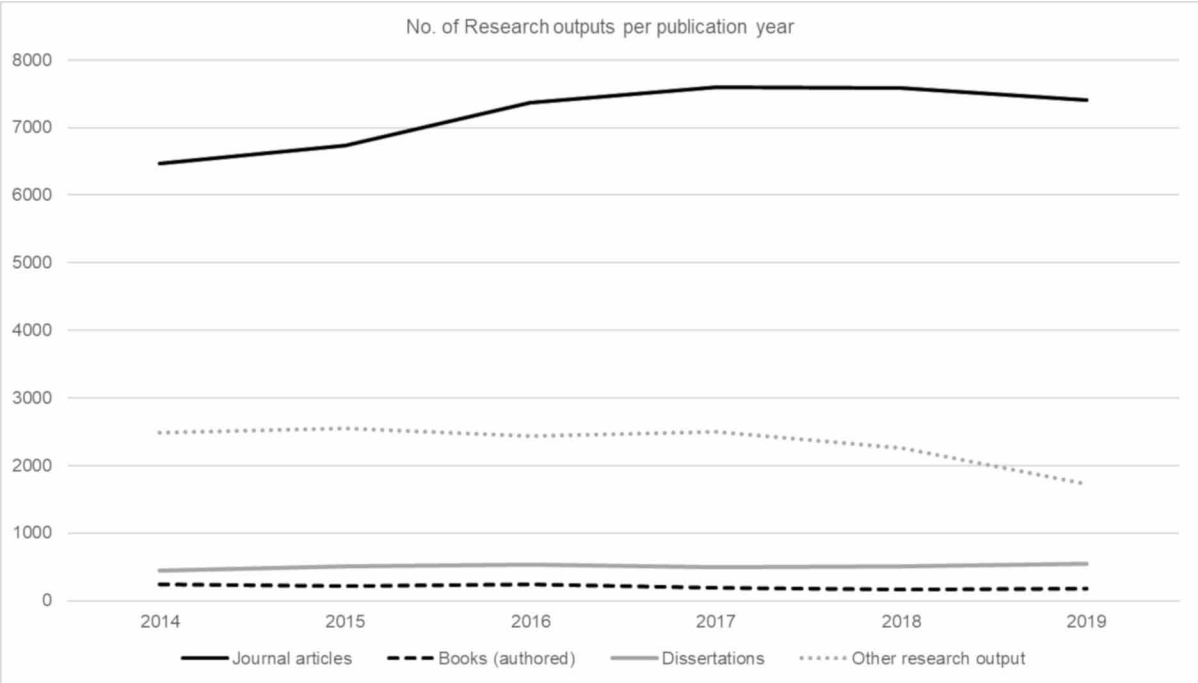
Figure 2. Research output recorded in Pure (data for the publication year 2019 are not yet complete) (Data source: The UG's Pure database)



of a research portal presenting all research output of the university. Figure 2 shows the research output of all kinds submitted by researchers to Pure since 2014.

Once the service had been firmly established, the initial project team handed its responsibilities over to the new Pure managers: Pure Support. This is a virtual office with a team consisting of about fifteen members based in the UB and CMB. To ensure that Pure is perceived as a service established for the entire university, Pure Support relies on a broad network of coordinators distributed among the faculties. They serve as a first, local point of contact for the researchers. Coordinators are responsible for the proper use of Pure in their faculty. Pure Support organizes bi-monthly meetings of this network.

The UB appointed a product owner, to whom the Pure Support team reports and who organizes quarterly meetings with the Research Output Management Board. To create a broad support base, not only among Pure users but also among stakeholders and decision-makers, the board consists of representatives from the faculties, including full professors or research deans, as well as the directors of the CIT and the Office of the University. The Dean of Research of the UMCG acts as chair. The management board takes strategic decisions in the area of RDM and on the use and development of Pure: for example, to extend the import facilities with additional online research databases or to enable the registration of datasets and research projects.

On the national level, Pure Support collaborates with the Dutch Pure User Group and provides its members with input. For the last two years, the UG's Pure product owner has been a board member of this group, which has meant that the UG has played an active role in organizing meetings, determining meeting topics, and prioritizing issues to discuss with the supplier of Pure.

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Pure Support contributes to the UB's core business: to make information accessible and combine state-of-the-art technology with traditional library expertise on (meta)data management. Pure Support fulfils a number of services for both users and stakeholders. Support includes introduction workshops for groups and individual contact: both face-to-face and by email. When research output is submitted into Pure, Pure Support validates it: verifies and completes the metadata, checks for and registers embargoes on full-texts, and makes the full-texts publicly available on the research portal when this is allowed. Pure Support also takes care of essential new releases, bug fixes, and maintains the online portal displaying research output.

The UG adopted a green open access policy as of 2017, asking researchers to upload the final author's version of their peer-reviewed articles to Pure. To facilitate this, researchers are offered an online form to "Deposit your Article". After the form is submitted, Pure Support completes the metadata; either registers the embargo period, if any, or makes the final author's version visible on the research portal immediately; and imports the final publisher's version in Pure, as it becomes available in one of the connected online databases. Since 2014, all of the university's PhD theses are registered in Pure. They are all made available in open access without restriction, though temporary embargoes are necessary in some cases. This is organized in collaboration with the team that manages the UG's online registration system for PhD students.

Request-a-Copy is the latest service offered in the research portal. The functionality operates on the principle of peer-to-peer sharing: If a publication in the database is not immediately available as a full text (e.g., due to an embargo), a database visitor can request the text directly from the author. The UB acts as an intermediary for these requests. UG authors receive a message from the UB if someone requests one or more of their publications using the Request-a-Copy function. With the researcher's approval, the UB fulfils the request. Currently the library receives an average of 100 such requests per month, with approximately 70% of these requests met.

Communication to end users relies on the regularly updated Pure Support website[2] . When a user logs in to Pure, system messages inform them about issues or new releases, with detailed background information provided on the Pure Support website. Major stakeholders within the university, Research Output Management Board members, and faculty Pure coordinators are kept updated through a newsletter about new releases, resolved issues, and organizational news.

An internal evaluation of Pure Support among all faculties' support staff is scheduled for early 2020. The aims are to evaluate whether Pure Support works according to the procedures established during implementation and whether any updates to these procedures are necessary, in order to reach the goals of research output visibility and 'findability', or to comply with the European General Data Protection Regulation (GDPR).

Open Access Services: Stimulating, Monitoring, and Advising on Open Access Publishing

Background

In its 2011 ten-year strategy memorandum, the UB committed to intensifying its efforts to implement open access at the UG (Nieboer, 2011), and in its Strategic Plan for 2015-2020, the UG referred to the implementation of open access as one of the strategies for promoting and facilitating a transparent research environment (UG, 2015a). But since the early 2000s, the UB had already been an active

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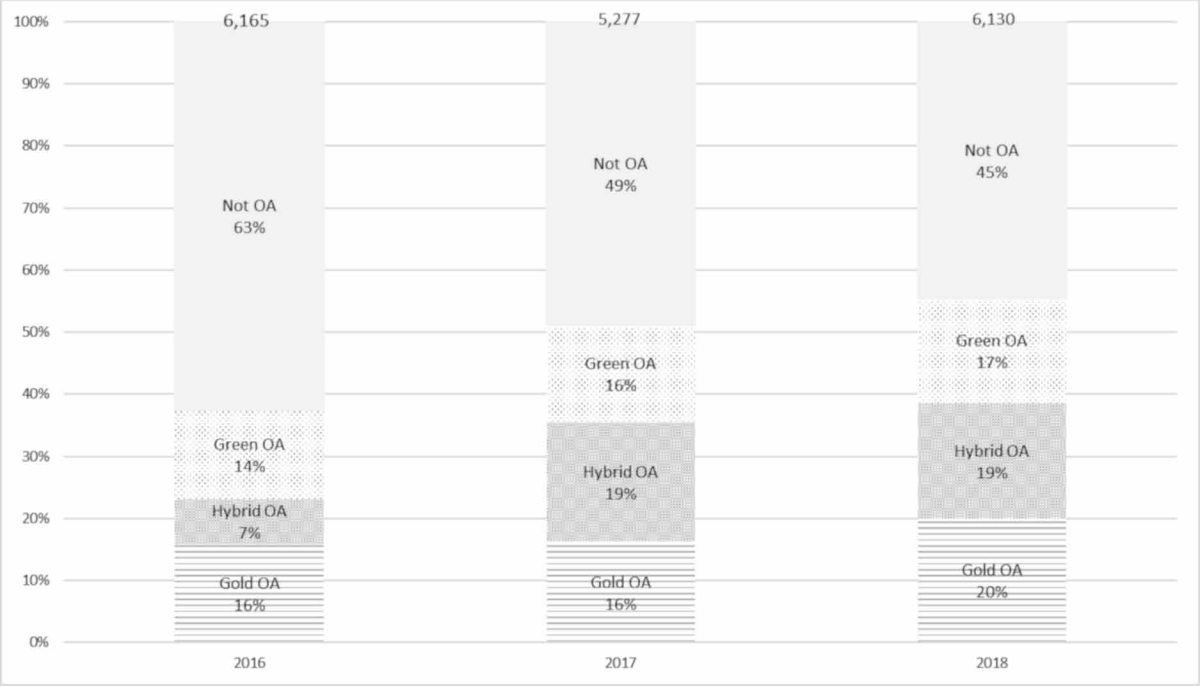
player in international and national initiatives for open access. In 2001, the UB was one of the founding members of the Scholarly Publishing and Academic Resources Coalition Europe (SPARC, 2020), and signed the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities in 2005 (Open Access Max Planck Gesellschaft, 2020). The library also supported new publishing initiatives such as the Faculty of 1000, and became an institutional member of the first commercial open access science publisher BioMed Central in 2002 (van Laarhoven, 2004). The CEO of BioMed Central and one of the 16 original signatories of the Budapest Open Access Initiative in 2002, Jan Velterop, was the keynote speaker at a local conference on open access at the UMCG in 2003. In 2016, the UB played a key advisory role in the formulation of the UG's first open access policy, which encourages researchers to upload the final author's version of their papers to Pure.

Open access policy in the Netherlands became manifest in a 2013 letter by the State Secretary of Education, Culture, and Science to the Dutch House of Representatives, which says that the results of research financed by any public money should always be freely available: I prefer open access publishing through journals that make scientific articles available for free: the gold route. My aim is to have realised a full transition to gold open access route within ten years' time, so by 2024 (Dekker, 2013)[3] .

The term *gold route* describes publications that are open access immediately, as a result of the payment of an article processing charge (APC) to the publisher. In 2017, the Dutch government, the VSNU, the national Dutch Research Council (NWO), and the Netherlands Organisation for Health Research and Development all signed the Dutch National Plan Open Science, which set out, among other things, to

Figure 3. Growth of the percentage of open access (OA) peer reviewed articles (green, gold, and hybrid) as part of the UG total between 2016-2018 (Data source: UG's Pure database and Unpaywall, 2020)



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make all Dutch publicly funded publications open access by 2020 (van Wezenbeek, Touwen, Versteeg, & van Wesenbeeck, 2017), moving this goal forward by four years.

To meet this challenge, Dutch universities have collectively negotiated various read-and-publish (R&P) agreements with the largest academic publishers since 2014 (VSNU, 2020). These agreements allow Dutch-affiliated researchers to publish open access at no extra cost in thousands of (mostly hybrid) journals. The number of publisher deals has increased sharply since then; by the beginning of 2020, over 10,000 journals had been covered by R&P agreements and offered free open access publication to Dutch-affiliated researchers. Despite the initial focus on larger publishers, R&P agreements are now also being concluded with smaller publishers and society publishers. Publisher agreements have led to a rapid growth of open access uptake in the Netherlands, with the share of peer-reviewed open access articles rising from 42% in 2016 to 54% in 2018 (VSNU, 2018). The UG figures are in line with this national trend, with 55% of publications open access in 2018), as shown in Figure 3.

Between 2010-2018, the NWO established an Incentive Fund to finance open access publications and support activities to raise awareness about open access (NWO, 2017). In addition, since 2015, the NWO has adopted an open access policy mandating immediate open access publication for all funded publications (both gold and green open access are accepted, but gold is the preferred route). The open access mandate will become even more stringent from January 2021, since the NWO is one of the signatories of Plan S. Plan S is an international initiative launched in September 2018 by a coalition of research funders known as cOAlition S. The plan aims to accelerate the open access transition and mandates that publications funded by participating funders be published immediately open access, in compliant journals or platforms under an open license (cOAlition S, 2019).

Organization and Activities

Open access support services at the UB developed in response to the implementation of these new open access policies at the European, national, and UG levels; these policies also led to increasing demand for advice from researchers. A team of academic information specialists dedicated to providing publication strategy and open access services started at the UB in 2014. Raising awareness about open access discounts and information provision on publisher's workflows (i.e., how to redeem discounts and waivers) was one of the focal points of the team. The first R&P deals were essentially prepaid open access, and the UB wanted to make sure that these open access opportunities were fully utilized by UG researchers. Therefore, the team reached out to research institutes at all faculties, in the form of up-to-date open access information prominently visible on the UG's webpages and intranet, presentations at staff meetings, and the like. At the same time, it took care of affiliation verification and the approval of open access waiver requests from publishers. It also took on the task of identifying missed opportunities to use open access agreements.

To develop a more full-fledged open access support service, the UB submitted a project proposal to the Board of the University. The Open Access Services project was awarded two years of funding (2019-2020) from the university's multi-year IT budget. The overall goal of the project is to maximize open access uptake, while minimizing the efforts of researchers; this is to be achieved by improving the quality and visibility of existing support services and tools and developing new ones where needed. At the end of the project period, the services and tools established by the project should be firmly embedded within the UB's research support services portfolio and maintained with adequate staffing.

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The project team provides counselling and advice on gold and hybrid open access outlets, and it has refreshed the institutional green open access policy, improved awareness about policy, and arranged workflows and tools to make the deposition of accepted manuscripts as straightforward as possible for researchers. In addition to informative activities, the team also implemented Article 25fa of the Dutch Copyright Act. This article, also known as "Taverne amendment" (named for the MP that introduced it), came into effect in July 2015. The amendment allows researchers to make their short scientific works (articles or book chapters) available to the public following a "reasonable period" after publication (Visser, 2015). The VSNU interpreted "reasonable period" to mean six months. In 2019, the VSNU and the National Platform Open Science (NPOS) ran a pilot project to test the implementation of this law on a national scale (Openaccess.nl, 2020). About 2,800 publications became available in open access via the institutional repositories as a result of the pilot, of which 200 were authored by UG-affiliated researchers (Schalken, 2019). The Taverne project now continues as a regular service provided by Dutch university libraries. The introduction of this law by the Dutch government can be seen as another sign of strong support for open access.

Another important task for the open access services team is to carry out institutional and ad-hoc analysis for faculties or departments, to monitor open access uptake and expenditures. This allows the UG to benchmark itself against other institutions and allows the UB to identify where extra support is needed. Determining the total cost of open access is complicated because there are APC expenditures in addition to R&P agreements, and even within these agreements, the cost of the open access component is difficult to isolate. These publication costs are usually paid from personal or project research budgets, or by individual faculties themselves; since these expenditures are not paid by the UB, it is difficult to track them with accuracy. The team has tried to find a way for the UB to monitor these expenditures by, amongst other things, liaising with faculty administrators to introduce a uniform cost code system for registering open access expenditures.

Although financed centrally by the Board of the University, the open access support services project is coordinated entirely by the UB. The project's steering committee is led by a librarian and includes two other librarians and three academics from different faculties. Two full-time open access specialists with a research background, based at the UB and the CMB respectively, were appointed to manage and run the project. These two specialists collaborate closely on all aspects of the project and their tasks are not limited by "territorial jurisdiction". The project team further includes two senior researchers and 18 library staff (primarily academic information specialists, the UB's license manager, and communication staff), who dedicate a part of their working hours to the project. Its services are targeted towards the entire research community at the UG–from researchers, research managers, and research support staff at faculties and research institutes to central organizational units dedicated to research support. The open access support team works in close collaboration with other Dutch university libraries within the framework of the open access and licensing working groups coordinated by the UKB.

Since the start of the project, open access support services have worked to become more visible and increase awareness about open access policies and available discounts among the UG research community. This has been achieved chiefly by improving communication channels to targeted groups and by broadening the UB's network at faculties and research institutes. The project team provides tailored support and advice to individual researchers via face-to-face contact and through an open access support inbox. The existing open access newsletter was restructured and rebranded as the Open Science Newsletter, to inform the UG community about the latest developments in scholarly communication, research data management, and open science research practices. The newsletter is distributed among all

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research staff, stakeholders, and policy staff at both the UG and the UMCG (more than 7,000 people in total). The web pages on open access were re-launched, and an Open Science blog was established featuring articles by researchers and library staff.

A regular programme of open access workshops for research staff was introduced. In addition, over 30 tailor-made presentations have been given at faculties and institutes (upon request). These presentations also include data on the uptake of open access by the respective faculty. Conferences on open access and open science have brought together researchers, funders, librarians, and publishers. When organizing these events, the UB takes care to give voice to both champions of open science and critical voices.

By 2016, the UB had established an open access publishing platform for UG staff: the University of Groningen Press (UGP). Currently, as part of this project, the UB is professionalizing its publishing activities by imposing stricter editorial policies on its journals, in order to meet the requirements of the Directory of Open Access Journals. Currently, the press hosts more than twenty academic journals; open access book publishing started in 2019 (UB, 2020). The University of Groningen Press combines traditional library expertise with advice on the latest publication trends and tailor-made technological support for academic editors and authors.

On a strategic level, project members pay individual visits to research directors, research policy officers, and funding officers to discuss the open access services offered by the UB. To increase support for open access and open science at the faculties, 12 researchers volunteered to become Open Access Ambassadors. They act as multipliers and help to disseminate information within their respective faculties. The UB has established a regular collaboration with the Open Science Community Groningen, a grassroots network of academics that aim to promote open science practices, connect open science advocates, and stimulate open science policy at the UG. This collaboration provides the UB with valuable first-hand information about what interests the UG research community with regard to open access and open science.

Research Data Services: Virtual Help Desk and Hands-On Workshops

Background

At the root of the initiative to set up research data services were cases in 2011 of scientific misconduct, such as the so-called "Stapel *affaire*" (social psychology) and the Poldermans case (cardiovascular medicine), and an advisory report by the Royal Netherlands Academy of Arts and Sciences (KNAW, 2013). Given the importance of research data and its management in empirical research, a central hotspot for research data management (RDM) was made urgent by technological developments, new regulations (such as the GDPR), lack of familiarity with helpful tools, and services spread over the entire university. Research funding organizations, academic journals, and the research community itself also started paying renewed attention to the handling of data. In 2013, the Board of the University initiated a three-pronged RDM approach that launched the Research Data Office (RDO), a joint task of the UB and CIT. In addition to setting up the RDO for support, SER was given the task of aligning research policies and quality management and Legal Affairs was asked to identify and clarify relevant laws and regulations. Additionally, the Board of the University asked the faculties to articulate their disciplines' best practices in the form of RDM policies.

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Organization and Activities

A project defining goals, services, operations, and staffing for the RDO was initiated. A helpdesk to share current best practices and provide access to existing national and international data facilities was identified as the most desirable service. In-depth interviews, with both researchers in various disciplines and research managers, identified additional required services. The UMCG's research support service remained independent, given the specific regulations for processing personal data in hospitals and health care centres, the size of the organisation, and its physical location elsewhere in the city. However, the UG and UMCG RDM teams continue to cooperate and exchange information on a regular basis.

What started out as a project quickly grew into a service, offering a lot more advice and support than a mere virtual helpdesk. Major research funders began requiring the transparency of data management during research projects and the availability of research data after finishing projects. Journals increasingly ask for data availability statements in articles, preferably with persistent links to data, descriptions, and scripts, to enhance research integrity and the re-usability of data. The RDO works on the basis of the FAIR principles: findable, accessible, interoperable, reusable (Wilkinson et al., 2016), to provide researchers with the tools and services that best meet their needs. For researchers working with human subject research data, RDO offers services and support to comply with the GDPR and relevant university policies.

In addition to researchers, regular users of RDO services include funding officers, research managers of research institutes, data managers (data stewards), ethics boards, and service departments. In fact, services often result from a cooperative process between researchers and support staff, wherever they may be stationed. The RDO closely cooperates with other services, such as those supporting open access, Pure, and research impact, to provide holistic advice for research policy officers of the university.

For researchers and staff, it may be difficult to find the right person in this network. Therefore, it is important to make sure there is "no wrong door". The RDO can only deliver by getting the right experts on board and by being referred to by colleagues whenever relevant. Several services have now been firmly institutionalized UG-wide as an outcome of the RDO project. The first services were the virtual helpdesk and information portal on the website[4]. Even though the main audience is UG researchers, the information on the web is deliberately public rather than restricted to the intranet. This makes it easier for partners in the UMCG and elsewhere to refer to relevant documents, such as policies in research proposals.

The virtual help desk consists of an email address and a telephone number. Emails are automatically sent to a tracking system, so the team can handle incoming questions promptly, connect with specialists in other departments, and track progress. Figure 4 shows the main topics of calls in 2018 and 2019. It reveals not only a strong growth in calls, but also reflects that different subjects become more important over time, influenced by policies, regulations, and phase of the research lifecycle. Researchers who ask for advice on RDMP, often return when it is time for data to be archived or published.

Nearly all research institutes or faculties have implemented a template of questions to align Research Data Management Plans (RDMPs) with the RDM policy of the university, subject- and institute-specific requirements, and a guide published by Science Europe (2018). The RDO supported this implementation by providing advice, managing a web tool [5] that enables making and managing RDMPs (UG, 2019c), and developing help texts and references to further information.

Whenever an RDMP is required by research funders, the RDO offers advice and can help get the right tools and services on board, with the help of experts in other departments as needed. Researchers

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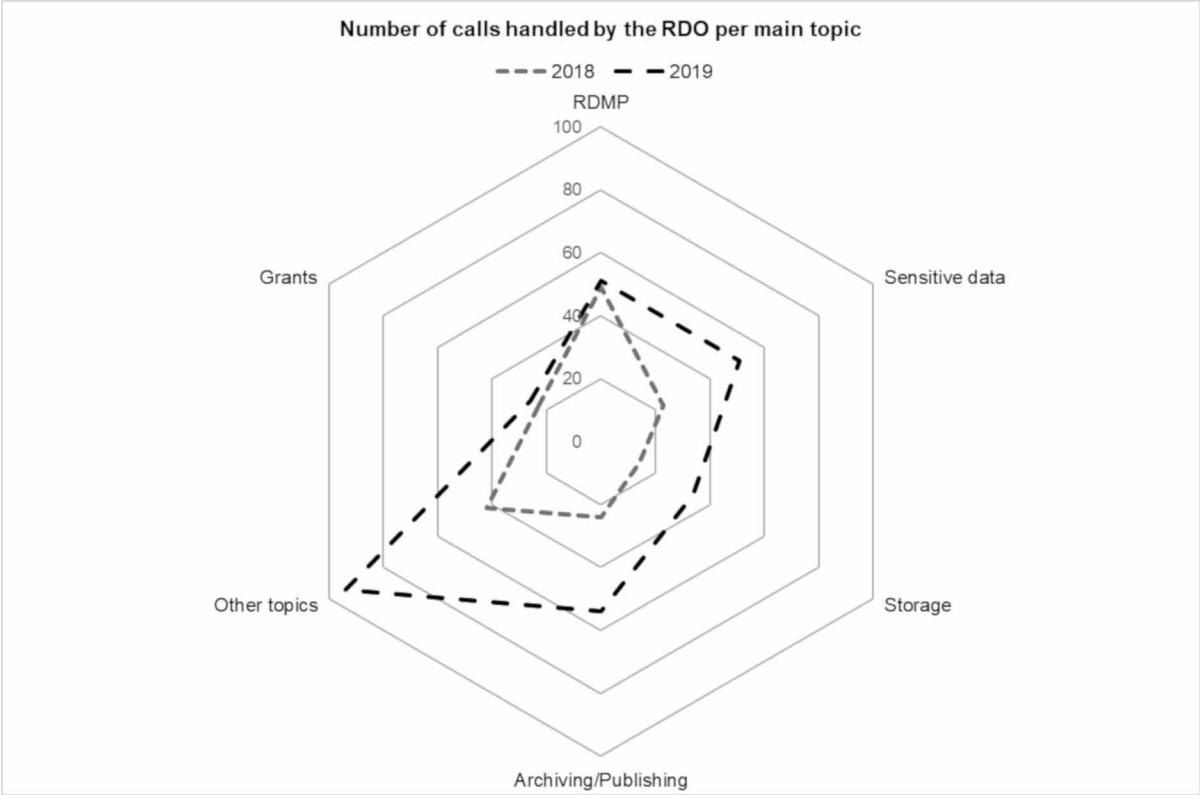
Figure 4. Development of cases per main topic handled by the RDO (Data source: the UB's issue tracking system, March 2020)



experience the RDO as a reliable advisor when they have to provide an ethics self-assessment as part of their applications for grants by the European Research Council.

The Data Protection Impact Assessment was recently implemented in close cooperation with the Legal Affairs privacy team. The aim of such an assessment is to identify risks in processing sensitive data and to take the appropriate organizational and technical measures to manage these risks. A methodology was developed (Hoorn & Montagner, 2018), using the approach of Bieker et al. (2016). Using these methods leads to more experienced research and support staff and, hopefully, to the identification of re-usable solutions that will lead in turn to greater efficiency.

The sharing of good practices also happens beyond the university level. The RDO links to national think tanks, such as the UKB's Research Data Management Working Group and the National Coordination Point of RDM in the Netherlands (LCRDM). Both groups keep a keen eye on developments at global and European digital data organizations.

The research data policy of the university (UG, 2015b) requires datasets to be findable and described for further use. Important instruments to achieve this are Pure and the research portal. Unlike publications, datasets are not stored in Pure due to its technical limitations. Hence, the datasets themselves are stored on external platforms, whilst their metadata including a persistent identifier and access information, are archived in Pure. To this end, RDO cooperates with the Pure team to ensure the quality of the metadata in Pure. Managed storage solutions that support archiving services are under development by the CIT.

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Early 2020 saw the 100th UG dataset published in DataverseNL[6], one of a set of archival data repositories approved by the Research Output Management Board, and nearly 700 datasets described in Pure.

As a network organization with members working at various university departments, the RDO's eight team members physically work in their own offices and at times together. Every team member contributes from their own professional background (e.g., library, IT) and relies on a broad network of expertise at their "home base". The RDO refers to the CIT for storage solutions, high performance computing facilities, data science, handling of geographical data, visualisation, and more. The team has recently been involved in clarifying requirements and testing new technological RDM services. Almost all team members work part-time for the RDO. In this way, everyone stays closely linked to departments across the university. As research data management is an ever developing subject, continuous learning and training is of the essence.

Research Impact Services: Analyzing and Benchmarking Academic and Societal Relevance

Background

A growing emphasis on evidence-based decision making and an increasing demand for evaluation of research for various purposes have motivated the UG to initiate centrally coordinated activities focused on research impact. The research impact team, with members from the UB and the Office of the University, leads the coordination of such activities and raises awareness about trends in research evaluation. This has brought unprecedented opportunities to support academics in demonstrating and optimizing the scientific and societal impact of their research.

How can the UG find collaborative partners? How can it acquire a quick overview of what is happening in a given field? What is the impact of adding a new researcher to a team? How is each UG research group positioned, with respect to national or international competitors? These are some of the most frequent questions raised by early career researchers, group leaders, and policymakers. Society, government, and funding agencies consider the impact of research within and beyond academia increasingly important. When used responsibly and interpreted in the right context, the answers to these questions assist researchers, managers, and policymakers in making well-informed decisions, strengthening funding applications, identifying collaboration partners, facilitating talent scouting, and boosting the overall reputation of the work of a group or institution. As a result, a growing number of institutions have introduced research impact services to their research community.

Research conducted at Dutch universities and research institutes is evaluated by the national Standard Evaluation Protocol (VSNU, NWO & KNAW, 2014) every six years, and the impact of this research must be demonstrated in applications for funding, promotion, or appointments. In response to the need of the UG research community for disciplinary benchmarking and in order to identify important patterns and trends within different research domains, the Research Analytics Alliance (RAA) project was initiated. The project started in January 2018 for a duration of two years, aiming to realize the goals of the UG Strategic Plan 2015-2020 concerning academic and societal impact (UG, 2015a). The overall objective of the RAA was to increase research intelligence expertise and foster the competent use of research analytics tools at all levels of the UG. The core of the RAA was built through the collaboration of the UB, SER, and the CMB.

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Organization and Activities

Research Impact Services (RISe) was established in 2018 as an initiative of the RAA. It offers the UG research community the opportunity to establish benchmarks and gather insight into the strengths and weaknesses of its research performance. Such insights serve as a basis for organizational and individual development, resulting in better support of talent development within the university and a more comprehensive overview of the quality of the UG's academic output. In particular, RISe explores, implements, and coordinates a broad range of resources and tools to assist researchers in determining the academic and societal impact of their research output. As a result, RISe supports research staff in boosting their research impact by increasing their visibility and their scholarly output, optimizing their publishing strategies, and evaluating their own research performance.

The UB has subscribed to a selection of advanced research analytics tools, including SciVal and InCites, to analyse and visualize the academic impact of individuals, groups, and institutes at the university. In addition, the UG's subscription to Altmetric Explorer makes it possible to track and visualize the societal impact of research.

In order to establish the role of RISe in assessments of research excellence at both institutional and individual levels, the support team offers customized instruction in visibility of research and research impact strategy, tracking academic and societal impact, research communication strategy, responsible metrics, and responsible assessment. This instruction and support is tailored to the needs of diverse target groups, and enables researchers to effectively use the available research analytics tools to meet their needs. In addition to such training, an online learning portal[7] has been developed to support the use of the research analytics tools.

While quantitative indicators can never replace expert opinion in research assessment, their responsible use can reinforce the expert narrative by providing complementary analytical evidence. Therefore, in line with international initiatives such as the San Francisco Declaration on Research Assessment (DORA, 2012) and the Leiden Manifesto (Hicks, Wouters, Waltman, De Rijcke, & Rafols, 2015), UG recognizes the importance of using metrics in a responsible manner. To this end, a clear public statement of principles and a policy on the responsible use of metrics are available to patrons at the UG (UB, 2017).

The RISe website[8] was launched in November 2018 as a point of contact and a virtual help desk. The goal of this website is to raise awareness and provide a clear message of what RISe is, what it stands for, and how it can support the UG academic community in highlighting academic quality, societal relevance, and viability of research, among other things. The research impact support team aims to regularly update the available online content with helpful information, articles, and latest developments in the field. It uses various types of communication channels, such as a newsletter, Twitter, and other social media platforms, to publicize the support and services it offers and to improve the understanding of the services it provides.

The RISe team's experience has shown that while there is a continued need to strengthen research analytics expertise at all levels of the university, centralized research impact support is indispensable. Putting it differently, research impact services are a core task of the university as a whole and, thus, should be centrally organized, in order to provide efficient and adequate support. The centralized research impact experts have offices at SER and at the UB, in the physical vicinity of the executive and policy branch, as well as other related research support teams.

The progress of the RAA project was discussed in several meetings with a steering committee composed of representatives from different faculties and departments: scientists, librarians, and policy

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officers. After the two-year project period, the steering committee was replaced by an advisory board, to which members are appointed for a term of three years. The advisory board has a maximum of ten members, who are invited to sit on the board as representatives of their faculties. The advisory board meets at least twice per year. Two full-time employees, one from the UB and the other from the Office of the University, lead and coordinate RISe. The senior research policy adviser and several colleagues from the UB and the CMB form the rest of the RISe core team. Members of the core team participate in national and international seminars, conferences, and workshops, to keep their knowledge of the research impact field updated and learn more about new models of research assessment and the global transition towards Open Science.

Moreover, to facilitate the exchange of knowledge among national research impact experts, close cooperation has been established with the UKB Research Impact Coordination Point and the Research Intelligence Network Netherlands. In addition to these national networks, to strengthen the position of research analytics within the UG and develop a knowledge-sharing network, an Expertise Network Research Analytics group has been initiated, which includes UG colleagues responsible for research policy and research assessment. The members of this group act as contact persons and intermediaries between the RISe core team and UG research institutes. Members discuss various aspects of research analytics, share the latest updates and developments of RISe, and subsequently decide on actions deemed necessary to enhance research impact services. One notable decision that emerged from these discussions was to form two working groups: one for the science, engineering, and medical science faculties and the other for the social sciences and humanities. This decision arose from critical differences between the evaluation of research in these academic disciplines.

The RAA project formally ended in 2019. After a positive assessment of the project by the steering committee, the Board of the University endorsed the continuation of RISe for a period of three years (2020-2022). The research impact services function will be reviewed regularly by the advisory board to ensure its continued relevance to UG's research policies during the next three years, before deciding on its structural financing as a centralized service. Perhaps the biggest approaching challenge is that RISe is a new and unorthodox service and, therefore, requires a culture change and continuous awareness-raising among researchers, support staff, and decision makers.

ADDED VALUE: CONCLUSIONS AND OUTLOOK

Contribution to UG Research

The UB's shift towards the research support services described above definitely seems to have met a need. These services fit a trend in academic libraries that Lorcan Dempsey (2010) called moving from "outside-in" to "inside-out" oriented services. The specific inside resources that were brought to the outside world were not primarily digitized images from the library's Special Collections, as Dempsey would have it, but first and foremost the university's research output: its scientific and scholarly publications and its research data (cf. Dahl, 2018).

Has the UB's research support been successful in contributing to the UG's research activity? The figures show an increase in the number of open access publications, regular registration of virtually all the UG's scientific publications in Pure, and growing numbers of other research activities entered in the

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Pure database. They also show a good turnout of researchers in symposia and workshops devoted to the library's research support services.

Pure

The Pure-based online research portal has come to serve as the "display window" for the research output of the UG as a whole and individual researchers, without the researcher needing to spend much time keeping it current. It is also a place where publications are openly accessible whenever possible, either in full text with a link to an open access version or with an option to request a copy. As Pure contains a vast amount of high-quality information, it has also become *the* reliable and efficient basis for annual research output figures. It is also useful as a source to substantiate research-quality evaluations and research analytics used by, for example, the local coordinator for research assessment. It is also an important tool for benchmarking purposes; in the Netherlands, researchers and research institutes are evaluated nationally by the Standard Evaluation Protocol, established by the VSNU, the Dutch Research Council (NWO), and the Royal Netherlands Academy of Arts and Sciences (KNAW; VSNU, NWO, & KNAW, 2014). The UG played a key role in designing a specific Pure module that meets the Standard Evaluation Protocol standards, providing figures that can be easily compared by research unit, over a period of six years.

Open Access Services

The UB's open access services have led to increasing numbers of UG researchers embracing open access publishing as the new normal (see Figure 3). This has become evident from the contact with researchers by the open access team: only a few years ago, open access publishing still needed to be advocated for; nowadays, most questions and requests for assistance have to do with open access submission workflows. Counselling and information activities seem to have paid off. The habituation to open access probably also has to do with the 10,000 journals now available for (gold or hybrid) open access publishing without financial barriers for Dutch-affiliated researchers. The recognition of Pure as the institutional repository with an added (green) open access function *and* the generally accepted notion that open access publishing leads to more exposure and, hence, to more citations and greater impact of research (a host of literature to support this can be found on SPARC, 2020b).

Research Data Management

Since it started, the Research Data Office has seen an increase in the number of datasets stored in data repositories, as well as in the number of RDMPs and Data Protection Impact Assessments drawn up with the help of RDO staff. Attitudes surrounding RDM have changed during their consultations: more positive feedback, growing interest in RDM, and increasing use of facilities. Having to deal with data and privacy regulations in the scope of a research process can sometimes feel like a burden for researchers. RDO sees, however, that more of them rely on RDO's services and advice (e.g., on FAIR data), beyond the mandatory red tape. The RDO now provides UG researchers with RDM training, tools, infrastructure, guidance, and support during the entire research lifecycle (and beyond), adhering to the GDPR and data management policies. Using the expertise of the RDO, researchers will be able to process data—at all stages from collection to archiving—in a more organized, understandable, and transparent manner.

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Research Impact Services

Based on the research output data registered in Pure, and with the help of a number of analytic tools, the research impact services support team provides services that benefit individual researchers, UG research institutes and faculties, and the university as a whole. Individual researchers at all stages of their careers use RISe to support applications for tenure or promotion, to strengthen requests for grants and other funding with responsible indicators, and to increase impact by assessing and identifying existing or potential collaborators in a specific research field. Research and HR managers may want to identify top talent, for which RISe provides data analytics feedback that can be used by hiring committees. At an institutional level, RISe is exploring trends to help research managers identify strategic areas of research and to map the university's research strengths and potential areas for growth.

Communication Strategy

To support the library's support services, a communication strategy for research staff was developed, such that each faculty is approached individually with information that is specifically useful to them, to be disseminated through their own communication channels. This strategy requires thorough preparation and careful timing on the part of the UB's communications department, but it has been observed that a larger target group has been reached since its introduction; researchers find it easier to approach the UB's experts, and electronic information is used more often.

The library has increased its visibility by using the faculties' intranets and internal newsletters and presenting library topics at staff meetings, in combination with the UB's own communications instruments (printed material, website, newsletters, narrowcasting, events). In recent years, the structural use of social media has also proven an effective way to inform researchers, respond to questions, and reach a wider audience within the national academic community, but also to engage in substantial online discussions. To improve the "physical" visibility of the UB at the faculties, the UB is currently developing a concept for library roadshows at the UG faculties. A Pop-up Library, staffed with research support experts, will provide on-site support and information. The concept, content, and logistics will be coordinated with the faculties to ensure that this new service meets the information needs and habits of academic staff.

Challenges and Outlook

Decision makers may not always be fully aware of the value of the activities provided to researchers, and budgets to support these activities are not always available. Well-established services also need ongoing attention. A recurrent funding requirement for all projects has been that the services developed during the project phase should continue within the ordinary operational management of the library (or other divisions of the university). Supplementary staffing and retraining and (re)deployment of the workforce has helped to realize this, as have education, refresher courses, and in-service training of staff. The UB is currently developing a customer relations management project to professionalize its internal UG collaborations. A new project, Research Output 2020, aims to improve (meta)data quality in Pure, optimize administrative processes, and support processes related to research funding. The library recently started to ensure that all UG employees request an ORCID identifier and register it in Pure. These efforts, along with the renewal of the Pure portal, will result in an even better presentation of the UG's research output.

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At the time of writing, the RDO is in search of a sustainable funding structure. It has found a strong partner in the Data Federation Hub of the CIT (UG, 2019a), which organizes regular meet-ups and information markets about RDM. In spring 2020, the RDO will conduct a customer satisfaction survey to learn more about the expectations and experiences of researchers and faculty support staff. With CIT and the Office of the University, the library will explore the establishment and expansion of this relationship through a Digital Competence Centre: one single site bringing together knowledge about data (and data stewardship) and the software and computing this requires.

Figure 5. Bicycles in front of the University of Groningen Library (UB). Photograph courtesy of the UB (Leonie Freese, 2019).

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Within the university, and in cooperation with external suppliers, large amounts of data have now been generated about successful or failed interactions with UB services (e.g., the uptake of open access opportunities, the use of journal articles). The UB is preparing to establish a Library Data Warehouse, in which these data will be systemically accumulated and analysed by multidisciplinary experts. This will allow the library to specify its own key performance indicators and fine-tune its services.

Some prejudices with regard to open access prevail; raising awareness about the responsible handling of research data will remain important, as will supporting and carrying out prudent research impact analyses. Tailored services are sometimes difficult to realize from a central service like the UB. Data management or publication strategies in astronomy, physics, mathematics, and computer science (where "open" is prevalent), are in sharp contrast to those in chemistry, where active research projects are often surrounded by secrecy. Researchers in the arts and humanities are also usually inclined to keep their data to themselves, at least until a research project has been finalized. Furthermore, open access outlets for the humanities and, to a lesser extent, for the social sciences are not as widely available as for STEM-researchers. Likewise, and unsurprisingly, the research support team has found that there are generational differences in receptiveness to new ideas.

The focus of the UB's research support will remain to advise researchers on publishing with maximum visibility and impact and relieve them of tasks that may deter them from carrying out research. In the composition of its expertise, the UB considers variation in types of research, the means of research and publication, and the cultures of publication and evaluation that exist across the various faculties (UG, 2015a). Specialist teams in the fields of open science, research output, research data, and research analytics will continue to help researchers stay up-to-date with developments in these areas and meet the diverging and emerging demands of authorities and research funders—welcoming them to the library online or in person (Figure 5).

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KEY TERMS AND DEFINITIONS

Current Research Information System (CRIS): A database in which all sorts of research output are registered and stored, usually by a research institution and with a focus on publications. Data sets, presentations, awarded research funding, prizes, and so forth may also be registered. Metadata describing the research output can be used to present, manage, analyse, and exchange the research performed at an institution or aggregated at a national or supranational level.

European Research Council: A public body for the funding of scientific and technological research conducted within the European Union (EU).

General Data Protection Regulation (GDPR): A European regulation, which came into effect 25 May 2018, designed to harmonize data privacy laws across Europe and to empower all EU citizens to protect their data privacy. In addition to other effects, it protects participants in research projects by offering transparency about the processing of data, and by requiring adequate security measures during the entire data lifecycle, including long-term archiving. The GDPR defines new obligations for organizations that handle and control the processing of personal data.

Gold Open Access: All articles in a journal are available for free on the journal's website upon publication under an open license. Many gold open access journals charge publication fees (so called Article Processing Charges, or APCs). A variant of Gold open access is Diamond (or Platinum) open access, in which the journal or platform is financed by the research community (research funders, libraries, learned societies). No APCs are charged in this model.

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Green Open Access (also known as Self Archiving): Researchers upload their publications to a freely accessible online website. This can be a personal website, the website of the research institution that funded the research (e.g., the institutional repository of the university), or an open repository. The version of the publication is ideally the final publisher's version (or version of record) or the accepted author's manuscript (final author's version). Embargo periods may apply.

Hybrid Open Access: A subscription journal that offers open access publication for individual articles upon payment of an APC.

Open Access: A publishing model through which scholarly publications are made available online to readers at no cost and with an open license allowing for re-use of the material.

Open Science: An umbrella term for a movement that aims to make scientific and scholarly activities more accessible to a large number of people. This includes making research results as openly accessible as possible. It includes, but is not limited to, practices such as open access publishing, open data, sharing code and software, and improving the transparency and reproducibility of the research process. It can also be understood as the opening up of scientific processes, which includes citizen participation.

Read and Publish Agreement: A deal between a library or a consortium of libraries and a publisher which combines the traditional license fee for reading access with an arrangement for the (pre-)payment of publishing articles in open access.

Research Data Management (RDM): The structuring, organization, and control of data produced throughout the research cycle, RDM can involve recording, dissemination, and archiving of research data and results. Responsible RDM must respond to the policies and conventions of local research institutes and funding agencies, as well as national and international legislation and codes of conduct for research integrity.

ENDNOTES

1 Reference to the UG should be taken to include the UMCG, just as reference to the UB includes the CMB, unless stated otherwise.

2 Pure Support website can be accessed in https://www.rug.nl/library/support/pure.

3 Mijn voorkeur gaat uit naar Open Access publiceren via tijdschriften die de wetenschappelijke publicaties online gratis beschikbaar maken, de Golden road [sic]. Mijn streven is erop gericht om binnen tien jaar, dus per 2024, de volledige omslag naar Open Access Golden road [sic] te realiseren.

4 Research Data Management web page www.rug.nl/researchdata

5 RDMP Web tool https://www.rug.nl/research/research-data-management/tools-services/rdmp/rdmp-web-tool

6 DataverseNL https://dataverse.nl

7 Research Impact Services Learning Portal https://rug.thecampster.com

8 Research Impact Services https://www.rug.nl/library/research-impact-services

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Chapter 2
"The Future Depends on What You Do Today": The Library as a Leader in Open Science

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EXECUTIVE SUMMARY

UCL (University College London) strongly supports the implementation of Open Science policies and practices. The library has taken the lead in the university across all eight areas of Open Science: the Future of Scholarly Communication, the EOSC, FAIR data, Skills, Research Integrity, Rewards, Altmetrics, and Citizen Science. UCL has modified these themes slightly to better fit its academic requirements, developing ambitious programmes and services to support the change of culture which is required. From the future of scholarly publishing, with the formation of UCL Press as the UK's first fully open access university press, to research data management, rewards, research integrity and next-generation metrics, UCL has become a leader in Open Science. This chapter analyses the success of UCL to date, describes the challenges, shows the benefits, and indicates what future steps are being planned to deliver a culture where Open Science is the default, thus delivering on the prophecy of Mahatma Ghandi, one of UCL's most illustrious alumni, 'The future depends on what you do today'.

INTRODUCTION

What is the role of a library service in a research-intensive university in supporting the university's activity in Open Science? Is Open Science a topic which should be led by the academy, or can a University Library play a role here? In some countries, academic leaders have been appointed as Open Science champions. In others, such as the UK, it is the University Library which has taken on such a role, either through the University Librarian themselves or else via the appointment of a senior manager to reach out to academic members of staff. The purpose of this paper is to look at possible roles that the University Library can play in this debate through a particular case study, that of University College London (UCL).

DOI: 10.4018/978-1-7998-4546-1.ch002

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University College London (UCL)

UCL is the third oldest university in England, after Oxford and Cambridge, founded in 1826. It is renowned for 'disruptive thinking', a characteristic inherited from one of its earliest supporters Jeremy Bentham, the utilitarian philosopher (UCL, 2020b). It was Bentham who first invented the word 'international'. Amongst English universities, UCL is the

- 1st in England to welcome students of any religion or social background;
- 1st in England to welcome women to university education;
- 1st in England to teach English, German, Chemistry, and Engineering;
- 1st in England to have a fully Open Access University Press, UCL Press.

As much as League Tables are a significant indicator of quality, UCL scores as follows:

- 8th in the world (QS World University Rankings 2020)
- 4th in Europe
- 1st in London

Academic excellence is where the university excels. UCL has/is:

- 29 Nobel laureates
- 11 academic faculties
- 42,100 students
- 13,360 employees
- 1st in the UK for research strength (REF 2014)
- 440 undergraduate programmes
- 150+ nationalities represented by the student body
- 675 postgraduate programmes

UCL has a total group income of £1.45 billion, of which £476.3 million is from research grants and contracts (UCL, 2020a). The university has an unparalleled reputation for academic excellence underpinned by creative and innovative thinking with a global perspective. UCL has 250,000 alumni in 190 countries. 48% of its students are international students and 29% of UCL's students studied abroad in 2017/18; 35% of the staff are also international. The picture created by this data is one of a vibrant community engaged in research, teaching, learning and knowledge exchange.

The State of Current Literature on the Role of Universities in Open Science

Much is written about the topic of Open Science. In Europe, the debate has been shaped by a number of Declarations and activities, many emanating from the European Commission and these are listed on the Commission's Open Science Platform (European Commission, 2020). Particularly important was the Dutch Presidency of the EU in 2016. Here, the promotion of Open Science was a major plank of the Dutch Government's activity during their presidency. This resulted in the Amsterdam Call for Action on Open Science (2016). Its vision consisted of four components:

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- Full open access for all scientific publications
- A fundamentally new approach to all use of research data
- New assessment, reward and evaluation systems
- Alignment of policies and exchange of best practice

This vision was supported by twelve concrete actions, clustered under the following headings:

- Removing the barriers to Open Science
- Developing research infrastructures
- Fostering and creating incentives for Open Science
- Mainstreaming and further promoting open science policies
- Stimulating and embedding Open Science in science and society

In this vision, the university as a research-performing entity lies at the heart of delivery. However, the Amsterdam Call concentrated on the end-result of all these actions – the delivery of Open Science solutions. It did not, in itself, identify how a university could deliver on the massive agenda which Open Science represents. It did not look in detail at power structures in universities and determine exactly *how* Open Science solutions could be advocated, managed and embedded at university level.

What is the role of a research-led university in the 21st century? An important insight is provided by Gerald Chan's lecture *The Research University in Today's Society* in 2017 (Chan, 2017). Dr Chan concluded that University research is now the most powerful impulse for human progress. That is an ambitious claim, for the emphasis is on the role of a university in society. That being the case, a number of university consortia and membership organizations began to look in more detail at the role of universities in developing Open Science solutions.

The European Universities Association has produced a number of reports on Open Access activity, for example the 2017 EUA Statement on Open Science to EU Institutions and national governments (European Universities Association, 2017). However, this Statement did not identify exactly *how* universities should implement Open Science practices at the organizational level. There was a gap in the literature on exactly *how* universities could manage the transition to Open Science.

The gauntlet was picked up by LERU, the League of European Research Universities. In 2018, LERU produced its Advice *Paper Open Science and its role in universities: a roadmap for cultural change* (League of European Research Universities, 2018). This paper is still the best high-level guide to the changes and developments necessary at university level to engage with Open Science. It called for massive cultural change throughout the academy, the appointment of Open Science champions at university level, and identified the Library as a key component and service provider in the Open Science landscape. A companion advice paper on Citizen Science has also been produced by LERU members and LERU promoted the recent signing of the Sorbonne Declaration on research data by 9 global university networks in Paris in January 2020 (Wyler, Grey, Maes, & Fröhlich, 2016)

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UCL LIBRARY SERVICES

The Library service at UCL was founded in 1829 and the first Librarian was Dr F.A. Cox. By the beginning of 1829, he had carefully built up a collection of 6,500 volumes (Harte, North, & Brewis, 2018). In 2020, the Library's collection stands at over 2 million items, plus one of the most extensive digital libraries in Europe. The Library is a family of libraries, managed centrally under the Pro-Vice-Provost (UCL Library Services). 17 libraries make up the UCL family, which extends across the whole of London and beyond (UCL, 2019a). The latest building to be opened is the UCL Student Centre, a facility managed by UCL Library Services with over 1,100 learning space which are open 24 hours a day, 365 days a year (Figure 1).

Figure 1. UCL Student Centre, opened 18 February 2019 (Source: the author)

It is a 21st-century concept of what a library and learning space should be. There are no paper books nor journals in the facility, although students can borrow materials from UCL's libraries and use them in the Centre, if they wish. The UCL Main and Science Libraries are less than 5 minutes away. The focus of the building is on digital delivery, group working and community building. Seating is a mixture of formal seating with desktop computers, more social seating for informal study and bookable rooms for group/project work. There is also a café and a rooftop area for outdoor refreshments.

The Library holds one of the best collections of archival material in the UK. Its collection of materials relating to George Orwell, famous amongst other things for his book *Homage to Catalonia*, has earned the collection UNESCO Designation. *Treasures from UCL* gives an overview of the richness and depth of the Library's historic holdings (Furlong, 2015). Newton's *Principia* (entry 31), for example, is one of the seminal works in the foundation of modern science. UCL's copy not only sits in UCL Special Collections, but it also goes out to undergraduate lectures. Students can then interact with the original of this great work, having just heard it described in their lecture. This is research-based teaching, one

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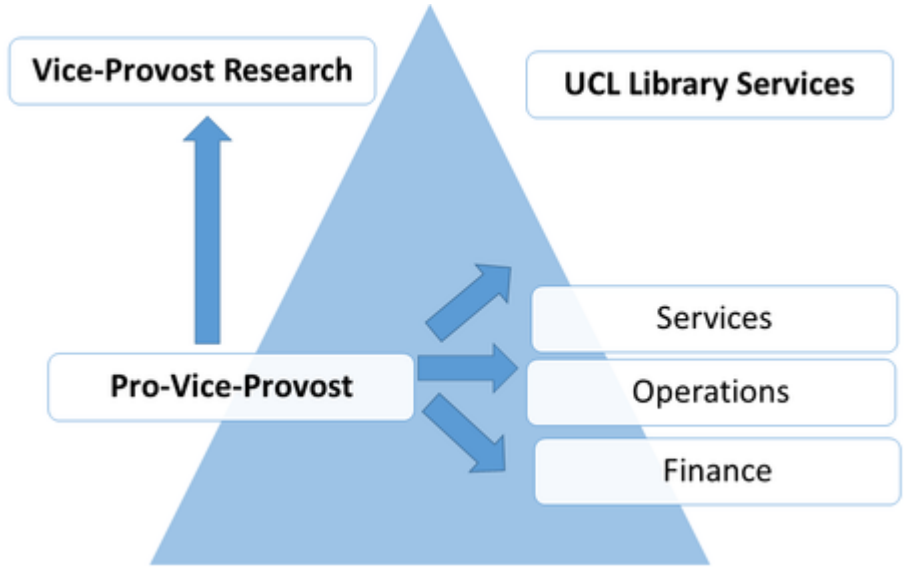
of the cornerstones of the educational experience in UCL. As research on the holdings in UCL gathers pace, amazing new discoveries are constantly being made. The Trevelyon MS. (entry 27) is now known to be a previously-unknown third copy of a compilation by Thomas Trevelyon (born c. 1548). Equally important is the recent discovery of the manuscript of a poem by Byron (entry 41) inscribed into Samuel Rogers' *The Pleasures of Memory* (London, 1810).

Organization

Administratively, the Library is organized into three main groupings, reporting via the Pro-Vice-Provost (UCL Library Services) to the Vice-Provost (Research) (Figure 2).

Figure 2. Organizational structure of UCL Library Service (Source: the author)



Most of the Open Science activity takes place in the Services grouping, overseen by the Pro-Vice-Provost (UCL Library Services), who is the institutional Open Science champion. Within the services grouping, there is a significant number of Open Science activities which support research and teaching in UCL. These include:

- Open Access Team, monitoring Open Access compliance with funder mandates and the university's return to REF 2021, a national research evaluation exercise
- UCL Press, the UK's first fully Open Access University Press
- Research Data Team, acting as a support service to advocate for and train UCL researchers in Open and Fair data practices, and to participate in UCL engagement with the European Open Science Cloud (EOSC)
- Bibliometrics Team, who lead on Next-Generation Metrics activity, and in the implementation of DORA (San Francisco Declaration on Research Assessment, 2012)

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- Copyright Team, who advise UCL academics on copyright issues and Creative Commons licences

Management of these teams is spread across different role holders in the Library, but all reporting to the Director of Services, who in turn reports to the Pro-Vice-Provost. In this way, the Library has created a Virtual Open Science Office.

The Pro-Vice-Provost reports to the Vice-Provost (Research) and this reporting line is crucial if Open Science practices are to be embedded into the research and education landscape in UCL. With this working relationship, activity in certain areas of Open Science is the direct responsibility of the Vice-Provost's Office, but overseen by the Pro-Vice-Provost. These activities are:

- Research Integrity and Reproducibility
- Sponsorship of the UCL Rewards framework, overseen by the Pro-Vice-Provost
- Joint work with the Library on Bibliometrics and Next-Generation Metrics

This partnership working with the Office of the Vice-Provost (Research) is vital. The Library leads in a number of areas of Open Science activity, but it is the University Librarian as Pro-Vice-Provost and a member of the Vice-Provost's team who can extend UCL's work in Open Science to cover all areas of Open Science activity. A new, original pan-university model for research support has thus been created by this partnership, with the Library taking the lead role. A typical current statement about research support in a University Library might take something like this form: 'The Library Services Research support team can help you manage your research profile and disseminate your publications and data, enabling you to meet University and funder requirements' (The Open University, 2020). Through its partnership with the Vice-Provost (Research)'s Office, UCL has developed a new model for research support by bringing into the Library's ambit areas of policy such as Research Integrity and Rewards which are not normally seen as Library roles.

UCL Research Strategy

UCL has a well-developed Research Strategy (UCL, 2020c). It has 3 core aims:

- To Inspire and Empower Research Leadership
- To Cross Boundaries to Increase Engagement
- To Deliver Impact for Public Benefit

Never has that mission been more critical. Regrettably, the key question for this generation of researchers has become: "How will society survive to the 22nd century?" By survival, UCL does not mean simply the continued existence of the human race, but also of the environments, institutions, structures and values that underpin and enhance society and enable humanity to thrive. UCL also recognizes the profound imperative to tackle the persistent injustices and inequalities in society today, and to help to deliver a more equitable future for all of humanity.

Society will not secure its survival without the knowledge and wisdom generated by multi-faculty research-intensive universities. Such progress will inform the innovations needed to address the enormous and critical challenges that humanity faces. Investment in the pursuit of enquiry and advancement of knowledge is critical; so too is an absolute commitment to collaboration in the generation and applica-

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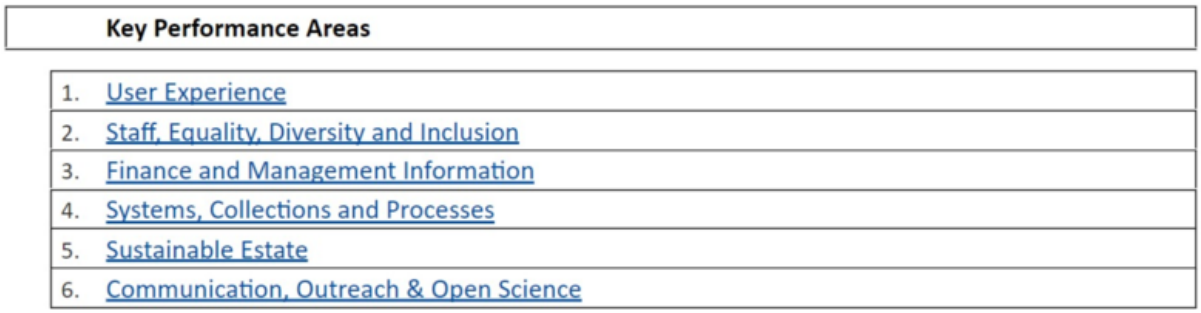
tion of knowledge, and to ensuring that knowledge benefits society. Researchers and their institutions cannot deliver the necessary insights if they operate in isolation. UCL is well-positioned to make major contributions to help humanity survive and prosper.

UCL Library Services Strategy

In a library system as large and as complex as UCL's, it is important to identify and agree a vision which will guide the development of this division of UCL as it approaches its 200th anniversary in 2026. Institutionally, this is the purpose of *UCL 2034*, a 20-year institutional strategy for UCL (UCL, 2020d). This strategy identifies 6 Principal Themes and 6 Key Enablers. The Library's contribution to *UCL 2034* can be seen in the accompanying Library Strategy (UCL, 2018b). This strategy is overseen by the Library's Senior Management Team and comprises 6 Key Performance Areas, all aligned with *UCL 2034* (Figure 3).

Figure 3. Key Performance Areas in the Library Strategy 2019/22 (Source: UCL, 2018b)



The User Experience is key to the success of the Library in delivering the mission of the institution. Already in this strategy period, UCL has supported the Library in delivering on this goal as shown in Table 1.

Table 1. Visits to UK academic libraries 2018/19 (Source: SCONUL Annual Statistics)

Institution	FTE students	Total visits
UCL	35,900	4,814,668
RLUK Mean	22,142	1,965,956
Imperial	17,570	1,660,496
King's London	28,520	2,353,973
Oxford	n/a	1,999,561
Cambridge	19,875	n/a
Edinburgh	31,660	3,034,755
Manchester	37,090	3,149,162
SCONUL Strategic Benchmarking Data 2018-19		

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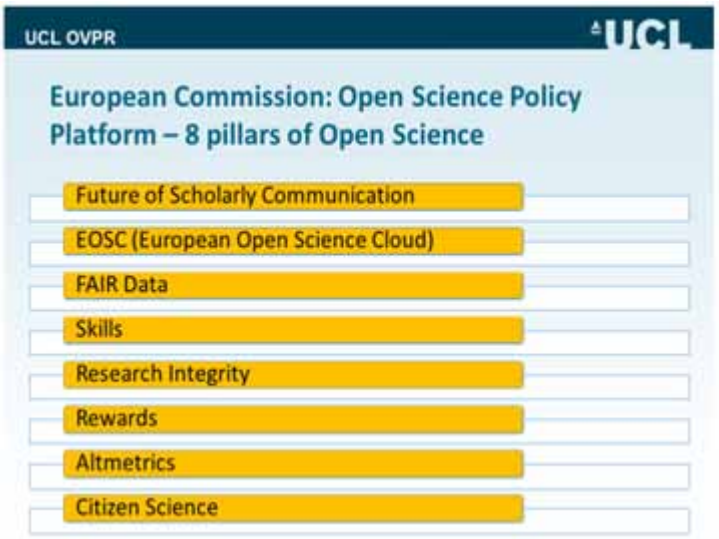
As can be seen from Table 1, UCL is easily the most heavily used university library in the UK, as measured by the number of visits to physical library and learning spaces. The figures reflect the opening of the UCL Student Centre only from February-July 2019. The figures for 2019/20 are certain to be even higher.

It is in the context of this heavily-used service that UCL Library Services identified Communication, Outreach and Open Science as the 6th of its Key Performance Areas. Activity in Open Science is overseen by the Pro-Vice-Provost (UCL Library Services) who has as part of his remit the co-ordination and promotion of Open Science principles and practice across UCL as a whole. It is the Library which has been chosen to lead the Open Science movement in UCL, with the Pro-Vice-Provost working with other Departments, Divisions, and the whole academic community to make Open Science approaches the norm going forward. This comprises 50% of his role, the remaining 50% being devoted to the strategic development of library services as the Head of Department for the Library.

EUROPEAN INFLUENCES IN DEVELOPING OPEN SCIENCE PRACTICE

UCL's model for the implementation of Open Science principles and practice is shaped by complementary movements on the continent of Europe. The European Commission has identified 8 pillars of Open Science, which form the bedrock of their advocacy for this theme (Figure 4).

Figure 4. 8 Pillars of Open Science as defined by the European Commission(Source: the author)



The nomenclature used in the 8 pillars of Open Science above does not work well in an Anglophone world, particularly around the phrase 'Open Science'. On the continent of Europe, 'Science' encompasses all academic disciplines, including the Arts, Humanities and Social Sciences (AHSS). This understanding is based on the Latin root, *scientia*, which means 'knowledge' or 'understanding'. In the UK, 'Science' means a subset of academic disciplines, which exclude AHSS. In some institutions, the phrase 'Open

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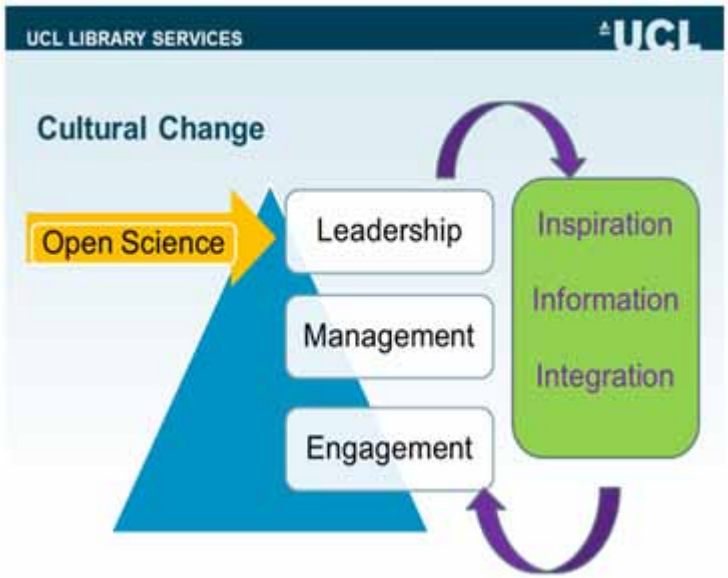
Science' has been replaced by phrases such as 'Open Scholarship' or 'Open Research'. These phrases themselves present challenges, since it is not obvious that Citizen Science is included in such definitions. There are, therefore, difficulties in trying to find a phrase in English which encompasses all the areas of research, study and practice outlined above. The meaning of 'Open Science' adopted in this chapter is the one prevalent on the continent of Europe and supported by the European Commission.

Culture Change and Leadership

For Open Science to succeed, leadership is essential. For universities and other stakeholders to embrace Open Science principles, policies and practices, there needs to be a culture change in these organisations if the transition is to be successfully negotiated. This is the main problem which is addressed here. The LERU advice paper on Open Science is clear on this point and it forms one of the most important conclusions of their work in the Open Science landscape (League of European Research Universities, 2018).

Open Science covers how researchers, research organisations in the widest sense, and educators support Open Science infrastructures, policies and approaches. Open Science also shapes how the resulting outputs are published, disseminated, conserved, evaluated, assessed and rewarded. It covers the whole range of activity, particularly in research-intensive universities, and embraces staff at all levels: researchers, educators, administrators, IT staff, and library staff as well as senior university decision makers. The size and extent of the challenge represented by a move to Open Science is so great that cultural change is needed institutionally and across all stakeholders to embrace the changes that Open Science brings in its wake. The process for this change, and how it is supported, is illustrated in Figure 5 below, which is built around a traditional model of Change Management.

Figure 5. Cultural Change to deliver Open Science (Source: Denning, 2012)



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To deliver the cultural change that Open Science demands, there needs to be **leadership**. This should be leadership from a senior member of the organisation who can talk to members across the whole university – academics, students, senior decision makers, administrators, professional service and academic support staff. Without this leadership, it will not be possible to identify a unified position across the university, nor to send a clear message to all stakeholders about the change that is necessary to deliver Open Science solutions. This change has to be **managed** through a formal programme, consisting for example of training, events, policy changes, development of new infrastructures, changes to appointment, reward and evaluation systems. For the change to be managed, there needs to be **engagement** with all stakeholders – and the list of stakeholders is large, comprising (but not restricted to) researchers at all grades, Principal Investigators, IT and Library staff, those involved in Human Resource management, members of appointment, interview and appraisal panels, policy and strategy developers, and senior decision makers. The three strategic drivers of Leadership, Management and Engagement are themselves supported by three enabling movements: Inspiration, Information and Integration. Inspiration is needed to enthuse stakeholders about the benefits that will ensue once Open Science practices are adopted. Open Science is not a threat, but an opportunity and implementing Open Science approaches is easier if those advocating change can do so in a positive spirit. At the heart of Open Science lie openness and transparency. To **engage** with audiences, those delivering new messages need to support their case with facts and case studies and the audience needs to feel that they are being given the correct information. In this way, the changes that ensue will be easier to deliver because the whole community – academic, professional services, academic support services – is working together and supporting each other on their journey to embrace Open Science as a new way of thinking and doling.

Pillar 1: Future of Scholarly Communication

What does the future of scholarly publishing look like in an Open Science world? This is the key challenge addressed in this section. Plan S, from a group of global research funders, aims to force through a rapid change to full Open Access publishing (cOAlition S, 2018). 'With effect from 2021, all scholarly publications on the results from research funded by public or private grants provided by national, regional and international research councils and funding bodies, must be published in Open Access Journals, on Open Access Platforms, or made immediately available through Open Access Repositories without embargo.' The current subscription model for journals is to be replaced by transformative deals which deliver on the coalition's ambitions, notably through 'read and publish' deals, where payments are made both for publishing OA research outputs and for reading them. 'The Funders do not support the "hybrid" model of publishing. However, as a transitional pathway towards full Open Access within a clearly defined timeframe, and only as part of transformative arrangements, Funders may contribute to financially supporting such arrangements (cOAlition S, 2018)'.

Plan S has come under significant criticism. The Royal Historical Society, for example, has studied extensively what the impacts on History would be in following Plan S (Royal Historical Society, 2019):

If the goal of OA instead is to build sustainable scholarly systems which—at scale—are capable of both equitably producing and delivering high-calibre research publications to an expanding universe of users, alternative mechanisms to Plan S would surely be devised. These systems would recognise that no person or community can read everything and that different groups of readers and researchers rightly have different types of needs. Systematic investigation of what different communities of readers' needs

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are and how they are best served is one of the most glaring gaps in cOAlition S Funders' approach to OA. To rectify this anomaly, an optimal approach to OA would likely be hybrid—not simply in the sense of including 'hybrid' journals, but in recognising that meeting authors' and readers' constrained actual needs—in sharp contrast to fulfilling their imagined infinite needs—may require multiple or tailored delivery systems as well as a diversity of both incentives and mandates for those who produce and disseminate research outputs. This diversity would allow OA systems to accommodate the full range of discipline-based and interdisciplinary research and researchers. It would also foster rather than stifle innovation.

This conclusion comes from the President of the Royal Historical Society, Professor Margot Finn, who is also Professor of History at UCL. The criticisms are deep and show a lack of engagement between the Funders who have signed up to Plan S and the academic community with whom these Funders engage.

In recognizing the challenges which Plan S poses, UCL has developed its own publishing mechanism to address some of these issues. This is the creation of UCL Press as the UK's first fully Open Access University Press (UCL, 2020e). The Press was born in 2015 after a series of extensive discussions with UCL academics (well in advance of Plan S) to see how UCL could support researchers (particularly in the Arts, Humanities and Social Sciences) to publish research outputs, typically long-form monographs. A number of benefits from OA presses were identified in the course of the discussions (Figure 6).

Figure 6: Benefits of an Open Access University Press (Source: UCL Press)

One of the strongest drivers for the creation of an institutional University Press was the global impact that published research outputs would have as a result, since researchers who could not afford to buy commercially-produced research outputs would have free access to UCL Press's whole catalogue.

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Three publishing areas were considered: long form monographs, textbooks and interdisciplinary journals (sometimes called megajournals); long form monographs were chosen for the Press's first publishing programme.

As of 31 December 2019, UCL Press has published 120 monographs, 13 journals, and 1 interdisciplinary journal (megajournal). The Press's publishing strengths have developed naturally. It publishes in all academic areas, but the following disciplines are now the subject of active commissioning:

- Anthropology
- Archaeology
- Architecture & Built Environment
- Education
- History
- Sustainability

Book series are also being established – 12 have been created up to 31 December 2019. The standard UCL Press Book Processing Charge (BPC) is £5,000 and non-UCL authors are charged this sum. There is no charge for UCL authors, editors, or to series editors with a UCL affiliation. The Press arranges peer review, editing, typesetting, proofreading, and indexing. The Press operates a waiver scheme for up to 5 non-UCL books per year, where non-UCL authors can publish for free. To 31 December 2019, the author/editor profile – including all co-authors and joint editors - is 50% UCL, 50% non-UCL.

Table 2. UCL Press downloads by country, 2015-2019 (Data source: UCL Press)

Country	Downloads
USA	712,151
UK	280,828
India	106,179
Canada	85,366
China	69,195
Germany	69,033
Australia	53,697
Philippines	44,744
Nigeria	36,293
Netherlands	35,681
France	34,563
South Africa	32,997
Brazil	32,311
Indonesia	31,559
Italy	28,876

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Between June 2015 and December 2019, the Press received 2.73 million downloads in 236 countries and territories across the world – an astonishing achievement when the average number of global sales for a commercially-produced research monograph across the bookshop counter is a mere 200 (Table 2).

These figures show that the original ambition of the Press, to receive global impact for its research outputs, has been achieved. The most downloaded titles are given below in figure 7. Professor Danny Miller's *How the World Changed Social Media* (2016) has been downloaded 386,370 times. It is part of a series of books produced by Professor Miller from a grant from the European Research Council (Miller et al., 2016).

Figure 7. Most downloaded titles 2015-19 (Source: UCL Library Services webpage)

The main format for Press publication is digital, but paper copies can also be purchased as print-on-demand copies via the Press website. Professor Miller's book has sold 753 copies. The sales figures of UCL Press titles disprove the theory that Open Access digital monographs destroy print sales. The evidence from UCL Press is the opposite – that digital copy actually promotes sales of the printed copy by acting as marketing material.

UCL Press has 9.2 FTE staff and is funded through a number of routes: income from sales, consultancy and publishing services, and funding from the UCL research budget. UCL Press offers white label publishing services to other universities, who want to establish their own university press imprint, but who do not want to invest in developing their own infrastructure. UCL Press can do the publishing for them in this context, but the outputs will be the badged as from the University Press of the commissioning university. Dublin City University in the republic of Ireland is the first university to take advantage of this offer. In terms of funding from UCL itself, the funding required to sustain the Press is a tiny percentage of UCL's total income – less than 0.2% of UCL's annual research income.

Pillar 2: The European Open Science Cloud (EOSC)

The writer was privileged to be a member of the first High Level Expert Group from the European Commission which produced the report *Realising the European Open Science Cloud* (European Commission High Level Expert Group on the European Open Science Cloud, 2016). The vision for that group was to see a web of inter-connectivity between differing platforms and repositories containing content – research

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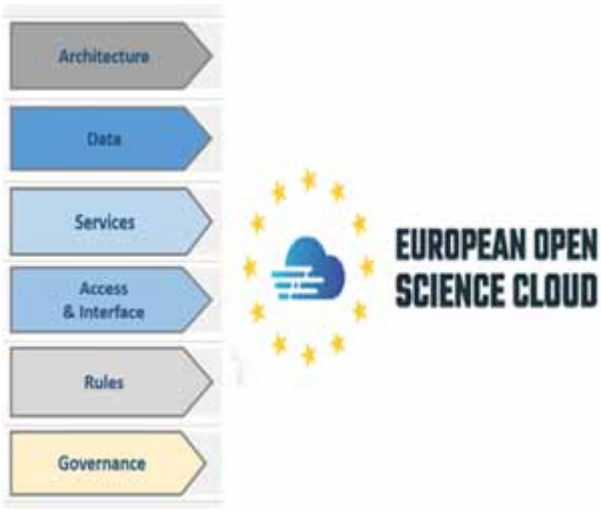
data, publications, software – which would produce an 'Internet of Things' (European Commission High Level Expert Group on the European Open Science Cloud, 2016, p. 13). How has work developed in delivering this vision? This is the key issue addressed in this section.

The EOSC Implementation Roadmap (European Commission, 2018) envisages activity in the following areas shown in figure 8.

Figure 8. Workplan for the EOSC (Source: European Commission, 2018)



For universities who wish to associate their content and services with the emerging EOSC, there are significant challenges. A university stakeholder Workshop was held in Brussels on 23-24 January 2020 to identify what the challenges and opportunities were. One of the most important points made by stakeholders present was that the Rules of Engagement for the EOSC need to be defined as soon as possible so that universities can align their work in research data management with the EOSC's ambitions to ensure that they can contribute metadata for their content to the Cloud. It was noted that universities produce significant amounts of research data, and that their presence in the EOSC was essential to its success.

Cost was also an issue raised in the Working Group meeting. Until now, the costs of the EOSC have been largely met by the European Commission. Going forward, this will not always be the case. What is the charging model for participation in the EOSC to be? The vision of a European portal, a portal rather than a Cloud, giving access to the shared endeavor of European researchers is compelling. However, for a European Vice-Chancellor, this is (in one sense) an extension of their costs. Perhaps, like Plan S, the burden of these costs will fall most heavily on the research-intensive universities. Is this sustainable?

The first EOSC Report also recommended:

The number of people with [the] skills needed to effectively operate the EOSC is, we estimate, likely exceeding half a million within a decade … we believe that the implementation of the EOSC needs to include instruments to help train, retain and recognise this expertise, in order to support the 1.7 million scientists and over 70 million people working in innovation. The success of the EOSC depends upon it.

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Figure 9. Signatories to the Sorbonne Declaration (Source: Data Summit in Paris, 2020)

The EOSC identified the need for a new calibre of technical expert:

Core data experts are neither computer savvy research scientists – although the latter also need to be educated to the point where they hire, support and respect Core Data Experts – nor are they hard-core data or computer scientists or software engineers. They should be technical data experts, though proficient enough in the content domain where they work to be routinely consulted in the research team at the very beginning (experimental design, proposal writing) until the very end of the data discovery cycle. They will work to secure that good data management plans are an essential part of good research practice (including data re-use and stewardship planning and proper budgeting) and the proper capturing of new data capture (formats, metadata richness, standards, provenance, publishing, linking and analysis), they will also support analysis. This package of skills and expertise is rare and the few people with this skill set are often attracted to industry or outside Europe where they are more respected and valued (European Commission High Level Expert Group on the European Open Science Cloud, 2016, p. 12).

Where are the curricula to support such training? Who will deliver it? And what is the level of support amongst existing professions to support this new development?

Frankly, there are huge costs behind these figures and little thought has yet been given to how these costs can be met. There needs to be a dialogue between champions of the EOSC, research funders and universities to identify ways to deliver on this agenda.

The concept of the European Open Science Cloud is truly exciting and the ability to share data and publications across national borders truly inspirational. Nevertheless, there are challenges in delivering this vision which are uncosted, not yet deliverable, but which are essential for the EOSC vision to be successfully adopted.

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Pillar 3: FAIR Data

On 27 January 2020, 9 global university organisations signed the Sorbonne Declaration on Research Data Rights (2020). It is the first time that such organisations have met together to agree on such a bold statement on research data (Figure 9).

As such, the Sorbonne Declaration is a major step forward for university organization in committing to Open and FAIR data. How easy will it be to deliver these agendas in universities? This is the main theme of this section.

Embedded in the Declaration is the principle that 'Providing access to and openly sharing data enables the development of new knowledge, accelerates discoveries for the benefit of society and economic development'. One of the ways to achieve this is to make metadata describing the research data FAIR: 'Supporting our universities and their researchers in making their data findable, accessible, interoperable and reusable (FAIR)'. Research data which is FAIR and Open for sharing and re-use means that researchers have easy access to experimentation by others, thus avoiding the need for costly duplication. Another advantage is that it enables research groups to look at research methodologies, to test the results produced by others, and to detect mistaken, even fraudulent, use of data.

How Open and FAIR is the research community now? As Dr Simon Hodson (CODATA) showed at the launch of the Sorbonne Declaration, the response to the ebola outbreak included many organisations and the resulting data was very scattered geographically. 65% of the data collected was not shared. Most data cannot be accessed directly at the record level (e.g. summarized in studies). Most clinical records from the outbreak are simply pdf scans. There is a lack both of metadata to describe the data and also a common data dictionary (a set of definitions which allows the variables in the data to be understood). It is also technically difficult to integrate all the different types of data that have been collected. There are lessons to be learned here – data capture for the current coronavirus, a Global Health Emergency, must not make the same mistakes.

The economic benefits of FAIR data are beginning to be identified. A recent European Commission Report (PwC EU Services, 2018) found that sharing and better managing research data would save 10.2 billion euros per year in Europe, with an additional potential of 16 billion euros of added value by the innovation generated [1] . These are enormous sums which would benefit research and society.

It has to be admitted, however, that there is a mountain to climb to enable universities to achieve the potential gains in this part of the Open Science landscape. On the whole, researchers are reluctant to spend time on describing their data using FAIR principles. They would see the submission of a new grant application as more important than curating and describing data previously collected. This takes us back to the issue raised by the LERU Rectors in the LERU Open Science Roadmap. There needs to be a fundamental culture change at university level to enable researchers to see the benefits of Open Science and the changes in workflow that these benefits require.

Pillar 4: Skills and Education

One of the roles of the Open Science champion, the Pro-Vice-Provost (UCL Library Services), is to address researchers in all disciplines who are new to UCL in the regular Induction sessions which are organized by UCL Human Resources. How easy is it to embed Open Science training an awareness in to the researcher landscape? This is the main theme of this section.

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In the UCL training sessions, researchers learn what is special and different about undertaking research at UCL. The UCL Research Strategy is carefully aligned to the global Open Science agenda (UCL, 2019b). The Research Strategy makes clear that it embraces the Open Science approaches being advocated in UCL. It welcomes 'policies and developments in open access (most notably, the establishment of UCL Press, the UK's first fully open access university press) and open science'.(UCL, 2019b, p. 10). It also expresses the desire to 'continue to deliver the necessary systems and processes to further advance our [UCL's] commitment to open access and open science.'(UCL, 2019b, pp. 11-12)

Many researchers arrive at UCL without a deep understanding of Open Science. The purpose of the Induction session is to open up these issues for UCL's researchers and to present them with six things they can do on day 1 of their UCL research career. These issues are further developed throughout their time in UCL with specific training courses, run largely by the Library, on different aspects of Open Science and a 1-day Workshop on Open Science, open to all, each Summer. It is also planned to develop videos and podcasts as training materials for researchers going forward, with funding from UCL Human Resources.

What are the 6 steps to Open Science that UCL researchers learn about in their first Induction session in UCL? (Table 3)

Table 3. 6-step test to adopting Open Science practice in UCL

Theme	Message
Publications	● Talk to the Library's Open Access Team about the funder requirements in Plan S ● Be prepared for the OA requirements of the UK's REF (Research Evaluation Framework) (Research England - UKRI, 2020) ● Use the UCL Research Publications Service (RPS) to record all your publication output ● Upload research outputs (where permissible) to UCL's repository UCL Discovery
Publications	● Consider publishing with UCL Press
ORCID IDs	● Get an ORCID ID and link it to your RPS account
Research Data Management	● Plan for how to manage your research data at the start of planning your research proposal ● Ensure you have a Data Management Plan ● Consider using the UCL Research Data Repository (RDR)
Reproducibility/ Transparency	● Ensure your approach is in line with the UCL Statement on Transparency in Research (UCLC, 2019c)
Next Steps in Implementing DORA	● Use the UCL Bibliometrics Policy to guide how you evaluate research outputs

To assess success, the Library regular monitors and produces reports on a number of the above activities. Use of RPS and downloads from UCL Discovery are reported at the UCL Press and Publications Committee each term, as is the take-up of ORCID IDs across the institution. Publications and downloads of UCL Press outputs are also reported. A reporting framework for research data and the use of UCL RDR is actively being prepared. How do researchers feel about the above matrix? Many early career researchers have concerns about the impact of some of the measures around DORA and what it may do to their research careers. Once it is explained that DORA is a global movement being embraced by an increasing number of universities, such researchers express themselves content at the road UCL is taking. More established researchers, who have forged their careers in a different research landscape, are slower to adopt Open Science principles, particularly around DORA. Here is the challenge and the culture change that Open Science needs to effect.

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Pillar 5: Research Integrity

How does Open Science impact on the field of Research Integrity? What major changes need to be made? These are the main questions explored in this section.

UCL has both a Statement on Research Integrity and an associated Code of Conduct. The Statement emphasizes the importance of Open Access publication for the UK's Research Excellence Framework (REF) (UCL, 2015.). UCL's Code of Conduct for Research Integrity was produced in 2013 (UCL, 2013). It is amplified by initiatives such as RRI – Responsible Research and Innovation (n.d.). RRI is a movement which is committed to developing an Open Science and innovation system that tackles societal challenges. The European Commission has provided six policy areas that RRI wishes to further. One is Open Access which is defined as follows:

Open Access addresses issues of accessibility to and ownership of scientific information. Free and earlier access to scientific work might improve the quality of scientific research and facilitate fast innovation, constructive collaborations among peers, and productive dialogue with civil society.

UCL is taking the debate around research integrity much further, stimulated by the creation of the UK Reproducibility Network(University of Bristol, s.d) by Professor Marcus Munafò at the University of Bristol. UCL wished to be one of the early adopters of this work in Research Integrity. Working through the Office of the Vice-Provost (Research), UCL produced an institutional statement on Reproducibility and Transparency (UCL, 2019c). Reproducibility forms part of UCL's wider commitment to transparency and rigour in all of its research. The university recognises that behaviours in support of transparency and rigour vary considerably across disciplines and methodologies, and encourages its researchers to adopt actions most appropriate to their disciplines. Reproducibility / Transparency is about openness in methodology, the sharing of publications and research data so as to enable conclusions and workings to be checked, evaluated and, where necessary, replicated.

The UCL Statement recognizes that Reproducibility is a concept which is particularly relevant to the experimental sciences with a quantitative focus. In the Arts, Humanities and Social Sciences it may be more useful to refer to transparency or academic rigour in the use of research methods through the whole research process. In terms of Reproducibility, the Statement has this to say:

The reproducibility of research methods is required for research to be replicated. This, in turn, is essential in research contexts where findings must be robust and reproducible in order to form a solid foundation on which to build further knowledge. In research contexts where reproducibility is possible and appropriate, we strongly encourage researchers to use measures that support it. These include (but are not limited to):

- *Pre-registration of study procedures with analysis plans, and use of registered reports where appropriate*
- *Transparent reporting of research in line with recognized community guidelines*
- *Disclosure of all tested conditions, analysed measures and results*
- *Transparency around statistical methods (including sample size planning and statistical assumptions and pitfalls)*

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- *Use of preprints*
- *Carrying out replication studies*
- *Publication of 'null' findings*

Professor Munafò and his colleagues have set out a summary of initiatives that support reproducibility, which has informed UCL's work (Munafò *et al, 2017).* In return, UCL's Statement on Research Integrity is being used as an exemplar Statement by the UK Reproducibility Network.

Pillar 6: Rewards

If academics are to engage in Open Science practice, it is only fair that they should be rewarded for doing so. How can university policies be developed to reward Open Science practices? This is the main question in this section.

Professor Bernard Rentier, Rector Emeritus of the University of Liège in Belgium, was involved in the production of a report for the European Commission on rewards and careers entitled *Evaluation of Research Careers fully acknowledging Open Science Practices* (European Commission, 2017)).At the OAI11 meeting in Geneva in June 2019, Professor Rentier said: 'It will be impossible to implement Open Science harmoniously without a large, significant and determined consensus on new ways to evaluate research and researchers' (Rentier, 2019).Professor Rentier has identified 23 criteria for undertaking such evaluation.

Figure 10. Matrix not Metrics in Evaluation practice (Source: Rentier, 2019)

This process has not yet been introduced into UCL, nor in any other university. Why? The reason comes back to the challenge identified by the LERU Rectors – the need for wholesale cultural change in

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universities if Open Science is to succeed. The new matrix represents a considerable challenge to traditional models of evaluation, where publications and Journal Impact Factors are given so much weight. Research publication do figure in Professor Rentier's matrix, but alongside 22 other criteria. The San Francisco Declaration has to be adopted by all universities worldwide before the above matrix can be fully implemented. That is a process which will take time, it is not a single event.

UCL has made a start by amending its appointment and promotion systems to reward openness, one of the first universities in Europe to do so. The new UCL Academic Promotions Framework (UCL, 2018) fully recognises the work which academics undertake to make their outputs open and available for sharing and reuse. It looks at research grades from grade 7 right through to the professorial grade, grade 10. The scope of the policy explicitly includes Open Science practice:

Enabling and leading research activities: contributing to the intellectual life of your discipline – including developing novel lines of enquiry; contributing to the development of open science principles; maintaining the highest standards of research integrity; developing cross-disciplinary research activities; addressing equality, diversity and inclusion issues in research; managing links to professional bodies, and generating research income at a level appropriate to the discipline.

From Grade 7 onwards, openness is seen as a core (or threshold) requirement. For Grade 7:

Threshold: an individual on this grade will demonstrate detailed understanding and knowledge of the subject and contemporary research activities within it. All research outputs are available through Open Access wherever possible (UCL, 2018a, p. 6)

At Grade 10, the requirement is:

Threshold: an individual on this grade will demonstrate successful delivery of outstanding contributions to a subject area o[r] body of knowledge, demonstrating both the ability to sustain [their] own research and to be successful against research competition in ways appropriate to the discipline. All research outputs are available through Open Access wherever possible (UCL, 2018a, p. 10).

The applicant is invited to give examples of the level and nature of their engagement with the Open agenda in a free-text narrative. Since all researchers wish to submit their research papers to the REF (Research Excellence Framework) which has an Open Access requirement, publications can be used as examples of activity in applications for promotion. Research data and open source software would also be in scope, as would the implementation of the UCL Statement on Transparency in Research.

Pillar 7: Altmetrics or Next-Generation Metrics

What does research excellence look like in an Open Science landscape and how can it be measured? These are the questions this seeks to address.

The Commission's naming of the seventh pillar as Altmetrics is not completely helpful, as this is also the name of a software product. In UCL, this pillar is usually referred to as Next-Generation Metrics. The concept of metrics in an Open Science environment is fraught with difficulty. Professor Rentier calls his

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evaluation grid for research and researchers a matrix, rather than a set of metrics. This is a useful insight into UCL's approach to the topic of measurement.

UCL is a signatory to the San Francisco Declaration on Research Assessment (2012) This is reflected in the UCL Academic Promotions Framework. If universities sign Declarations, there is no alternative but to implement them. The UCL Promotions Framework makes clear:

Research activity is described with reference to qualitative and quantitative evidence of achievement, including appreciation by peers, impact, scale, originality, rigour and significance of research outputs. UCL is a signatory of the San Francisco Declaration on Research Assessment and we reject the use of certain quantitative indicators, in particular those that apply at the level of Journal or similar, rather than directly to the piece of research in question. UCL's research strategy also establishes that "advancement and profile within UCL does not depend overly on easy metrics such as grant income or citation numbers that might penalise those who are advancing fields not yet fully appreciated by the wider research community, but instead suitably recognises and rewards creative and distinctive intellectual achievement" (UCL, 2018, p.5)

In this context, it is not permissible to use Journal Impact Factors or simple journal hierarchies in job adverts or in their Further Particulars as a surrogate for academic quality. Nor should academics lapse into using them when making promotion cases. In the area of job adverts, such statements would be intercepted before the adverts are published and a re-write would be requested. There is no point in signing the San Francisco Declaration, if it is not going to be implemented at a local level. In the UK, this is easier because panels for the REF (Research Excellence Framework) do not use such metrics in their evaluations.

The next step for UCL was to codify its attitude to the use of bibliometrics in a formal Bibliometrics Policy, the first time the university had ever possessed such a policy. At the time of writing, it is due to be considered for signoff by UCL's Academic Committee at the end of February 2020. The policy is grounded in the San Francisco Declaration and the Leiden Manifesto (Hicks, D, Wouters,, Waltman, Rijcke & Rafols, 2015). The policy takes the view that quantitative metrics are not replacement for qualitative approaches. Reading the paper and making a judgement of its rigour, comprehensiveness, accuracy and contribution to academic research is much better practice than relying on numerical indicators as a surrogate for quality. Metrics, but *not* the Journal Impact Factor, can be used but as a supporting statement for a separate qualitative assessment, not as a replacement for it. The use of journal hierarchies is discouraged, and instead academics are asked to consider the rigour of the journal's processes, such as peer review, or the contribution of the journal to a particular academic community.

How was such an approach evaluated when brought to the Academic Committee, chaired by the Provost and President in March 2020? The Library had been careful to invest in close consultation with individual academic Departments and Faculties over a period of 2 years to identify a consensus position on the responsible use of bibliometrics. Once presented at the Academic Committee, and having been endorsed by academic Faculties, the policy was greeted with acclaim and hailed as 'sector leading'. The whole episode is a model of how to introduce cultural change in a research organization. Digital training materials will now be constructed to support the UCL academic community to start using the practices the policy advocates. This change again is a process, not an event, and will take time to deliver. What the policy will do is to establish a baseline on which further successful work can be built.

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Pillar 8: Citizen Science

What is the role of Citizen Science in the university landscape? This is the question examined here. The final pillar of Open Science being considered as part of the UCL Open Science programme is Citizen Science. Citizen Science is often thought of as a set of activities where the lay citizen works alongside the professional researcher and where the data gathering and/or results are crowdsourced, Citizen Science can also happen where the citizens work by themselves to add to knowledge in certain research areas. In UCL this latter activity is called Extreme Citizen Science[2] . UCL has adopted both approaches because the university sees Citizen Science as a principal means whereby universities can re-engage with Society and prove their worth. In the era of 'false news', and constant attacks in the Press for being 'elite' and 'remote', universities need to embrace the vision propounded above by Dr Gerald Chan – to become the most powerful impulse for human progress. Engagement with lay citizens helps universities to re-engage with society at a time when the academic voice may not be trusted or even heard. How can Global Warming not be understood by the population at large? 97% of climate experts agree that humans are causing global warming; but there is still a general myth that there is no consensus on the topic(Skeptical Science (2016). The re-engagement of universities with society can only help to correct such gross misconceptions and help to solve pressing challenges which afflict the world as a whole.

In UCL, ExCiteS is currently working on 4 projects. Extreme Citizen Science: Analysis and Visualisation (ECSAnVis) is a five-year, €2.5M project funded by the European Research Council, which aims at the development of geographical analysis and visualisation tools that can be used, successfully, by non-literate people and any other community in culturally appropriate ways, that further fit their needs and social practices (UCL Department of Geography, n.d.).

Within UCL Library Services, colleagues engaged in Open Science have advised the Bentham Project on crowdsourcing the transcription of the complete archival collections of the 19th-century utilitarian philosopher Jeremy Bentham, the majority of whose papers are kept in UCL Special Collections. In the transcription update for December 2019, it was reported that 22,740 manuscript pages have been transcribed or partially transcribed. 21,951 (86%) have been checked and approved by Transcribe Bentham (2017) staff. These transcripts will form the nucleus of the printed volumes of Bentham's works. The project also publishes an Open Access journal, using infrastructure supported by UCL Press, called the *Journal of Bentham Studies* At the time of writing, the journal has published 47 articles with 10,098 views (Journal of Bentham Studies, n.d)

Within UCL Library Services, Citizen Science is one of the 6 Key Performance Areas in the Library Strategy 2019-22. The relevant ambition is listed as 'UCL Library Services has identified key priorities for Citizen Science activity and embeds these in a pan-UCL Programme'. (UCL, 2018b,p74) To achieve this, a European consultant will be visiting the Library in summer 2020 to develop a Citizen Science Strategy for library colleagues. The work plan will be aligned with the recommendations of the LIBER Citizen Science Working Group, which the present writer chairs.[3]

CONCLUSION

UCL sees Open Science as a defining movement in the evolution of universities in the 21st century. Following the LERU Roadmap for Open Science, it has appointed a senior manager in the university to co-ordinate activity across the institution. Cultural change in how individuals work and act are crucial

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to the successful implementation of Open Science principles and practice. Without this leadership, and ensuing cultural change, a move to Open Science will not be possible.

UCL has taken the 8 pillars of Open Science, as defined by the European Commission, and initiated activity in all areas. Some of these have been made easier by national policies, e.g. the Open Access requirement for the UK's Research Excellence Framework (REF). The movement for FAIR metadata and Open research data has resulted in the construction of the UCL Research Data Repository (RDR) as a home for outputs where there is no national/international subject repository. The costs of research data management, as identified by European Commission reports, are daunting and will pose enormous challenges for universities going forward. In terms Skills development, training in Open Science practice begins when a researcher is first inducted into UCL with a 6-step test towards adopting Open Science procedures. The evolution of frameworks for Research Integrity has resulted in the development of the UCL Statement on Transparency in Research. In terms of Rewards, UCL has developed its Academic Promotions Framework to establish openness as a core requirement in cases for promotion. With Next-Generation Metrics, UCL is about to approve a Bibliometrics Policy which is built around the San Francisco Declaration and the Leiden Manifesto. In Citizen Science, there is significant activity in individual academic Departments and projects; UCL Library Services is about to develop its own strategy for this key activity.

At UCL, the Library is key to the successful delivery of Open Science principle and practice, and its partnership with the Office of Vice-Provost (Research) has been pivotal in developing a new concept for research support in academic libraries. Library and Research Office work together as partners, co-ordinated by the University Librarian who is a Pro-Vice-Provost in the Vice-Provost's Office. This model has enabled the Library more easily to influence and shape university policy in areas which are not normally seen as part of a Library's remit – for example in Research Integrity and Rewards policies. It is a defining model for the evolution of an academic library service from one based around collecting, to one shaped by giving – in support, training, university policy development and cultural change.

At a global level, what needs to be done in future to engage with universities to deliver the Open Science agenda. This paper suggests a number of challenges:

- Each university needs a senior individual to be appointed as Open Science leader for the University
- Further engagement with the research community is essential if issues such as FAIR and Open data and Research Integrity need to be addressed
- Cultural change is essential to underpin these changes, but that change will take months and years to deliver, not weeks
- Further research needs to be undertaken on future models for scholarly publishing. There is not one solution that will fit every challenge. For Plan S, how can research-intensive universities avoid greatly-increased costs if price is linked to research production rather than reading? How important are alternative publishing platforms such as UCL Press? What is their impact? How do researchers feel about this approach to publishing?

The case study around UCL presented in this paper suggests successes and challenges in their approach to Open Science. Universities globally need to seize this moment and tackle challenges outlined here if Open Science is to become the 'new norm' in the research landscape.

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KEY TERMS AND DEFINITIONS

Citizen Science: a movement in Open Science which looks to the lay citizen as a participant in research practices or as the lead in research activity

DORA: The San Francisco Declaration on Research Assessment, which is aligned with Open Science goals

EOSC: European Open Science Cloud, a project to create a European Open commons of research data, publications and other outputs

FAIR: A term used in relation to research data which is Findable, Accessible, Interoperable, Reusable

Open Science: a global movement in research, education, innovation and engagement which emphasizes collaboration and sharing

Reproducibility: An Open Science movement which emphasizes transparency in methods, analysis and outputs and the importance of being able to replicate findings

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Sorbonne Declaration: a statement signed in Paris in 2020 outlining the importance of research data and Open Science in the new research landscape

UCL Discovery: the Open Access repository at UCL

UCL RPS: UCL Research Publications Service, where bibliographic details of UCL research outputs are stored

ENDNOTES

1 A longer version of this discussion can be found in P. Ayris, 'The risks of not sharing data are greater than the costs', *THE*, 8 Feb. 2020; available at https://www.timeshighereducation.com/blog/risks-not-sharing-data-are-greater-costs.

2 ExCiteS: Extreme Citizen Science: https://www.geog.ucl.ac.uk/research/research-centres/excites

3 LIBER Citizen Science Working Group: https://libereurope.eu/strategy/innovative-scholarly-communication/citizenscience/

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Chapter 3
Research Data Management Support at Kaunas University of Technology

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EXECUTIVE SUMMARY

Kaunas University of Technology is one of the largest technical universities in the Baltic region. The university staff has been involved in different Open Access- and Open Science-related activities for more than a decade. Different initiatives have been implemented: stand-alone and series of training and awareness-raising events, promotion of Open Access and Open Science ideas so that institutions develop their Open Access policies and make their repositories compliant with larger research infrastructures. Within the institution, the initiatives of Open Science are implemented as a result of joint effort of the library, the departments of research, studies, and doctoral school. The current tasks involve revising the institutional Open Access guidelines and facilitating the implementation of data management plans in doctoral studies. In this chapter, the aim is to provide an overview of the efforts highlighting the successes and failures on the way to best practice in research data management support both institutionally and on the national level.

INTRODUCTION

The current debate in redefining the roles of academic libraries in the light of the changing scholarly communication practices has affected the daily routines of university libraries worldwide. According to Revez (2018, p.10), “research libraries are trying to find a place that is not necessarily new, but which is now in an environment with new features”. In the recent decade digital technologies, globalization

DOI: 10.4018/978-1-7998-4546-1.ch003

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and the importance of networks have been shaping the conventional roles of librarians as a result of the changing user needs. The Library at Kaunas University of Technology (KTU) is among numerous libraries in the world that have been affected by these processes. However, even though the Library has always served the needs of the university community, the explicit reference to research support services emerged in the local discourse on library practices relatively recently, in 2014, when a new library strategy was developed. The Library aims to adopt the best practices of advanced research libraries in Europe and the world, to be dynamic and ready to adapt to the constantly changing environment and users' needs.

The objective of the chapter is to provide an overview of the efforts highlighting the major successes and failures in providing research support services in the context of institutional changes and as a result of Open Access and Open Science initiatives. The chapter reflects both on the practices that the KTU Library has adopted in the course of the recent years, not only to respond to the needs of the university community, but also global developments in the landscape of scholarly communication; and their value for the research activity of the university.

BACKGROUND

The way research support services currently work in practice at Kaunas University of Technology was determined by two factors: institutional demand of users (researchers, PhD students and research administration) and proactive attempts of the Library in promoting practices of academic libraries of leading universities in Europe and beyond (first of all, related to Open Access, Open Science and Research Data Management).

Kennan, Corrall, and Afzal (2014) highlight bibliometrics and Research Data Management as prevailing trends in research support services. At the time of developing the KTU Library strategy, they were incorporated as reflecting the best global practices of librarianship rather than resulting from the real needs of the users at that time. As the Library strategy that attempted to build on the features of state-of-the-art library services was developed, a gap in the organizational structure of the Library became visible. Thus a new unit of Research Information Services was established. Its aim and responsibilities were to develop and maintain institutional repository, to create metadata and upload research publications and unpublished research works to the repository, to perform bibliometric analyses and write reports for the Research Office of the University, also provide training and support for researchers, promote and disseminate information about Open Access and Open Science. This set of activities was a result of strategic planning both in response and in anticipation of the users' needs. The users' expectations for research support services at that time were focused on traditional services (e.g., managing research publications), whereas other activities (e.g., bibliometrics and research data management) became important later on, because of different reasons, most importantly due to outside incentives, such as research evaluation practices based on bibliometric indicators and funder requirements that mandate research data management of funded projects.

Tenopir et al. (2017) have summarized that "Research data services (RDS) provided by libraries vary and may include: creation and management of institutional data repositories, providing tools for data mining and visualization, training for researchers on data management activities, guidance on institutional policies, help with creating data management plans and metadata for data sets, and assistance with intellectual property and privacy issues surrounding research data, and other services." In the case of the KTU Library, the list of services that are conceptualized as research data management services is less

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extensive at present: creation and management of institutional data repositories, training for researchers on data management activities, guidance on policies and creating data management plans (DMP). Planning the Library strategy for the new period (2021 – 2025) includes discussions on the current needs for Research Data Management Services at the university, so the definition may be expanded.

Kaunas University of Technology

Kaunas University of Technology (KTU) dates back to 1922 when the University of Lithuania and its technical faculties were established. The development of Lithuanian scientific ideas continued in the first Lithuanian independent technical school of higher education but from 1950 to 1990 the institution was referred to as Kaunas Polytechnic Institute (KPI). It was renowned for the ultrasound and vibrotechnics laboratories, research of textiles and others.

In 1990, after Lithuania regained its independence and KTU was granted university status, the modern era started with rapid reforms of studies and research. Despite the wide range of issues in Lithuanian higher education and other areas during this period, the University has continued to pursue sustainable partnerships of science, business and industry, develop and implement new ideas and innovation.

The mission of the University is to provide research-based studies at the international level, develop and transfer knowledge and innovative technologies for sustainable development of the State and development of innovations, create an open creative environment that inspires talents and leaders. It aims to become a leading European university that draws on the development and transfer of knowledge and technologies. The University strategy is based on institutional traditions and strengths. These involve links with industry, studies and research related to technologies and aligned with national needs as well as trends of international development. The strategy focuses on developing corporate social responsibility and welfare state. The main activities in this area refer to the transfer of knowledge and technologies created at the University to make them contribute to a sustainable and knowledge-based economic, social and cultural development of the country.

The University consists of nine faculties: Chemical Technology, Civil Engineering and Architecture, Electrical and Electronics Engineering, Informatics, Mathematics and Natural Sciences, Mechanical Engineering and Design, Social Sciences, Arts and Humanities, Panevėžys Faculty of Technologies and Business and School of Economics and Business, also eight institutes, nine research centres, twenty-three student organizations, twelve dormitories, and seven art societies. It has a sports centre and a publishing house "Technologija". KTU has founded two integrated centres of research, studies, and business – "Santaka" and "Nemunas" valleys.

At present, 10,231 students are studying at the university: 7,481 of them are students of the first cycle (bachelor's) and integrated studies, 2,398 – master's students, 324 doctoral students, and 28 students of professional studies. More than 515 international students study at KTU. Student mobility is very much encouraged at the University, even though the numbers are not very big: 176 outgoing students of partial studies and internships and 163 incoming students of partial studies and internships.

There are 129 study programs in total; 62 of them – for bachelor's, 67 – for master's, 18 – for doctoral studies. KTU offers 46 bachelor's and master's study programs in English; all the PhD study programs are conducted in English. The total number of staff is 2195 employees who take 1971.36 full-time equivalent (FTE) positions at the University: 947 of them are lecturers (713.58 FTE positions) and 183 researchers (118.86 FTE positions).

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Sustainable development, which promotes responsible, environmentally-friendly behaviour and culture, is one of the priorities of KTU activities. The University maintains the attitude that new knowledge and technologies have to serve the well-being of the people as well as the environment. The sustainable development strategy and activities of Kaunas University of Technology were awarded the European Union's QUESTE-SI accreditation. The University is a member of several international organizations, Baltic Sea Region University Consortium for Science and Technology (BALTECH), Association of leading universities of science and technology in Europe CESAER, the European Consortium of Innovative Universities (ECIU), the European University Association (EUA), the European University Continuing Education Network (EUCEN), the European Society for Engineering Education (SEFI), the Network of Excellence for University Cities (Unitown) among others. These memberships are a valuable and effective stimulus to integrate into the international environment and to learn from best practices.

Five priority areas of the University's research were approved by the Senate in 2013: Diagnostic and measurement technologies, Smart environments and information technology, New high technology materials, Technologies for sustainable development and energy, and Sustainable growth and socio-cultural development. In 2018 the Senate approved five new areas of research and innovation for the University: Health technologies, and Digital transformation and smart environments, New materials for industry and medicine, Food technologies and Innovation management. The main research areas for the next five years period approved in 2020 are the following: Functional materials and technologies, Diagnostic technologies, Mechatronics (midtronics), and Information technologies.

The University has set the main objective to become one of 400 best research universities in the world by Research, Development and Innovations (R&D&I) achievements by 2020, to direct and to strengthen R&D&I activities to have a considerable impact on society and business in Lithuania and overseas.

Ambitious goals in the international field, also the research evaluation practices developed by the Research Council of Lithuania, require a lot of support, also from librarians. Bibliometric analysis, recorded as an element of activity in the Library strategy, also emerged as a demand from the university research managers in 2016.

The Library

The University Library is one of the biggest academic libraries in Lithuania. It manages one of the largest collections in Physics, Technology and Engineering in Lithuanian and foreign languages, and provides access to worldwide information resources. The Library is open for members of the University community, residents of the city, representatives of industry and business in the country and overseas.

The Library subscribes to databases and provides access to the up-to-date resources of research and studies information: electronic books, interactive training material, scientific and professional journals, conference proceedings, statistical data and other documents. Users can access these resources in the university network or via remote access 24/7. Links to Open Access and subscribed databases, e-journals and books, final projects and other information for studies and research are available in the Subject Guides. Library users have access to 55 databases, 494.585 e-books and 31.833 full-text e-journals. The Library also provides access to modern study resources – interactive training courses and environments by Pearson, Oxford and Cengage.

The Library has been promoting the development of students' information literacy and information competence of the academic community: introductory training sessions on Library Information System are given to first-year bachelor students, whereas senior students, teachers, and researchers are given

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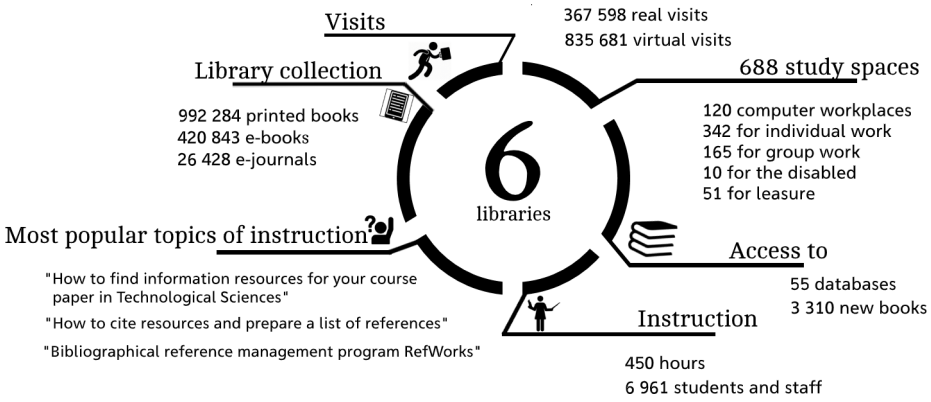
courses in information competence development. Training sessions and individual consultations for users are carried out as stand-alone and are also integrated into the majority of bachelor's and master's study programs, which results from intensive collaboration with the Study Office and academic departments.

The users also have access to different tutorials and self-study materials in two languages: Lithuanian and English. As a result of collaboration with other libraries, different learning materials have been developed not only for the academia of Kaunas University of Technology but also for library staff and researchers of other institutions. In the frame of the project DEDICATE of the Fourth Framework Program from the European Commission, Kaunas University of Technology was among the pioneering institutions in creating online courses for developing information literacy. To find out the need for skills among researchers, a needs analysis was carried out (Tautkeviciene, Duobiniene, Kretaviciene, Kriviene, & Petrauskiene, 2010). The Library staff members, in collaboration with colleagues from other academic libraries, have developed a variety of training materials (e.g., Tautkeviciene et al., 2010) and online training courses targeted at self-directed development of information literacy skills in different groups of users. Figure 1 summarizes the main statistical indicators of the Library environment in 2019.

Figure 1. Library in the nutshell (Source: KTU Library)



A highlight of the Library is more than 95 thousand documents stored in the Rare Books stock. The items belong to different collections: books, iconography, cartography, small format printed items, periodicals and manuscripts. The biggest part of printed stock consists of books: over 78 thousand copies are stored. The Library stores 14 incunabula in the Latin language. The oldest is "Carmina..." ("Poems...") by Caius Valerius Catullus, published in 1475. "Postilla, tatai esti trumpas ir prastas ischguldimas Evangeliu,..." by Jonas Bretkūnas, printed in 1591, is a gem in the collection of Lithuanian books from the period of 16th century to the first half of the 20th century. It contains collections from libraries of notable people and legacy from Lithuanian and overseas manors. For this reason, the Library attracts users from all the country and overseas, both researchers and the general public.

Library services are provided in the Central Library (located in the city centre) and five branch libraries (on the University Campus which is outside the city centre): Chemical Technology Library, Informatics Library, Mechanical Engineering and Design Library, Civil Engineering and Architecture Library and Panevėžys Faculty of Technologies and Business Library (the latter located in another city, some 100 kilometres away from Kaunas). The services are managed by five departments: Reader

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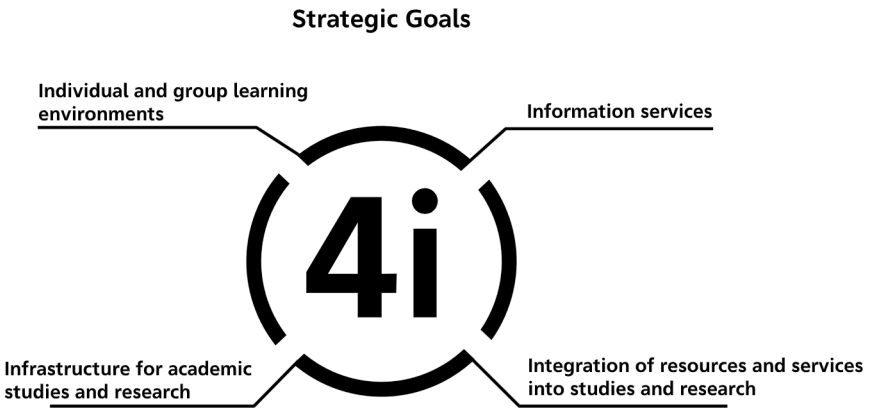
Services (26 FTE), Information Services (3,5 FTE), Information Resources Management Services (10 FTE), Research Information Services (4,5 FTE) and Rare Books (1 FTE). The physical location of all staff members, except for Reader Services, is the Central Library which also is the library for the School of Economics and Business and the Faculty of Social Sciences, Arts and Humanities. The staff of the Reader Services (most of them subject librarians) work at the branch libraries and are ready to respond to users' needs locally.

The Library participates in national and international projects of infrastructure development and fosters partnerships to ensure better visibility and dissemination of University research results, as well as worldwide access to them. The Library is a member of the International Association of University Libraries (IATUL); its staff members have been engaged in the activities of the Electronic Information for Libraries (EIFL) and have coordinated Open Access in the Lithuanian Research Library Consortium. The Library director is a member of the Lithuanian Academic Libraries Directors' Association.

The New Strategy of the Library

The context of developing the new Library strategy was the university reform that started in 2012, which focused on resource optimization rather than user demand for new services. Examining the practices of academic libraries at leading European universities, also outside Europe, has led to the vision that the Library services at Kaunas University of Technology needed to become more diverse and also much more integrated into the university community. The Library strategy for 2016-2020 was approved in 2014 (the strategic goals are presented in Figure 2).

Figure 2. Strategic goals of the Library 2015-2020 (Source: KTU Library)



The mission of the Library is to provide efficient services, meeting the needs of current and future users by ensuring access to the resources at the Library and the global information resources available online. The Library envisions itself as a state-of-the-art science and study information resource hub that integrates physical and virtual spaces, creating a favourable environment for study and research, providing services and access to the necessary information resources. The environment created in the Library aims to encourage collaboration, creativity and self-directed learning.

As shown in Figure 2, the Library strategy was organized around the 4Is model:

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- Information services: the transition from printed resources to internet-based electronic resources; a continuing inquiry into users' information needs by different forms of communication; improving the Library Information System by applying the latest virtual and mobile technologies.
- Integration of resources and services into studies and research: providing individualized, thematic consultations and assistance; integrating information resources and virtual learning environments to the study modules; informing about library resources and services; developing students', teachers' and researchers' information competence; engaging the academia into the library activities and events; organizing educational and cultural events.
- Individual and group learning environments: increasing the number of group workspaces, establishing smaller and larger group workspaces; establishing individual workspaces; establishing different zones – silent, leisure, etc.
- Infrastructure for research and studies: preparing documents that regulate the collection, preservation, access and dissemination of research output – research publications and data – at the university; creating and maintaining Open Access institutional repository; collecting research publications and data, final theses and doctoral dissertations and ensuring access to them.

One of the most notable factors was introducing the position of subject librarians who were able to bridge numerous gaps in terms of services and their integration. Introducing the position of subject librarians as part of the new strategy has proved to be a most successful change: by now subject librarians are confident of their role in collaborating with faculty administration, researchers and students, collecting needs on the acquisition of books and e-resources, promoting the library services and resources and providing training. Subject librarians coordinate every field of study and research. They communicate with the academic community of their faculty, give advice on information search, organize and provide information literacy training sessions for students and researchers, ensure access to the most recent literature and e-resources necessary for study modules. Library training sessions are also integrated into formal study programs.

The need to perform as subject librarians was a major, even though a short-term challenge for some of the staff members back in 2015 but this role became inextricable from the university life in about a year from its introduction. The librarians have acquired relevant competencies through working on different projects and continuing learning. The staff members learn a lot and develop their competences in international staff training programs (e.g., ERASMUS + Staff Training Mobility), conferences and other events.

The Library aims to be among the libraries of advanced universities, paying a lot of attention to the users' needs and development of information competence. The changes in the study process, the rapid development of science and technology determines changes in the users' needs and possibilities for meeting those needs. Therefore, change is one of the keywords that describe the daily life of the KTU Library since the implementation of the new strategy started.

All this change, rather than being accidental, involved a clear vision, strategy, leadership and daily effort. Among the most important factors of facilitating change in the library was the knowledge, competence and flexibility of the library staff. This may be comparable to the time when librarians had to develop their computer and information literacy as all the library functions became computerized. Later, developing English language skills also became a challenging priority because the number of international students was increasing, as well as the number of information resources and databases in English.

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The library staff members are engaged in continuous learning and competence development to be able to provide professional services and assistance. They have been involved in different national and international projects. This is beneficial to both librarians and library users. The users gain access to an increasing number of information resources and new services to meet their needs. For the library staff, project work is a source of new knowledge and experience, an opportunity for competence development and being in touch with the latest trends of academic libraries.

As a result of the new strategy, physical changes in the Library as a workspace are also visible. The spaces have been renovated and modernized, even though with limited resources, to provide better conditions for individual and group work. The number of computer workplaces has increased; printing, copying and scanning services have been introduced. However, we believe the new era in the library, in terms of the development of physical spaces, will begin with the new building and its modern spaces of the Civil Engineering and Architecture Library on the University Campus in 2021. The library will become the main library of the University with physical access to individual and group learning spaces 24/7. This project was also initiated as part of the process of implementing the library strategy in 2015.

The new strategy highlighted a relatively new area: support for research and researchers. In addition to strengthening more conventional areas, such as the development of Publications Data Base (PDB), new activities were planned: bibliometric analysis, consultations and training sessions, promotion of Open Access and Open Science.

RESEARCH SUPPORT SERVICES AT KAUNAS UNIVERSITY OF TECHNOLOGY LIBRARY

To respond to the new strategy, the Research Information Services was established in early 2015 as a new department at the Library. In the beginning, it was primarily responsible for managing the institutional research publications and electronic theses and dissertations. The data from the institutional PDB and ETD databases were transferred to the new national repository, the Lithuanian Academic Electronic Library (eLABa). The Department was also responsible for promoting Open Access within the university community and beyond. It employed five persons at the beginning: three institutional repository managers, one information manager and the head of the office.

Two years later, in 2017, the position of a data librarian was introduced and new services, such as bibliometric analysis for individual researchers, research groups and departments were initiated. However, the expanding scope of work did not result in the increased number of staff within the department. On the contrary, Research Information Services has employed four staff members since 2017 and relied on the assistance of other departments (e.g., subject librarians help in uploading the final theses and addressing questions in bibliometrics, colleagues from Information Resources Management Services assist in entering the publications on the repository if needed). This is how the ethos of collaboration is fostered in the Library and the institutional needs for optimizing human resources are considered. Some activities of Research Information Services are supported by different projects that not only bring financial support but also competence and expert knowledge.

The above-described practices embody part of what is perceived as research support services: research output management on the institutional repository (in collaboration with the Department of Research Affairs of the University) and related issues (e.g., researcher identifiers and networks), academic publishing, research integrity, copyright issues, and bibliometric analysis. This is a centralized service although

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with some decentralized features due to the role played by subject librarians: they may be competent to answer questions directly or forward them to a dedicated person at Research Information Services. Users can take advantage of various channels to communicate: Ask a Librarian via Messenger, contact Research Information Services by email or phone directly, contact their subject librarian, register for face-to-face consultation via the online form accessible from the Library website. Responses are provided within 24 hours.

Information competence development (information search strategy, reference management tools) has remained a constituent element of research support. This area is within the scope of subject librarians.

Another important emerging part of research support services is research data management (RDM) services that are related to complex issues in implementation. Further in this chapter Research Data Management services will be approached from a broader perspective of Open Access and Open Science.

Open Science in Lithuania: Context

On April 30, 2009, the Law on Higher Education and Research stated that the results of all research carried out in state higher education and research institutions must be communicated to the public. This was a big and welcome step towards Open Access. However, a coherent national Open Access policy was missing and awareness of Open Access and how Open Access may benefit research was limited, even though the first workshop on Open Access was organized by the Lithuanian Research Library Consortium in 2005.

From 2011 to 2013 Electronic Information for Libraries (EIFL) funded three projects to raise awareness about Open Access in Lithuania and to demonstrate its benefits to stakeholders, including young researchers; to improve journal publishing practices; and to take forward discussion of national and institutional Open Access policies.

After the project "Promoting Open Access in Lithuania" (2011), the Lithuanian Society of Young Researchers (LSYR) was committed to Open Access and planned to continue training on Open Access for young researchers. Therefore, the LSYR, the Lithuanian Research Library Consortium and the Association of Lithuanian Serials implemented the EIFL-funded project in 2012 educating young researchers on the benefits of Open Access and engaging them to become Open Access advocates in the country (Tautkevičienė, Petrikaitė, & Eidukevičiūtė, 2013).

The project "Promoting Open Access to Young Researchers" was able to form a partnership among all national stakeholders in R&D. The Research Council of Lithuania and the Ministry of Education and Science were engaged and actively supporting the Open Access discussions. A national Open Access Working Group was created that included representatives from the Research Council of Lithuania, the Lithuanian Science Academy, the Lithuanian Research Library Consortium, the Lithuanian Society of Young Researchers, the Research and Higher Education Monitoring and Analysis centre (MOSTA), Agency for Science, Innovation and Technology (MITA), and the universities. The goal of the Working Group was to implement the recommendations on Open Access for funding agencies and research institutions.

Websites of institutions across Lithuania were updated with comprehensive information about Open Access and its benefits. Dr. Vilma Petrikaitė, President of Lithuanian Society of Young Researchers, said that "*Openness as a most important value is included in the strategic plan of the organization because it is the background for the collaboration, creativity, and development. Open Access can contribute to the assurance of research quality*" ("Promoting Open Access to young researchers," 2012).

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In later years, Open Access in Lithuania has been supported through three European Commission-funded projects: Open Access Policy Alignment Strategies for European Union Research (PASTEUR4OA) from 2014 to 2016, Facilitating Open Science Training for European Research (FOSTER) from 2014 to 2019, and Open Access Infrastructure for Research in Europe (OpenAIRE) from 2009 to 2020.

As a result of EIFL support and the three European Commission-funded projects, Open Access was placed high on the national agenda. A breakthrough happened in 2016: the Research Council of Lithuania adopted the "Guidelines for Open Access to Research Results" (Research Council of Lithuania, 2016). The Guidelines encourage other research performing institutions in the country to adopt similar Open Access and Open Research Data policies. The Electronic Academic Library of Lithuania (eLABa) serves as the national Open Access repository of the Ministry of Education and Science and all academic institutions.

In 2012 the Recommendation on access to and preservation of scientific information from the European Commission (2012/417/EU) was part of a package that outlined measures to improve access to scientific information produced in Europe and to bring them in line with the Commission's policy for Horizon 2020. The new Recommendation, adopted on April 25, 2018, explicitly reflects developments in areas such as research data management (including the concept of FAIR data i.e. data that is Findable, Accessible, Interoperable and Re-usable), Text and Data Mining (TDM) and technical standards that enable re-use incentive schemes.

On February 29, 2016, the Research Council of Lithuania (RCL) approved a set of "Guidelines on Open Access to Scientific Publications and Data" (Research Council of Lithuania, 2016) that addresses publications and data from research funded by the Council. The Guidelines say that the data must be preserved for a period no shorter than years after the completion of the project and that a data management plan must be included in the project proposal. They also include the statement: "to establish the transitional period for the implementation of the Guidelines by the 31st of December 2020".

Several institutions have adopted Open Access policies and mandates by now: Klaipėda University, Lithuanian University of Health Sciences, Mykolas Romeris University, Vytautas Magnus University, Lithuanian University of Educational Sciences (merged with Vytautas Magnus University and Vilnius University by 2019), Vilnius Gediminas Technical University, Vilnius University and Kaunas University of Technology among them. At Kaunas University of Technology the Regulations on Open Access were approved following the Guidelines from the Research Council of Lithuania. The most recent national development is that in January 2020 Working Group for addressing the need for national Open Science policy was established by the Ministry of Education, Science and Sport. This may offer a welcome breakthrough in the development of the national landscape of openness.

Promoting Open Access at Kaunas University of Technology

The Library has been involved in Open Science activities by promoting the initiatives of Open Access and Open Science: it organizes training sessions for different target groups (researchers, research administrators, librarians), seminars, information events and conferences, also participates in developing and improving Open Access infrastructure. These activities have also been supported by different projects. Since 2009 the Library has been a partner in the EC-funded project OpenAIRE: OpenAIRE from 2009 to 2011; OpenAIRE plus (2nd Generation of OpenAire) from 2011 to 2014; OpenAIRE2020 from 2015 to 2018; OpenAIRE-Advance (OpenAIRE Advancing Open Scholarship) from 2018 to 2020. The Library has played the role of the National Open Access Desk (NOAD) for information dissemination,

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support and coordination of Open Access and Open Science events in Lithuania. Currently OpenAIRE is one of the flagship initiatives actively contributing to the development of the European Open Science Cloud (EOSC).

In addition to working for the OpenAIRE project, other opportunities to attract ideas and funding have been sought. Back in 2011, the Library coordinated the project "Promoting Open Access in Lithuania" that was funded by the EIFL and carried out in partnership with the Lithuanian Research Library Consortium. It implemented national and institutional Open Access advocacy campaigns to reach out to research communities and Open Access publishing initiatives. As a result of this project, the Lithuanian research community and policy-makers became better informed about Open Access benefits and new possibilities for the research dissemination and sharing, as well as about the impact of Open Access on scholarly communication: a conference was held with over 100 participants, who learned about Open Access initiatives and projects. Three promotional videos were produced from interviews conducted with well-known policy-makers, researchers, librarians and publishers discussing open access (Kodėl svarbi atviroji prieiga, 2011 [*Why is Open Access important*]; Kaip skatinti atvirąją priegą, 2011 [*How to promote Open Access*]; Kas yra atviroji prieiga, 2011 [*What is Open Access*]). The videos were used to promote Open Access among research managers and researchers and the number of downloads indicates that there is interest in learning more.

"Open Access allows finding out very quickly what is happening in the scientific world, what research is carried out, what results have been achieved. At the same time it allows you to spread information about your research and its results," Professor Vytautas Ostaševičius from Kaunas University of Technology said in the interview at that time. The project also resulted in a new partnership between the Lithuanian Research Library Consortium and the Lithuanian Society of Young Researchers that later proved to be efficient in new initiatives (e.g., "Promoting Open Access to Young Researchers" in 2012 and FOSTER training events from 2015 to 2016).

In 2012 the Library was working on the EIFL-funded project "Open Access from the Perspective of Young Researchers". The project aimed to present Open Access initiatives to early-career researchers and to encourage them for Open Access publishing.

Research Data Management Support at Kaunas University of Technology

As a result of the Library's participation in various activities related to Open Access and Open Science for more than a decade, Open Science is high on the agenda of both the University and the Library.

A variety of initiatives of promoting and training for Open Science have been implemented: standalone and series of training and awareness-raising events, promotion of Open Access and Open Science ideas so that institutions develop their open-access policies and make their repositories compliant with larger research infrastructures, like OpenAIRE and RDA Europe 4.0.

With the support of the project FOSTER, the Library implemented the project "Promoting Open Science among Young Researchers: Opportunities and Challenges" from 2015 to 2016. Workshops and round-table discussions were organized for different stakeholders: research administrators, researchers, librarians, etc. More than 300 participants attended these events.

In the international PhD summer school held by Kaunas University of Technology in the summer of 2017, one day was devoted to Research Data Management. The event attracted more than 50 participants. In April 2018, a workshop on research data management was held for PhD students and researchers, including Principal Investigators, at Kaunas University of Technology. The event attracted around 40

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participants who gave the most positive feedback. The speakers were Elly Dijk and Marjan Grootveld from DANS (Data Archiving and Networked Services) in the Netherlands. Recent events were the Open Science Trainer Bootcamp for librarians from academic libraries in Lithuania and a workshop on writing data management plans for PhD students (Ceseviciute, 2019 b).

One of the most recent large-scale training initiatives at KTU was developing and formalizing a Ph.D. course on Research Data Management which is offered as an elective for Ph.D. students since 2018. The course consists of the following topics:

1. Research Data;
2. Research Data Management Plan;
3. Research Data Management Guidelines, Standards, and Tools;
4. Legal and Ethical Issues. Data Licensing and Data Citations;
5. Using and Sharing Data;
6. Data Repositories and Archives; and
7. Open Science Initiatives.

The experience in developing the course and the materials is very useful in our daily practices: we keep providing on-demand short training sessions in Research Data Management to different target groups (first of all, PhD students and researchers involved in projects with a mandate of Research Data Management from institutions, national and international funders). Short surveys on the needs for training and support is our usual practice and a form of getting feedback.

In 2019 Data Management Plan (DMP) was introduced as an obligatory element in doctoral studies at Kaunas University of Technology. This involves a collaborative effort of the Research Office, Doctoral School, Library and IT department in setting up relevant infrastructure and coming up with regulating documents. In our case, primarily, the revised institutional regulations on Open Access will record the mandate of producing DMP for doctoral students.

In 2019 the Library of Kaunas University of Technology started the one-year project "Research Data Management: Awareness Raising and Support". The project aims to raise awareness about and support Research Data Management in Lithuania. The University became the National Node for the Research Data Alliance (RDA) Europe, coordinator RDA activities and act as champions in their countries, advocating for the development of solutions to data challenges. The Research Data Alliance provides a possibility to adopt the current European and global best practices and tools to facilitate and accelerate the development of local practices. The Node acts as a team of experts who represent different institutions (the Ministry of Education, Science and Sport of the Republic of Lithuania; Kaunas University of Technology, Vilnius University; Electronic Information for Libraries and fields of activity. The Node activities aim to promote and disseminate the outputs and recommendations developed by the Research Data Alliance to raise awareness and provide support in Research Data Management in the national context, and also provide feedback to RDA on achievements.

Research Data Management is a core component of Open Science and a growing number of research funders in Europe and Lithuania now require researchers to include DMP in their research proposals. To meet funders' requirements, the research community needs awareness, guidance and support. On October 30, 2019, the workshop "Getting Started with Research Data Management Support" welcomed university managers, research support, administrative support staff and librarians to Kaunas University of Technology. The workshop was given by Dr. Marta Teperek, Data Stewardship Coordinator at TU Delft

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in the Netherlands, Dr. Ir Santosh Ilamparuthi, Data Steward at TU Delft and Dr. Ir Shalini Kurapati, Senior Research Fellow of Open Science at the Politecnico di Torino in Italy (Ceseviciute, 2019c). The questions on how to provide effective support for research data management, on the key elements of research data management and the existing components which can be re-used and adapted from elsewhere, to engage with researchers about research data and how to make them interested in these topics and use the tools and services developed for them.

The interactive event provided the participants with tangible solutions they can take away with them to get started with Research Data Management support at their institutions. The event attracted more than 40 participants from 12 institutions of higher education in Lithuania: General Jonas Žemaitis Military Academy of Lithuania, Kauno kolegija / University of Applied Sciences, Kaunas University of Technology, Lithuanian Academy of Music and Theatre, Lithuanian Sports University, Lithuanian University of Health Sciences, Mykolas Romeris University, University of Management and Economics (ISM), Vilnius Gediminas Technical University, Vytautas Magnus University, Vilniaus kolegija / University of Applied Sciences and Vilnius University.

The participants of the workshop appreciated the practical tips they received, institutional cases of providing research data management support, also the interactive nature and atmosphere of the event. They were left with a homework task of finding out more in the recently published "Engaging Researchers with Data Management: The Cookbook" (Clare et al., 2019). The workshop was organized in the frame of OpenAIRE-Advance and was also part of the work plan of Kaunas University of Technology as a coordinating institution of the RDA National Node Lithuania.

Survey on the Needs for Research Data Management Competence Development

Conducting research related to academic community needs, user satisfaction with information services, individual and group work environments, infrastructure for research, Library resources and services integration into the study and research activities, is a usual activity at the University and at the national level (Tautkeviciene et al., 2010; Tautkevičienė, Duobinienė, Banionytė, & Vaškevičienė, 2011; Tautkevičienė & Manžuch, 2015).

In recent years there has been increasing research interest in the competence and knowledge of Lithuanian researchers in the field of information and data management and the need to develop them.

The research results inform further activities: organizing training sessions for different target groups (researchers, research administrators, librarians) seminars, information events and conferences, also participating in developing and improving open access infrastructure (e.g., the open-access literature national repository eLABa) (Tautkeviciene, 2011). Surveys and needs analyses of different extent are carried out at the Library regularly and before engaging in new initiatives (e.g., developing the PhD course "Research Data Management").

The recent survey was carried out in March 2019. The respondents were PhD students, early career researchers, experienced researchers and representatives of administration: 295 respondents in total from 8 biggest institutions of higher education in Lithuania. The online survey was distributed by the Lithuanian Academic Libraries Directors Association and by contacting research administrators. The survey was open from March 17, 2019, to April 15, 2019. Tables 1 and 2 show the demographics of the survey. Most responses came from institutions where training opportunities and information dissemination are comparatively more intense.

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Table 1. Distribution of survey respondents by broad subject disciplines (Data Source: KTU Library survey)

	Frequency	Percentage
Biomedical Sciences	33	11,2%
Physical Sciences	44	14,9%
Engineering/Technology	85	28,8%
Social Sciences	104	35,3%
Humanities	29	9,8%
Total	295	100,0%

Table 2. Distribution of survey respondents by rank or position (Data Source: KTU Library survey)

	Frequency	Percentage
PhD students	80	27,1%
Early carrier researchers	75	25,4%
Experienced researchers	131	44,4%
Research managers	9	3,1%
Total	295	100,0%

We asked them to respond if they know what Open Access policy documents are adopted at their institution, how they evaluate their knowledge and skills related to research data management, what barriers they see on the way towards the implementation of research data management and what needs they have for Research Data Management training, also drawing on their previous experience.

Concerning institutional policy documents on Open Access to publications and research data, only one third (34%) of the respondents are familiar with them, whereas 65%are not sure if such documents exist and 3,1%say that they do not exist.

Different departments are responsible for coordinating Open Access in different institutions. Many respondents indicated more than one department. As many as 45%of the respondents are not aware of the responsible department(s). The most frequently mentioned departments were the Library and the research office.

The representatives of administration see themselves as the most knowledgeable in Research Data Management. This may be because there were least numerous (only nine) among the respondents and because they know the general requirements by the main funders but they do not have immediate involvement in dealing with practical problems that researchers face to comply with those requirements; it is most often the libraries that deal with them. PhD students, early career researchers, and experienced researchers see their knowledge and skills as average or intermediate.

In terms of Research Data Management barriers, experienced researchers point out the lack of institutional financial support, whereas PhD students point out the lack of knowledge on Open Access as the main barrier to Research Data Management. Apparently, PhD students have not encountered issues arising from lack of institutional support because they are just starting their careers.

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A lot of respondents (36%) do not know where they can deposit research data; 41%would deposit them in their institutional repository, others (33%– in the national repositories: LiDA (Social Sciences and Humanities) and MIDAS (Physical, Biomedical, and Technological Sciences).

The approaches to Open Access and Research Data Management are different at different institutions. The responses from institutions that are more active in promoting the Open Science agenda were more numerous and elaborate in terms of indicating the problems and the needs for training.

When evaluating their needs for Research Data Management training, PhD students were the most active indicating they have already had useful training. Interestingly, experienced researchers are those who are most willing to have training opportunities, according to our survey.

Concerning Open Science training, around 20%of the respondents have attended some kind of training events and evaluate them as useful; 4%of those who have attended have a negative experience. Of those who have not attended any kind of training, 60%have indicated they would like to attend. This kind of training is not of interest to a relatively small part of the respondents: 14%.

The respondents said that the most relevant topics for future training would be funding opportunities for Open Access, Article Processing Charge, depositing publications and research data to repositories, copyright issues, communication with publishers, and embargo periods.

This survey has shown us that despite the different initiatives and ample opportunities provided, there is still a need for knowledge and skills in Research Data Management among different groups of researchers. For us, this means a need to continue working on increasing both educational opportunities in different formats (especially on the topics that are of most interest) and be ready to provide individual consultations.

Looking for Alternative Ways of Developing Open Science Competence

As active ways of learning and hands-on experience are at the heart of the contemporary curriculum, we are also looking for new ways to engage researchers in Open Science activities. In 2019, the usual activities (mainly conferences and workshops) during the Open Access Week celebration at Kaunas University of Technology took a different turn: in addition to promoting the OpenAIRE webinars, the initiative of setting up an Escape Room was brought to life.

Rasa Dovidonyte, Senior Information Manager at the KTU Library, followed the instructions by Katrine Sundsbø, the Scholarly Communications and Research Support Manager at the University of Essex, on how to set up the Open Access Escape Room (Sundsbø, 2018). The initiative was a success: 14 teams of bachelor, masters and PhD students, also researchers from different faculties and research administrators – 60 participants in total – embraced the challenge of escaping the Escape Room during the Open Access Week (Ceseviciute, 2019a).

The activity was an opportunity for the participants to reflect on the importance of Open Access not only to publications but also to research data. Their smiles after escaping are a reflection of their positive reaction. Unfortunately, the Room could not remain permanently as such, as the space is popular as a group work room among our Library visitors. We have already considered the need to set the Escape Room more often and supplement the activity with longer follow-up discussions on the real-life challenges of Open Science with the participants over a cup of tea. For us, this encouraging experience was another opportunity to find out that small, playful steps can make a difference on the way to Open Science in academia and a game can be an effective way of reaching out.

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Current Challenges and Concerns Facing the Organization

The development of Researchers' Data Management Competence and the creation of the Research Data Management Support system at Kaunas University of Technology has been a long process calling for a lot of effort. We still find ourselves at the beginning of the long road. The experience of more than a decade has shown that to implement Researchers' Data Management Competence development and Research Data Management Support in the organization requires engagement and collaboration of all stakeholders (researchers, research department, library).

The Library can contribute in different ways: by providing training, organizing information events, giving individual consultations. These activities may be more intensive if researchers and research management staff show more need for them. Researchers' engagement may be improved by clear institutional regulations on Open Science and Research Data Management. It is also important that all administrative departments concerned with research play an active role and facilitate the processes of Research Data Management in the institution.

To improve researchers' motivation, Research Data Management indicators should be part of performance assessment. Concerning competence development, different approaches are relevant for different target groups: early career researchers, more experienced and experienced researchers. The Research Data Management competence development of early career researchers should be part of their formal study (in the form of a Research Data Management course or other forms); writing a data management plan should also be an obligatory element of program requirements. Discussing topics of research data management and DMP writing as part of summer schools and other training events may raise interest and motivation for involvement in Research Data Management practice.

In comparison, experienced researchers tend to prefer individual consultations that are specific to their individual needs and support from data stewards. Researchers need to see the value of engaging in Research Data Management and be supported whenever support is required. Indeed, support should involve doing some routine Research Data Management tasks for researchers so that Research Data Management practice is less time-consuming for them.

The concerns of the recent years were related to issues of different kinds and on different levels: lack of national policy on Open Access, fragmented nature of national infrastructure for research data that we have in the country (the aforementioned archive for Humanities and Social Sciences LiDA hosted by Kaunas University of Technology and the National Open Access Research Data Archive MIDAS, a repository hosted by Vilnius University).

Therefore, the current preoccupation of the Library is related to the most immediate tasks:

1. revising the institutional Open Access guidelines;
2. developing a Data Management Plan template to be used for institutional purposes and
3. facilitating the implementation of DMP in doctoral studies.

They are related to the decision by the Research Management team of the university to include writing the DMP as an obligatory element of doctoral studies. For training purposes, the Library kept promoting DMPonline provided by the Digital Curation Centre (DCC) for some time. However, to be implemented, the decision needed to be supported by formal incentives. Thus, the mandate of writing DMP will be recorded in the revised institutional Regulations on Open Access. A template based on the

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Horizon 2020 DMP one will be part of the Academic Information System and the Library is committed to providing students (and probably also their supervisors) with support in creating DMPs.

Relevant infrastructure for depositing research data is a requisite in this process. While setting up an institutional data repository remains a task on the waiting list, relying on larger international infrastructures, like Zenodo, one of the OpenAire services, is a practical option.

There is also a concern related to the increase in the workload and demand or new knowledge and competences for the librarians. So far, the support for Research Data Management in terms of daily activities has been minor: advising on occasional inquiries from researchers who are working on project applications. In the future, the amount of work will increase, so it is important to train dedicated staff in the Library, and also work with the Department of Research Affairs on RDM models that involve data stewards and other responsibilities.

CONCLUSION

Becoming a key agent in research success of the research activity may be regarded as a long-term goal for the Library. The Library's current contribution is still at the level of raising awareness of the potential and importance of the different elements of library activity: from advice on how to select a journal for your article to those on how to write a Data Management Plan. Thus this also raises consciousness about the roles the Library can play and marketing its services. One of the best measurements of success and motivators is the strong tendency of positive formal and informal feedback that we receive from our users as part of an annual institutional survey on the quality of Library services, also surveys on the users' needs like the one discussed above in this chapter.

To implement Open Science, knowledge of global trends and efforts to address them on the national and institutional level (in terms of legal documents, infrastructure) are critical. Formal incentives are required for making stand-alone practices embedded and continuing. However, there are many barriers on the way, including such as the change of staff in the top management positions at different stakeholder institutions. Being proactive and persistent may be offered as an immediate solution to dealing with different barriers.

Seeking support from stakeholders is fundamental, even though it may sometimes seem an endless process. Proactive behaviour and persistence are also required for daily effort in raising awareness on the benefits of Open Science and developing the competence of researchers and administrative staff. Looking for new, active and perhaps playful ways of engaging researchers in Open Science practices is no less important. Thus the following principles may be referred to as helpful generic solutions:

- understanding global trends and striving to implement them at the national and institutional levels;
- seeking support from stakeholders, communication between different stakeholder groups;
- raising awareness;
- developing the competence of researchers and administrative staff;
- being proactive; and
- looking for new ways of engaging with researchers.

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KEY TERMS AND DEFINITIONS

Open Access: Free of charge and free of most copyright and licensing restrictions access to digital online resources.

Open Science: The practice of science through different interrelated activities and initiatives (Open Access, Open Data, Open Peer Review, Open Source Software, Open Government, Altmetrics, Open Research Infrastructures, etc.) for a more efficient development and application of knowledge and economic development.

Open Science Competence: A set of knowledge, skills, values, and attitudes required to practice Open Science.

Research Data Management: The process of organizing data to make it findable, accessible, interoperable, and reusable in a secure environment; this process encompasses all the research lifecycle.

Research Data Management Competence: A set of knowledge, skills, values, and attitudes required to practice Research Data Management.

Research Data Management Services: Support for researchers in complying with the funders' requirements for data management planning and to promote access to Open Research Data.

Research Support Services: A set of library activities oriented to researchers' needs to acquire and manage information resources, also to manage, store and share research data.

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Chapter 4
Library Research Support Services:
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EXECUTIVE SUMMARY

This chapter addresses library research services at the Universitat Politècnica de Catalunya · BarcelonaTech (UPC), an institution engaged with science and technology that clearly emerges as a research university. Due to the attributes of the UPC, its library, publications, and archives services differ from traditional libraries and have been transformed over its lifetime to offer services to researchers that fit their current and future needs. Librarians are actively seeking personalized solutions to meet researchers' needs. The Research Service Charter of the UPC libraries includes a range of assets related to UPC researchers as producers of new scientific output and as primary agents of its dissemination.

DOI: 10.4018/978-1-7998-4546-1.ch004

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INTRODUCTION

The goals of this chapter are both to exhaustively list and briefly describe the library research service of the Universitat Politècnica de Catalunya · BarcelonaTech (UPC), and to highlight how it contributes to achieving the UPC's research challenges and objectives. In order to explain these services to the reader, they are illustrated by contextualizing them in the following aspects:

1. **Research-oriented university:** UPC's will to be a research institution makes it unique in the Catalan university system.
2. **Strategic planning:** using strategic planning as a management tool for the UPC Library, Publications and Archives Service (UPCLPAS).
3. **Organization chart:** UPCLPAS is organized based on units, created from the basic segmentation of university library users, and is refined with distinctive structures such as thematic rings.
4. **Technological evolution:** UPCLPAS's services have evolved in accordance with the dramatic changes in the computerization of research, including the information and communication revolution associated with this environment.
5. **Innovative services:** the flagship products of the UPC libraries available to researchers.
6. **Library users:** the heightened segmentation of users to whom library research services are devoted and the correlation of these users with all of these services.

Due to the attributes of the UPC, its library service clearly differs from traditional ones. End-users have historically been positioned at the center of the organization, which is being transformed throughout its lifetime to offer researchers services to meet their current and future needs. The assimilation of the University's archives and the integration of its publishing services have significantly helped make this vision a reality. In this field, the UPCLPAS has been very active from the beginning in promoting and facilitating the deposit and publication of UPC's scientific production in open access, through books and scientific journals, and particularly with UPCommons, the institutional repository, that has traditionally achieved a leading position in the international rankings that evaluate these repositories.

Thereby, the provision of the library research services is not understood as a static proposal that is passively delivered to centers, departments, and groups of researchers. On the contrary, UPC librarians actively seek personalized solutions to meet the informational needs of particular researchers. The Research Service Charter of the UPC libraries aims to easily pinpoint specific answers the UPCLPAS gives to the research activity of the University staff. This is particularly noteworthy because this research activity is considered strategic from a Return on Investment (ROI) perspective and from the point of view of the social and economic future of Catalonia.

This chapter presents an overview of the UPCLPAS organizational structure, which is characteristic of UPC libraries and determines how all available research services are conceived and delivered. These services are described here in depth, and some brand new and innovative ones are explained in detail, focusing on their current and near-future impact on the university's overall research goals.

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UPC: A BRIEF HISTORY AND OVERVIEW OF A RESEARCH UNIVERSITY

The origins of UPC date back to 1971 with the foundation of the Universitat Politècnica de Barcelona (UPB). The University developed from several existing schools: Barcelona School of Industrial Engineering, Terrassa School of Industrial Engineering, Barcelona School of Architecture, and some other research institutes. Although it is a relatively young University, due to the greatly impoverished university situation inherited from Francoism (Pedrals, 1986), UPC is one of the oldest universities within the Catalan university system.

The UPB changed its name in 1984 to the Universitat Politècnica de Catalunya (UPC), which remained the valid name of the university until 2012 when the official name became the Universitat Politècnica de Catalunya · BarcelonaTech (UPC). During these years, the University has been managed by a total of eight rectors who have dealt with the integration of new centers and the split-off of some others to finally reach the current composition of UPC, which includes 18 schools (and two additional affiliated business schools) spread across six different cities in Catalonia. In addition to these centers, UPC is composed of 30 academic departments, 21 of its own research centers, and 19 linked research entities.

On its webpage, UPC defines itself as a "public institution of research and higher education in the fields of engineering, architecture, sciences and technology" ("The institution", n.d.). The UPC specializes in science and technology, and it offers a wide range of programs and degrees devoted to a broad spectrum of engineering and architectural fields. In fact, the total offering for the 2019-2020 academic year is up to 65 bachelor degrees, 79 master degrees and 48 doctoral programs. The amount of research activities conducted by professors and researchers boosts the institution to be a very prestigious university, reaching top-tier positions in the most renowned international rankings. Some basic figures in the research area for the 2019-2020 academic year can help understand the notable strength of UPC and its excellent position at national and international levels: 1,713 active agreements and projects (of which 654 are brand new ones), 2,058 articles in scientific publications, 292 doctoral thesis presented, and up to 157 scientific and technical distinctions earned.

It is also worth noting that the university's description (quoted above) prioritizes research. It is true that, from the outset, there is an individual motivation factor caused by the fact that the Spanish evaluation system clearly values research over teaching activities when assessing university professors' career and tenure. UPC reinforces this tendency with a strong commitment to generate both basic and applied high-quality research. To effectively develop this intended vocation, the institution has endowed itself with an organizational structure, the so-called Research and Transfer Area/CTT (ART/CTT), to support the research activities from a broad perspective; it also helps overcome challenges related to research, technology, and knowledge transfer within the Action Plan UPC 2018-2021 (Pla d'actuacions UPC, 2018).

This Action Plan functions as UPC's strategic plan and is based on seven commitments that generate a total of 12 challenges with additional strategic goals for each of them. Challenge five is titled "To consolidate UPC's position as a leading university in its own research fields" and holds the following strategic action lines: attract research talent to work in UPC research groups, promote faculty staff participation in excellence programmes, promote international mobility for doctoral students and faculty staff, stimulate research lines with the greatest social, economic and technological impact, adapt scientific and technical infrastructures and maximize scientific production visibility, both internally and at a national and international level.

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To unfold these strategic goals, ART/CTT is divided into four services: Research and Innovation Support Service, Innovation Management Service, Knowledge Management of Research and Innovation Service, and Economic Management of Research and Innovation Service (this area is especially active considering the number of resources obtained by the UPC, as shown in Figure 1). The system is completed by local structures geared toward research assistance on all campuses.

Figure 1. Some data about the funding of UPC research (Source: Participación española en Horizonte 2020: resultados provisionales (2014-2018), 2019)

Some data about the funding of UPC research

Regarding research funding issues, the university's inward investment is complemented by external financial resources and UPC researchers are very active in raising funds through:

- **Project calls**: Participation in international project calls within the EU Research and Innovation program Horizon 2020, and its Catalan counterpart crystallized in the strategic frame RIS3CAT (RIS3CAT, 2018).
- **Plan Estatal de Investigación**: Plan Estatal de Investigación Científica y Técnica y de Innovación 2017-2020 of the Spanish Ministry of Economy, Industry, and Competitivity (Plan estatal de investigación, 2017).

Other resources from individuals and organizations complement these main additional funding lines. The total amount of money obtained from all these resources during 2018 (58 M€) is up to 20.5% of UPC total budget (282,7 M), a similar figure to the revenues from student fees (21% of the 2018 UPC total budget). Another sign of the dynamism in this field is that UPC, not one of the largest universities, is leading fundraising in Spain in the total count of Horizon 2020 program (2014-2018), with 125 participating projects – of which 39 are coordinated by UPC researchers- (Participación Española, 2019).

ORGANIZATIONAL STRUCTURE OF THE UPC LIBRARY SYSTEM

Libraries have been a part of UPC since its origins. As an essential service for faculty and students, each and every one of the schools, which would later become part of the UPC, had their own library. For some years, these libraries were a mere group of centers with poor relationships between them. However, this situation drastically changed in 1989 when the currently named UPC Library Publications and Archives Service (UPCLPAS) was redesigned to become an organized structure, changing a group of almost unconnected libraries into a real library system, with shared services, procedures, and

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policies for all UPC libraries. It is worth noting that a key element in making this change possible is that UPCLPAS is managed by library professionals but, before this transition, it was managed by faculty and staff. This professionalization trend was reinforced by a movement with the same characteristics at an institutional level; the UPC began to reorganize the entire management, administrative apparatus, and university services from the same criterion of professional expertise.

Strategic planning became the tool to draw together and boost the reorganization and improvement of the UPC libraries. In 1991, with the Leibniz Plan approval, which was a plan for the improvement of the library services at UPC and the first ground-breaking strategic plan in any organizational area within the university (as well as in any university library in Spain), UPC libraries started a new way to manage and develop resources and services. It has been successful to date and has led to the present Enginy20 program with which UPC libraries are in their 6th strategic plan. The complete list of these plans encompasses almost 30 years of library service to the UPC community:

- Leibniz 1991-1993
- Escher 1995-1999
- Paideia 2000-2005
- Aprèn 2007-2010
- Digital! 2012-2014
- Enginy20 2015-2020

Notable events during the development of these strategic plans were that, at the request of the University's governing bodies, the Library Service integrated the archiving service, which was incorporated as the Office of Documentation and Archives (2007), and the publishing services, which were rebranded as the Digital Polytechnic Initiative (2011). Also during this period, the UPCLPAS began to participate in national (CSUC), state (REBIUN), and international (IATUL and LIBER) librarian networks and associations. Of these partnerships, the most decisive for the UPC libraries has been, by far, the one established with CSUC, since it has meant sharing library acquisitions, interlibrary loans, professional training courses, an integrated library system, shared storage facilities, and many other critical aspects and services with other Catalan universities.

Organizationally, the UPCLPAS is placed under the Office of the Vice-Rector for Digital Transformation and the Academic Area of the UPC. Moreover, the research services of UPCLPAS support other Vice-Rector offices: Office of the Vice-Rector for Science Policy, Office of the Vice-Rector for Assessment and Quality, the Office of the Vice-Rector for International Policy, and ART/CTT services.

From an internal structuring perspective, UPC strives to be user-centered. UPC library services are addressed toward a diverse audience, including students (27,951 in 2019-20 academic year), professors and researchers (3,147 in 2019-20 academic year), and administration and services staff (2,006 in 2019-20 academic year). Conscious of the different needs of these groups of users, in 2002, the UPCLPAS switched from a traditional organizational structure to an organizational chart based on the different needs of users. Considering that UPCLPAS is made out of 12 Campus or School libraries distributed across the Catalan territory, each of them with different staff compositions, the organizational system must be well designed to handle the complexity generated by this multiplicity of actors while guaranteeing a system-wide standard of service. The chosen organizational solution meant a complete reorganization of staff and services to obtain a scheme based on three sections:

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1. UPCLPAS Direction
2. **Libraries General Services:** manages all centralized services and coordinates the activities of all 12 existing libraries. The team of people integrating Libraries General Services includes some highly qualified ICT technicians who have helped this coordination and have allowed for a high level of innovation and online service delivery. Eventually, Libraries General Services organizational chart was crystallized in a structure made up of five units:
    a. Research Support Unit: it deals with services directly linked to faculty and researchers. Nowadays, the Unit is staffed by one head of area and 3 librarians. It supports the Library Service Director in defining the lines of each UPCLPAS strategic plan, setting its goals and overall actions that libraries have to perform to provide services to support research at UPC. It is also responsible for the management or supervision of the budget for the subscription of journals and databases, whether subscribed at the institution level, within the framework of the University Services Consortium of Catalonia (CSUC) or with national agreements. Expenditure on these concepts is 80% of the total budget of the UPCLPAS.
    b. Learning Support Unit: it deals with services directly linked to students.
    c. Digital Support Unit: it deals with the crosswise services to cope with the switch from the traditional to the digital library.
    d. Management and Development Unit: it deals with the resource allocation needed to provide services to the library users.
    e. Communication and Projects Unit: it deals with the organizational support to new projects and the face-to-face and virtual dissemination of the UPCLPAS offer.
3. **Campus libraries and School libraries:** for each campus or school library, the general model is based on having a research support service head. This person leads a small or rather big team, depending on the size of the library, and also plays the role of cross-talk with other colleagues and members of the Libraries General Services through regular meetings and mailing lists, especially the "Knowledge Dissemination" list. In conjunction with the Research Support Unit, each library has two other teams, the Learning Support Unit, and the Digital Support Unit, which are all led by the Head of the library.

The whole organization chart was refocused in 2017 to simplify it and make it more flexible (which was needed after the constraints caused by the economic crisis). Moreover, the organizational chart needed to be adapted to fit the evolution of research services, which have become increasingly oriented toward the dissemination of research results. Figure 2 shows UPCLPAS's organizational chart with the mentioned features.

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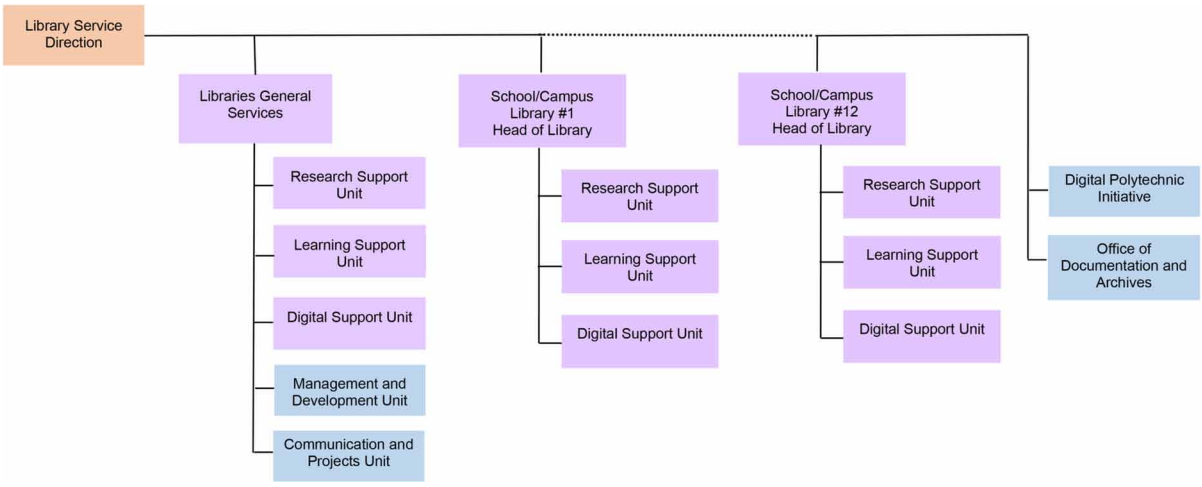
Figure 2. UPCLPAS simplified organizational chart (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)



To complete the organizational structure of library research services, the "thematic rings", made up of subject librarians from all UPC libraries dealing with the same topics, collectively cover documentary needs of research users related to such topics (Figure 3).

EVOLUTION OF THE RESEARCH SUPPORT SERVICES AT UPC LIBRARIES

The UPC Libraries have always maintained a constant choice for change and adaptation to academic, technological, and social transformations, in consonance with the goals of the University, government, and supranational strategic lines regarding scientific policy and technological innovation support. Until the end of the 1990s, the UPC library's research support action lines were oriented almost exclusively to collection expansion and the growth of the scientific and technical resources. This was the main goal for that period, and it alleviated the effects of underfunding (structural and services) that characterized the Catalan university system for much of the 20th century. Substantial improvement in access to research collections was achieved by increasing budgets and through the consortial purchase of electronic packages for journals and databases thanks to the big deal model. The Library shaped its research support services as a necessary link between collection and researchers, with traditional intermediary services such as specialized reference, document delivery service, or selective dissemination of information.

The emergence of online electronic information since the mid-1990s was one of the main causes of the transformation of research support services in university libraries. The widespread access to online collections and resources (Tenopir, King, Edwards, & Wu, 2009), the growing use of Internet search engines (Rowlands et al., 2008), and the technological expertise of most UPC researchers led to a gradual decrease in in-person visits and in library services based on primary document access. At the same time, the inquiries received became more complex with regard to their resolution. Mediation, therefore, had to involve more expertise and add more value to the offered services. For this reason, UPCLPAS chose to focus on the professional competence of librarians and on the dissemination of information tools and resources to the research community.

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Figure 3. Thematic rings at UPCLPAS (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)

Thematic rings at UPCLPAS

UPC is a university which teaches and conducts research on the same topic on more than one University campus. The organization of library services conforms to this peculiarity with the "thematic rings", or groups made up of subject librarians from different libraries who, despite not having an academic degree in the University disciplines, have specialized in the information sources of the subject they provide support to. The "thematic rings" were launched in 2001 as an organizational and collaborative way across all UPC libraries to improve the provision and dissemination of the available research information resources. These "thematic rings" were made up of subject librarians who perform the following tasks:

- **Task 1**: Be acquainted with the bibliographic novelties and solve, analyze and interpret the demands and needs of scientific and technical information of library users.
- **Task 2**: Provide information and training in the use of information resources and library support services for research.
- **Task 3**: Search and disseminate quality scientific and technical information to meet the needs of research and continuous training of users.
- **Task 4**: Normalize the curriculum vitae of researchers in the Current Research Information System (CRIS) and archive the publications in the institutional repository of the University.
- **Task 5**: Develop projects related to information and documentation.
- **Task 6**: Set annual goals and plans for improvement of the library research services.

Up to 27 rings cover all UPC thematic areas. These thematic rings have a numerical composition that varies according to the number of schools in which teaching and research are carried out dealing with such 27 subjects. Thus, there are one-person rings, as in the case of Nautics (the subject of a single UPC center) and up to rings with 12 members (this is the case of Teaching and Learning, with a presence on all UPC campuses). One of the integrating subject librarians is responsible for the activity of each of the rings and leads the evolution of that specific ring under the guidelines provided by the Research Support Unit of the UPCLPAS.

Furthermore, the thematic indexing is done using standard tools like the Library of Congress Subject Headings and with a thesaurus created by UPC librarians that contain more specific terms at a second or third level within each of the 27 UPC thematic areas.

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Although these actions were convenient, it was certain that the technological changes already had a profound impact and would soon have a more global impact on the dynamics of the processes linked to research and, in particular, on the role that libraries had in the academic system (Guédon, 2001). In front of this challenge, the UPC Libraries aimed to be part of the transformation process between information and knowledge to boost the quality of UPC research, technological innovation, and its scientific production.

The Open Access movement, which was joined by UPC in 2006 with the creation of the UPCommons institutional repository (Figure 4), and the endorsement of the Berlin Declaration ("Berlin-Declaration", 2003) in 2007 became a key impetus to take on new roles and acquire new capabilities.

Figure 4. UPCommons: The institutional repository of the UPC (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)

UPCommons: The institutional repository of the UPC

UPCommons was created in 2006 as one of the first open-access institutional repositories in Europe, and it responded to UPC's willingness to be a driving force for open access. It was designed to facilitate a single access point to the digital archives run by UPCLPAS, and its main goal was to organize, preserve, and increase the visibility of the intellectual heritage of the UPC (Gómez, 2004). It was also part of a strategy to combat the rise of scientific journal prices that between 2000 and 2010 increased as much as 15% per year.

UPCommons offers UPC authors a technological tool to publish full-text documents and uses the interoperability protocol Open Archives Initiative (OAI-PMH) to increase the visibility of the archived documents. Records are labeled using DCMI (Dublin Core Metadata Initiative) and Creative Commons licenses are recommended.

Among the 16 repositories included in UPCommons, six of them are dedicated to research documents: E-prints (45,957 journal articles, conference papers, and research reports), doctoral theses (4,232 documents), research data (8 datasets), UPC journals (12,300 articles), UPC conferences (5,340 papers), and Bachelor/Master theses (43,475 documents). This wide offering is intensively used by UPC researchers, so the green road is the preferred open-access solution (37% of all UPC open-access documents) at UPC (Rovira & Labastida, 2019). Further, UPCommons has become a very well-positioned repository in the main world ranking, achieving a rank of 19th place in the last edition of Webometrics ("Ranking web of repositories", 2020).

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With the launching of the European Research Area (ERA), UPC desired to increase the quantity and quality of its scientific production. The professional skills of UPCLPAS staff were gradually diversified as a mid-term strategy action, to take a position within the research process in new roles that go beyond information dissemination and conservation. These include intellectual property advice, edition and publication facilities, bibliometry and scienciometry analysis, etc. Further, new competencies to respond to the priority needs of researchers-authors were needed (Rovira, 2007). The UPC included this objective on the 2006-2010 Government Plan: To integrate libraries into the UPC's learning and research activities to contribute to achieving the new challenges of the European Knowledge Area (EEES and EER).

However, with the beginning of the economic crisis in 2008 and the subsequent budgetary constraints, a paradigm shift for the UPCLPAS research support services occurred. Collaborations with other units or services of the University in key processes of the research operations began being established. During this period, just like in all universities (Hernández Armenteros & Pérez García, 2016), libraries had to make a painful effort of budget containment that, among other measures, led to a drastic reduction in their workforce and to the cancellation of 51% of subscriptions to journals and other specialized information resources between 2010 and 2015, including those acquired through consortial acquisitions. This adverse situation also arose in the context of growing competitiveness. The demand for funding and resources forced the university to use its assets and to be particularly rigorous in terms of accountability.

The UPC libraries, due to their versatility, decentralized structure, and their links with schools and departments, have been seen as agents with a remarkable ability to actively participate in management processes through alliances with other units of the University. In 2009, UPC approved its institutional open-access policy (*Institutional open-access policy,* 2009*)* and expanded it in 2014 (*Approval for awarding, 2014)*, which led to the institutional mandate to publish in open access the journal articles signed by UPC authors, in accordance with European Union directives. The UPCommons repository's interoperability with the UPC's Current Research Information System (CRIS) set up a gateway interface through which researchers archive their publications. In 2015, with the creation of FUTUR[1], the UPC's Research Production portal, data from other University information systems were also connected (Doctoral School, Personnel Service, Project Office, etc.). These successful collaborations opened the door to further alliances with UPC units on research project management, patentability, and training of research staff.

The evolution of research support services is aligned with and consistently supported by the UPC's 2018-2021 Action Plan and also by the RIS3CAT plan of the Catalan Government, which aims to consolidate Catalonia as a European hub of knowledge through the internationalization and valorization of research, social impact, transparency, and the assumption of responsibilities.

RESEARCH SUPPORT SERVICES AND STRATEGIC PLANNING IN UPC LIBRARIES

The UPC Libraries have a global mindset for understanding research support services, which aligns with UPC's statutes where research is identified as one of its fundamental activities. In total, the UPCLPAS is currently made up of a team of 120 people distributed between the 12 libraries and the Libraries General Services. Of these, 81 are qualified librarians, 30 of which support researchers. These librarians are called research librarians, many of whom are subject librarians specialized in information resources for a particular topic and liaise with the University's researchers and research units.

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The desire to provide the UPC Libraries with research support services is stated for the first time in its 1995 strategic plan (Programa Escher, 1995). But from 2000 onward, strategic plans of the UPC Libraries are structured in different cornerstones where one or more are directly related to Research Support Services.

In other words, the UPC libraries management mechanics are based on strategic planning (Martínez, López-Vivancos, Sunyer-Lázaro, & Vives-Gràcia, 2007), and consists of the following items: (1) statement of mission and vision of UPCLPAS, (2) establishment of master lines to accomplish the stated mission and vision, (3) annual goals setting according to master lines already established for the whole UPCLPAS and for each library, and (4) evaluation of the annual goals achievement and overall strategic plan achievement. The most significant achievements are published in an annual report.

Enginy20, the current strategic plan (*Enginy20,* 2015*)*, has a duration of five years (2015-2020), (similar to prior UPC strategic plans), and it states the mission and vision of the UPC libraries, emphasizing their role as a key agent for the development of the learning, research, and documentary development at the University. It also acts as an effective way to face the ongoing economic crisis (Figure 5). Those concepts are underpinned by some values that can be synthesized in this list: self-commitment, great flexibility, quality, innovation, open-access, responsibility, professionalism, collaboration, and transparency. In any case, the content changes over strategic plans, but the Leibniz Plan (*Programa Leibniz*, 1991) already established two conceptual bases and have become necessary for creating services and values: (1) the alignment of interests and needs with the institution and (2) the orientation of services toward end-users. Both concepts are essential for defining future action plans because they help determine the design of the UPC libraries' organizational chart.

Similar to the UPC's Action Plan (*Pla d'actuacions UPC,* 2018*)* that devotes a section to research development, Enginy20 second core idea is "Network research" and defines the following general libraries goals for the period 2015-2020: support processes related to the scientific publication of research results, promoting open access to scientific communication, be publishers, consultants, and disseminators in the new scientific publication in open access to the net, ease and guarantee both access and use of scientific and technical collections and resources, analyze and respond to the needs arising from the management and data plan of UPC research projects and enhance the management of journal collections and electronic resources of information in order to address the real needs of information and documentation in research.

RESEARCH SERVICES PROVIDED BY UPC LIBRARIES

Issues

This section presents the current services that are offered to researchers. All of them aim to contribute to the quality of UPC research results, although evidence remains scarce in terms of quantifying this contribution. Some figures show that the influence is considerable and that library research support services are highly rated. For instance, in 2019, of the 204 doctoral students who were taught by librarians in training sessions on information management tools, 80 participants in a survey rated their overall satisfaction as 5 out of 6. – What is more, regarding personalized services, attention from library staff was awarded the highest score, 5.3 out of 6. The year 2019 also saw 3,413,386 visits to the research repositories in the UPCommons, in addition to a total amount of 9,944,818 downloads. Whether in person or online, UPC libraries assist both groups and individual researchers not only in querying and gathering

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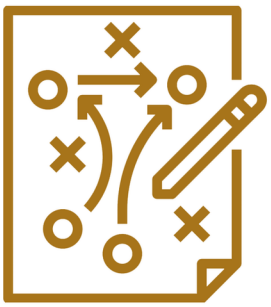
the information they need to conduct their research, but also in publishing their results, managing their data, and increasing the visibility of their results and digital identity.

Figure 5. Strategic planning to cope with the impact of the economic crisis (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)

Strategic planning to cope with the impact of the economic crisis



The preface of the strategic plan Enginy20 (2015) begins with a statement that frames the background for its development:

> "In recent years, UPC libraries have suffered significant cuts in the provision of resources as the result of the economic crisis affecting all universities. If we add the frequent changes produced by ICT in information and scientific publishing, learning, and research, we are in a new scenario full of challenges that need to be managed with more imagination, more work, and more effort, if needed." (p. 2)

The recipes to tackle this challenging context are related to efficient management, optimization of resources, and establishment of alliances and collaborations with other services and units. To do this, the following goals were established:

- **Goal 1**: Improve organizational communication, participation, and partnerships with other services and associations.
- **Goal 2**: Increase the quality of information and communication technology processes and services.
- **Goal 3**: Improve the availability of managed resources.
- **Goal 4**: Train staff in cross-disciplinary and new digital skills.
- **Goal 5:** Create new, innovative projects that provide added value to users and the organization.

These goals are intended to be applied in management working areas such as developing key procedures, working collaboratively, communicating internally and externally, customizing service charters, defining and updating tasks, analyzing and reviewing existing regulations, building cooperative relationships, managing annual budget effectiveness, sponsorship, and return on investment, among others.

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Table 1. Types of users of UPC library research services (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)

	Users	Virtual / Face-to-face
Information Search & Management		
Support for database searching		Virtual
Advice on patent searching		Virtual + F2F
Access to scientific and technical documents		Virtual + F2F
Bibliographic reference management		Virtual + F2F
Training courses		F2F
Support for doctoral candidates		Virtual + F2F
Research heritage conservation		Virtual + F2F
Research Projects		
Compliance with open access requirements		Virtual + F2F
Library collaboration with the UPC RISS		F2F
Facilities & Meeting Places		
Study areas for doctoral candidates		F2F
Research Café		F2F
Visibility, Impact & Assessment		
Revision of the quality of publication in CRIS		Virtual
Visibility and impact of research		Virtual
Accreditation and assessment of research		Virtual + F2F
Research profiles		Virtual + F2F
Bibliometric studies		Virtual
Quality indicators monitoring in rankings		Virtual
Improvement of research assessment		Virtual + F2F
Publishing		
Advice on writing articles, theses		Virtual + F2F
Open access publication		Virtual + F2F
Institutional signature and affiliation		Virtual + F2F
Intellectual property		Virtual + F2F

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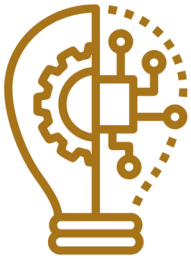
Figure 6. New patent search assessment service (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)

New patent search assessment service



Patent search assessment is the latest service that UPCLPAS has made available to UPC researchers. Clearly aligned with the UPC goals to stimulate a generation of new patents, the service is provided by research librarians, specialized on documentary sources related to patents, who search patent databases subscribed by the UPCLPAS (such as the Derwent Innovation Index) and prepare a first report to detect and contextualize precedents related to the potential patent. After that, the researcher can decide whether to go to the Patent Office of the Innovation Management Service of the UPC to begin the process of creating a new patent.

First feedbacks regarding this service fulfill by far the established goals. This is the opinion of one of its users:

- The service is very responsiveness regarding the support provided by the library staff according to their experience in searching topics in this specialised environment that is not common for the researchers.
- Through this service, the access to unusual databases is facilitated.
- By means of joint collaboration between the authors and the library staff, the results from the database can be effectively filtered.
- From the results, a preliminary view is provided, in order to decide about the feasibility of the patent to be submitted.

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Faculty, graduate students and other users conducting research are personally assisted throughout the process of their investigations and enjoy a wide range of services, which are summarized in Table 1

At the institutional level, research is evaluated by librarians, who authenticate and standardize metadata of articles, preprints, and books. In addition, they provide support for UPC researchers who are participating in congresses while also increasing their visibility through the institutional repository and the university's scientific production portal. Finally, in monitoring the UPC's position among international rankings, the UPCLPAS provides knowledge on the bibliometric tools used by the publishers of

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these rankings (Web of Science and Scopus). Furthermore, it participates in developing the university's strategies and initiatives for maintaining and improving the position in these rankings.

Beginning with a general perspective of the library research services, the UPC libraries Research Service Charter (2019) is the first item mentioned because it compiles the current range of research services intended for individual researchers, groups (departments and research groups), or for the University as an institution. This Charter is publicly available through Bibliotècnica[2], the webpage of the UPC libraries and is displayed in customized versions for each library.

The research services range from the acquisition of new knowledge (stemming from the information resources search) to the research production dissemination and publication, research evaluation support, and positioning of UPC in international rankings. In recent years, traditional services like advice on seeking information have been integrated with new ones, such as support in publishing, digital visibility and preparing bibliometric studies.

The complete list of offered research services grouped by area is detailed below:

1. **Information search and management:** Support related to specialized information is provided. Along with traditional services, such as UPC documents delivery and interlibrary loans, advice is given on the use of the metasearch engine DiscoveryUPC and subscribed databases. Information search and management also includes the following services:
    a. Access to scientific and technical documents: through the DiscoveryUPC metasearcher, a single search box provides access to a vast breadth of resources from the classic library catalog, the digital library, and the institutional repository UPCommons.
    b. Research heritage conservation: services related to antique collections, architectural heritage collections and UPC Digital Archive.
    c. Support for database searching and advice on patent search: this traditional service has been recently completed with the patent search assessment service. The UPC digital library offers specific information resources on patents (Derwent Innovation Index, DEPATISnet, Espacenet, etc.) and a librarian's subject team helps researchers register new inventions (Figure 6).
    d. Bibliographic reference management: all UPC members have Mendeley Institutional Edition access, and this product is recommended to UPC researchers for managing their references.
    e. Training courses to faculty, staff, postdoc staff, and doctoral degree students: a wide range of training courses is offered within the training program of the UPC Institute of Education Sciences. The Doctoral School helps to disseminate and manage open enrollments to the UPCLPAS training sessions among the students. There is also an extensive training program for undergraduate students.
    f. Support for doctoral candidates: with the approval of thesis directors and doctoral program coordinators, doctoral degree students are trained in a personalized manner on issues related to information search and management.
2. **Publishing:** Publishing support is also provided, ranging from guidelines on how to write a journal article to intellectual property issues and open access assistance. Some services are directly provided by the Digital Polytechnic Initiative within UPCLPAS, which include the following:
    a. Advice on writing articles, theses, contributions to conferences: librarians assist researchers with selecting journals or conferences to present a paper and also provide guidelines on how to write a doctoral dissertation.

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b. Open access publication: assistance on the different routes to open access publishing (institutional open access repository, open access journals with or without Article Processing Charges, discounted article processing charges for UPC authors, etc.). Moreover, the institution is committed to open access and holds a mandate that requires all UPC authors to submit the last full-text version before publishing (i.e., the author's final draft). This version of the document is published in the institutional repository in an open way, with an embargo period or closed, always complying with journal and conference policies.
c. Institutional signature and affiliation: for both the researchers and the university,, it is very important that research staff use the same signature and correctly mention UPC in their articles and academic works. This helps appropriately retrieve results when searching databases, particularly bibliometric ones, and also helps the institution maintain relevant positions in scientific production rankings. Some guidelines are developed on how to sign publications and are recommended to all researchers within the university community.
d. Intellectual property: author's rights, and ethical use of information: training to young researchers on how to prevent plagiarism and the ethical use of information in their papers is provided. Some guides are available on the use of Urkund, the anti-plagiarism software used by UPC.
e. Publication of books and journals: the Digital Polytechnic Initiative provides access to open-access academic books and to journals published by UPC research units.

3. **Research projects:** Assistance is provided to help comply with open access requirements. The main focus of this group of services is on research data, Data Management Plans (DMP), conditions and possible embargoes of open access journals, and the dissemination of research results.
A great majority of university researchers take part in research projects funded by organizations for which open access is required, for both articles and research data. Following the guidelines of the Office of the Vice-Rector for Science Policy, and in collaboration with the Research and Innovation Support Service, libraries provide open access to publications and research data in accordance with the institutional policies approved by the governing bodies of the University, on the initiative of the Vice-Rector. For instance, the Library collaboration with the Research and Innovation Support Service results in a service where research librarians take part in kick-off meetings to give advice to the research team on informational issues. The aid provided in these initial meetings includes:
    a. Basic information: about the publication of papers and data for each project.
    b. List of journals: An arranged list of acknowledged journals and conferences on the topic of the project, their conditions for publication, open access publishing (green and gold routes), article processing charges, embargoes enforced by publishers, and Creative Commons licenses.
    c. Research data information: Information about managing and publishing research data in UPCommons or other data repositories. Help is provided to create a DMP, elaborate on research data, revise citations, and disseminate results for facilitating the publication of documents and data in UPCommons.
    d. Diffusion information: Information about dissemination on social networks run by libraries of papers published in the framework of research projects.
    e. Other information: Aid in the production of educational videos, article publication in social media sites, and availability of library spaces for meetings or exhibitions showcasing the results of their research.

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4. **Facilities and meeting spaces:** The emergence of electronic publications has brought new possibilities for the transformation of the academic library spaces. Almost all UPC paper collections have been substituted by facilities focused on converting the library-as-a-place into a meeting place where, aside from more traditional features, participation, co-creation, and collaboration are not only possible but are also promoted. Despite the fact that too few investments have been made so far in redesigning library spaces due to economic constraints, the UPC libraries have already created brand new self-use relaxation areas and bookable meeting rooms. These new areas end up being used mostly by undergraduate students, so the libraries have complemented these spaces with work areas geared toward researchers by adding study areas for doctoral candidates and a Research Café.

The most notable study areas for doctoral candidates are located in the biggest UPC library, the Rector Gabriel Ferraté Library of the UPC North Campus in Barcelona, where UPC Ph.D. candidates can take advantage of some exclusive rooms well equipped with technological outfits and bookable lockers. On those premises, they also have access to a meeting room with multimedia equipment where they can work together on their projects. The attendance at these open doctoral rooms has not been massive, and currently, some of the rooms are exclusively dedicated to the students of a particular doctoral degree program. Thus, several research groups of the University have a private space where their doctoral students benefit from their own locked office inside the library. Additionally, those spaces have been opened to UPC students enrolled in Erasmus Mundus master's degrees, who can now enjoy valuable resources that were initially intended only for doctoral students.

Besides a good wealth of various sizes bookable meeting and study rooms to accommodate individual or group work, UPC libraries carry out activities to help make research visible. For instance, Research Café sessions, in which young researchers are invited to the library to present their work, are regularly offered. The libraries undertake the organization and full logistics of the event but widely recognized experts always conduct the sessions. The main goal of the Research Café is to increase the visibility of new projects and to promote the interdisciplinary exchange of ideas and collaboration across research areas. The assistants are doctoral students, academic staff, and other researchers that exchange their points of view, research, knowledge, opinions, doubts, etc. within an informal environment. To finish the cycle, the library publishes the presentations in the institutional repository.

5. **Visibility, impact and assessment:** To enhance the visibility of research, libraries provide support in taking advantage of FUTUR, UPCommons, and Geocommons and also in other relevant services dealing with accreditation of research and metrics support. Bibliometric studies are also carried out for a variety of academic fields.

   The University requires all faculty, staff, and doctoral degree students to submit their activities into UPC's CRIS. When activities are publications (journal articles, congresses contributions, research reports, etc.) the already mentioned open access mandate requires them to submit the author's final draft version. Following the guidelines of the Office of the Vice-Rector for Science Policy set as far as 1999, all publication references submitted to the CRIS (5,612 in 2018) are normalized by UPC librarians who load the open-access full-text version in UPCommons in compliance with publisher's policies.

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Figure 7. recerTIC UPC (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)

recerTIC UPC

recerTIC UPC consists of a set of ten bibliometric studies, on the same number of subjects, intended to provide a representative vision of UPC's scientific publications on emerging fields in information and communication technologies.

Both from a conceptual and a formal point of view, recerTIC UPC constitutes a step forward in the bibliometric analyses conducted so far by the UPLPAS. Some of the features that define this new generation of reports are the use of advanced technologies (the most interesting of them was developed specifically for these surveys), a highly user-friendly presentation of the results, and the option to interact with data. The combination of these elements makes a difference in how bibliometric studies are shared with the UPC academic community. Furthermore, the reports were designed to improve the user's experience when consulting the provided information (Pocull et al., 2019).

In terms of content, recerTIC UPC aims to provide a wide view of the publications authored by UPC researchers, with an emphasis on co-authorship, internal and external collaborations, their impact, and topics. The results presented at recerTIC UPC are based on journal articles and conference publications published by UPC professors from 2007 to 2017 and are indexed in the Web of Science Core Collection database.

In 2006, with the launch of UPCommons, the UPCLPAS started to disseminate UPC research on the Internet. Now, the institutional repository contains more than 159,000 academic items, and most of them are open access. The UPCLPAS also developed two other information systems to increase the visibility of UPC production worldwide:

a. FUTUR: FUTUR website displays all active research staff's CVs and includes activities of emeritus, retired faculty and staff, and overall scientific and technical production from research units and groups.
b. Geocommons: Geocommons[3] platform provides a geolocalized view of the academic production of the University.

Librarians provide guidance to researchers undergoing an accreditation process to national or state agencies such as Agència per a la Qualitat del Sistema Universitari de Catalunya (AQU Catalunya), or Agencia Nacional de Evaluación de la Calidad y Acreditación (ANECA), and to researchers participating in competitive calls that require recording bibliometric data from their scientific productions. In these

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cases, librarians give advice and seek information to obtain the impact factor of a journal, received citations, normalized impact, and other bibliometric indicators.

Additionally, it is increasingly necessary to have researcher identifiers to ensure the correct identification on the network. UPC libraries promote the use of all main identifiers such as ORCID, ResearcherID, Scopus Author ID, and Google Scholar profiles.

Libraries conduct bibliometric studies to meet the needs of schools, departments, research groups, and the university as a whole. From queries to bibliometric databases and corporate information systems such as the FUTUR portal, bibliometric reports are produced to visualize scientific output and to support decision-making by these units. Some relevant examples are the Observatori de Recerca de la Catalunya Central[4] and the recerTIC UPC studies (recerTIC UPC, 2019), which are devoted to making UPC scientific production visible in emergent information and communication technologies topics (Figure 7).

Additionally, quality indicators are used to monitor, maintain, and reach high-ranking positions in international rankings. UPCLPAS provides services to the University and participates in a transversal cross-working group created by the Office of the Vice-Rector for Assessment and Quality to monitor the UPC's position in the different national and international rankings. In addition to providing guidelines for researchers to correctly indicate their affiliation and organizing open symposiums to instruct researchers on the different ways to guarantee a good position in the University's rankings, the UPCLPAS works with the Planning, Assessment, and Quality Office to effectively monitor all the university units to make sure that different variants of the UPC name are correctly displayed in the Web of Science and Scopus so that editors of the rankings who use these sources can comprehensively retrieve all of UPC's scientific output.

Improving research assessment is another important goal. UPCLPAS currently supports the Office of the Vice-Rector for Science Policy in promoting Open Science, responsible research, and innovation. They work with the Planning, Assessment, and Quality Office to define the criteria to move toward a multi-indicator-based institutional research assessment within the frame of international initiatives such as the Leiden Manifesto and the San Francisco Declaration (DORA). Thus, it is also remarkable that the Office of the Vice-Rector for International Policy has encouraged the UPC libraries to actively participate in European networks such as LIBER (Ligue Européenne de Bibliothèques de Recherche) and CESAER (Conference of European Schools for Advanced Engineering Education and Research). As a member of the CESAER Open Science Task Force, specifically in the open-access subgroup, work is being done with 11 other technological universities to advance these initiatives in different fields (such as providing access to full texts presented at conferences or open publication monitoring). For that matter, the Open Access Observatory[5] is a new tool created by UPC's library services and the University of Barcelona (UB) that allows ongoing monitoring of the open access movement among Catalan universities (Rovira & Labastida, 2019).

The set of specific services that support UPC researchers has been shaped by the opinion or by the direct demand of the users and by the gradually positioning strategy of the UPC libraries at different stages of the research cycle, while assisting researchers and anticipating their needs. It is remarkable that direct interaction with researchers or with research support units has been of particular interest in the design and creation of new services and in the improvement of existing ones. Although a formal process of gathering information on users' satisfaction on library research services is pending (expected by 2020), previous processes of this kind, based on internal surveys and external evaluations, have provided very valuable information that has been taken into account for the evolution of existing services and the creation of new offerings. It is also common to include the end-users in the design and launching of new

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library features, starting from planned interviews and meetings depending on the goals to achieve with their participation. The diversity of the University's specialties, coupled with the decentralized structure of both the libraries and UPC itself, means that the generation of new services based on detected needs is carried out by any of the 12 libraries and not by direct indication of the strategic plan.

SOME POSSIBILITIES FOR FUTURE LIBRARY RESEARCH SERVICES AT UPC

Academic libraries will be operating within multiple scenarios in developing library research services in the near future. At UPC, those services are anticipated to be determined mainly by the information provided by assessment tools that the UPCLPAS will implement very soon: on the one hand, UPC libraries are going to conduct structured surveys among doctoral degree students and open interviews with UPC researchers; while on the other hand UPC libraries are devising a dashboard for collecting statistics and indicators to help monitor the services offered by each UPC library and the UPCLPAS as a whole. At the same time, the UPCLPAS is aware of international trends and is taking into consideration some emerging issues that are summarized below:

- **From Open Access to Open Science:** UPCommons has consolidated itself, and researchers count on the benefits of publishing in the institutional repository. Now is definitely the time to move forward and transform the existing dynamics and infrastructures in accordance with the Open Science movement. In this sense, it is planned to promote open research data and open source software repositories. Moreover, it would be useful to promote preprint archiving for open-peer review and to implement the benefits of Webs 2.0 and 3.0 (evaluating contents and notifying authors when their contents are used, among others). In addition, UPCLPAS may soon implement some functionalities related to citizen science and generating collaborative networks based on its repositories.
- **More personalized services:** The UPCLPAS plans to delve deeper into personalizing research services. The library goes far beyond being a mere service provider and seeks to become the very collaborator in the research process by participating in every stage, from designing the study to publishing the results. For instance, it is planned to consolidate the figure of the embedded librarian who already works on H2020 projects from the very beginning, and extend their presence to national projects while they will also give direct advice to doctoral students and academics. In short, UPC libraries will ideally provide researchers with a "personal librarian" service, whenever requested.
- **Bibliometrics and altmetrics services**: Greater demand is predicted for this field taking into account the acceptance of the surveys that have been already published to analyse the research on specific areas and, what is more, to help researchers with their CVs, increase the impact of UPC research, and help research units obtain quality accreditations. These surveys are forecasted to be extended to databases and platforms, such as altmetrics, which have not been used so far. Furthermore, these will provide more complete and sophisticated ways of visualization for facilitating the discovery of new possibilities in cross-disciplinary research while also focusing on improving the university's position in international rankings.

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Figure 8. Bibliometric Indicators for Architecture Journals (IBRA): Assessing researchers output on architecture (Source: Universitat Politècnica de Catalunya, Library Publications and Archives Service)

Bibliometric Indicators for Architecture Journals (IBRA): Assessing researchers output on architecture

In the particular case of architecture, there has been a historic need for consistent tools to clearly report on the quality of journals within the field as few architectural journals are indexed in Journal Citation Reports (JCR), which is the primary tool for assessing journal articles published within Spanish universities.

In 2012, UPC librarians and faculty staff devised a system that reports on indicators for journals in the field of architecture and urban planning. The system considers other quality indexes apart from JCR, including Arts & Humanities Citation Index, Avery Index to Architectural Periodicals, Carhus +, ERIH PLUS, and other databases. As this tool was considered useful by several universities, the Standing Committee of the Conference of Directors of the Architecture Schools of Spain agreed on the established criteria and methodology for classifying architectural journals, which led to brand it as Bibliometric Indicators for Architecture Journals (IBRA). It was agreed that IBRA responded to the requirements for organized information on high-quality journals that publish and disseminate knowledge for the international community. Librarians from the two architectural schools supported the establishment of this self-assessment system, and they currently keep it updated.

Regarding UPC assessing to journal articles and as a result of this new tool, the University raised awareness on the special needs of the architectural field and some other areas such as Business Administration, close to the social sciences, and adapted IBRA to design a new assessing grid particularly deserved to these fields.

- **Socializing research, spaces to share experiences:** UPC libraries already promote social work activities for young UPC researchers, mainly through the abovementioned Research Café. In this line, significant effort must be made in upcoming years not only toward adapting the physical space to new ways of sharing interdisciplinary research and novel workflow dynamics, but also toward redesigning and creating virtual services tailored to wherever researchers are located.
- **New disruptive technologies:** Big data, artificial intelligence, machine learning and blockchain are technologies that are rapidly gaining momentum in most sectors. Their eruption in research pathways and the associated information management will have a dramatic impact on the processes and tools used in library research services. Collaboration between researchers will be highly incentivated by platforms, like ResearchGate or Academia.edu, that are using these technologies.

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Institutional repositories will be able to provide semantic information to their users. University libraries have already begun to move in these new directions, especially in regard to the use of AI for better discovery tools, but library research services need to be vigilant to the emergence and impact of these technologies if they do not want to fall behind. Moreover, due to the technological nature of the UPC, UPCLPAS anticipates this impact to occur sooner at this university than in most of its surrounding environment.

USERS OF THE UPC LIBRARIES' RESEARCH SUPPORT SERVICES

As research is of foremost importance at UPC, research users are a focus of library services. All research activities related to the library or devised by the library are user-centered and UPC libraries are already used to adapting and managing changes of all kinds: technological, organizational and related to management (Codina-Vila & Íñigo, 2015). Furthermore, the vision of the UPCLPAS included in the same strategic document states that UPC libraries need to become an indispensable service for the study and research of their users.

There is a wide range of research activities conducted by the UPC researchers, and it is remarkable how much the kinds of research conducted vary. This is because there are very scientific and technological profiles performing basic and applied research and other profiles, for instance in the architectural domain, whose research is close to the social and human sciences. This means that there is a variety of research output conducted by students and academic staff. For this chapter, the classification of users of research services is going to be as follows:

Undergraduate students: bachelor's degree students usually focus their research on a final project and, in consequence, their research needs significantly differ from the other user categories dealt with in this chapter. At this stage, the majority of undergraduate students (from 65 bachelor's degrees run by UPC) need to know and access a small group of information sources and, in most cases, bibliographic management software. Therefore, they are included among the potential recipients of the library's research services.

Graduate students: master's degree students and doctoral degree students are included in this category. They are graduates that conduct research guided by a faculty researcher. As for master's students, they usually conduct research within their established syllabus or their technical specializations with the end goal of writing their master final project. With regard to doctoral students, as they don't take lectures and have almost no classes, they are a rather scattered target. They often live abroad and regularly meet their tutor through virtual or face-to-face appointments. They are, indeed, full research services users and they are in an explicit need to access and take advantage of sources and information tools. UPC has 79 master's degrees and 48 doctoral programs with more than 7,400 enrolled students. Each year, more services are delivered to graduate students and the delivery tends to be more personalized.

Faculty researchers: postdoctoral staff performing teaching and research activities and staff fully dedicated to research and pursuing an academic career are included in this category. They direct doctoral dissertations, publish papers in top academic journals, win prizes in architectural competitions, register patents, innovate in laboratory experiments, and take part in technology-based companies and European or national projects. Along with doctoral students, they become the main focus of the library research service. UPCLPAS has highlighted that professors are the main recipients of the library research services, who meet their needs and even develop tools such as the Bibliometric Indicators for Architecture

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Journals (IBRA) (Figure 8), which deal with areas of research activity that have not traditionally been well explored.

Researchers from industry/professionals: they are individuals or corporations not directly linked to the university community and are occasional users of research services that have UPC libraries as their reference point for very specialized information needs such as technical standards searches, patent searches, training on information sources management, or bibliographic software use. The UPCLPAS meets these information needs through payment services open to these users.

Almost all library services are available to all the university community. Because of its nature, some of them are particularly targeted to a group of patrons. For instance, the advisory service on patents is mainly delivered to doctoral students, faculty, and staff. In some cases, such as the devising of new bibliometric studies, the service is delivered to a research group or academic department. Table 1 provides a list of research services related to the type of user of such services.

CONCLUSION

UPC defines itself as a research university, so its libraries provide a variety of research services. The UPC Library Publications and Archives Service (UPCLPAS) organizational units shape and use strategic planning as a management tool to meet the researchers' current needs and to adapt to new research demands, and they have been doing this for the past three decades.

The economic crisis that still permeates Catalan universities has had a significant impact on the UPC libraries. For this reason, UPC libraries have sought to position themselves and engage in the UPC's research processes through internal and external collaborations at the national and international level (CSUC, Rebiun, CESAER, LIBER, and others) while continuing the lines of work begun prior to the crisis (UPCommons, CRIS administration, FUTUR, and others). Likewise, the university's commitment to improving the efficiency of its management processes has fostered this engagement and definitely helped in consolidating its services.

Besides, UPC's library research services have reached an important level of maturity in terms of personalized assistance for researchers, in products related to the publication, in the visibility of UPC research and its researchers, and in the analysis of research output through bibliometric studies or research assessment tools in the field of architecture (a subject area that was particularly deficient in regard to such evaluation tools). As for open access publishing, it has been able to achieve successful results in terms of open publication rates. UPC reaches other leading European universities' open access rates and has also promoted initiatives for monitoring open access at the universities of Catalonia, such as the Open Access Observatory, developed by UPC and UB.

Consequently, libraries now play a remarkable role in the university's research ecosystem and can be considered a major player in supporting research activities and a visible contributor to new research services, as demonstrated by the assessment of the new patent search service, one of the latest library services launched at the UPC.

Despite the complexity of a system consisting of 12 libraries spread all over Catalonia, both users and governing bodies highly value the library research services. However, a more formal evaluation is needed to show the real state of the opinion of the recipients of the services, and evidence of real impact in research output. New guides can be drawn to enhance the evolution of services according to the criteria of their users. This evaluation is planned for 2020, through a collaboration between UPCLPAS

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and UPC Planning, Assessment, and Quality Office that is going to launch a massive survey to UPC researchers. In the same way, a dashboard for quantitative analysis of research services offered by UPC libraries is planned to be operational in the near future.

Furthermore, the UPC's library services will need to be proactive to keep giving satisfactory answers to face big future challenges, such as internationalization and collaboration between researchers to move forward in increasingly multidisciplinary fields, the evolution and revolution of technologies in the generation-processing-distribution of research information, and in library systems in general. One of the strengths of the UPCLPAS staff structure has been the availability of an information and communication technologies team in-service, which has enabled a high level of innovation and provision of online services. With the forthcoming dramatic technological changes that are about to occur in the coming years, staff should be guaranteed to ensure the continuity and improvement of strategic projects.

The best way to tackle these great challenges is to advance the integration of library staff and services into the University research workflows by embedding librarians in research networks (as has already been done with the new research projects) and by maintaining the two cornerstones that have inspired the UPCLPAS activity so far: the user-orientated approach to services and the alignment with the policies and goals of the UPC.

ACKNOWLEDGMENT

The authors acknowledge the following authors for the icons used in this chapter:

- Icon made by Freepik from www.flaticon.com
- Icon made by Nhor Phai from www.flaticon.com
- Icon made by Becris from www.flaticon.com
- Icon made by Geotatah from www.flaticon.com
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- Icon made by Monkik from www.flaticon.com

Many thanks to Mr. Andrés Pérez, head of the Digital Support Unit of the Rector Gabriel Ferraté Library, for processing the images shown in this chapter, Ms. Marga Ceña, head of the Andorran Government Research Area, and Mr. Ernest Abadal, Professor of Library and Information Science, University of Barcelona, for their critical reading of the original manuscript and for their remarks that helped improve previous versions of the text. Also, thank you to Mr. Dídac Martínez, Director of the UPC Library, Publications and Archives Service, Mr. Valentí Guasch, Director of the UPC Research and Transfer Area/CTT, Mr. Lluís Anglada, Director of the CSUC Open Science Area and Mr. Lluís Belanche, Associate Professor at the UPC, for providing valuable information to the authors.

Finally, a special thanks to all the UPC Library, Publications and Archives Service staff. They make what is described in this text a reality on a day-to-day basis.

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KEY TERMS AND DEFINITIONS

Bibliometrics: Statistical methods applied to published research output.

Bibliotècnica: The digital library of the UPC, which provides access to all collections and to information regarding the resources and services offered by UPC libraries.

Current Research Information System (CRIS): Database for storing and managing information and metadata related to an institution's research activity.

Data Management Plan (DMP): Document that describes in detail all aspects related to collecting and managing research data.

FUTUR: The portal that displays the lines of research conducted by the various UPC departments and the documentary production of their researchers.

Thematic Rings: Groups made up of subject librarians in different UPC libraries, all of whom are specialized in the information sources for the subject they support.

UPCommons: The institutional repository of the UPC. It gathers the teaching and research output of all university community members and provides them in open access.

ENDNOTES

1 FUTUR can be accessed in http://futur.upc.edu

2 Bibliotècnica, the webpage of the UPC libraries can be accessed in https://bibliotecnica.upc.edu/en

3 Geocommons platform can be accessed in https://geocommons.upc.edu

4 Observatori de Recerca de la Catalunya Central https://orcc.upc.edu

5 Open Access Observatory is part of Bibliotècnica https://bibliotecnica.upc.edu/en/observatory

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Chapter 5
Gap in the Wall: A Writing Center, Offering Complex Research Support

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EXECUTIVE SUMMARY

The Writing Center is the newest, innovative service, established as a project-based initiative within the organization of the Library of Corvinus University Budapest. The present and future goals of the Writing Center require a wide spectrum of services if wanting to cater for the needs of doctoral students and faculty members. This includes traditional and novel tasks, such as fostering publication activities, combating information overload, being familiar with abstract writing, and Open Access offered to experienced and to early career researchers. The goal in this chapter is to demonstrate how the learning and research support activities of a library, comprising curricular and extra-curricular courses, trainings, and consultations can be integrated into the knowledge structures of the university as a whole. The authors place special emphasis on the role of group-based and individual mentoring throughout a university career, spanning from student to researcher, and on the development of transversal skills through the training programs of the Writing Center.

DOI: 10.4018/978-1-7998-4546-1.ch005

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THE CONTEXT

This chapter is focused on the activities of the Writing Center, which is a functional unit of the Library of Corvinus University Budapest (CUB) (henceforth Library). The Writing Center is the only institution of this type in Hungary. The chapter's title was inspired by an Ashna Shome's paper, where she speaks about a pedagogical 'gap' that can be filled by Writing Centers. The authors share with her that this is a main goal of such institutions.

The Hungarian National Strategy on the Development of Higher Education underlines that most libraries in higher education fulfill not only their traditional role but go beyond that (Emberi Erőforrások Minisztériuma [EMMI], 2016). Based on this document and mapping international trends, the "Strategic Directions for higher Education Libraries for 2018-2023" devised by the Hungarian College of University Librarians (Nagy & Karácsony, 2019) has set several priorities. Three of them, i.e. increasing student success, serving foreign students, and providing support to the research process define the philosophy and practice of the Writing Center at Corvinus University of Budapest. It provides students with structured education, state-of-the-art methodology and personalized counseling to help them become more self-sufficient in learning tasks, information searching competences and the formal requirements for publications and references. In the center of the Writing Center's education, we find academic literacy that involves the comprehension of the entire system of thinking, values and information flows of academia (Elmborg, 2006).

The University

The University of Economics of Hungary, as a separate, autonomous university was established in 1948. Prior to that, the education of economics took place at the Faculty of Economics of the Royal Hungarian University of Sciences, founded in 1920. The name and organizational structure of the University have changed several times during the past 72 years as a result of broader political changes and structural reforms concerning the higher education system of Hungary (Karl Marx University of Economics 1953-1990, Budapest University of Economics 1990-2000, Hungarian University of Economics and Public Administration 2000-2003). In 2004, the university received its current name: Corvinus University of Budapest.

The University operates on two campuses and, in the larger part of the period covered here, it was organized into 3 faculties (Corvinus Business School, Corvinus School of Economics, Faculty of Social Sciences and International Relations). As of February 2020, the faculties have been abolished and their role has been taken over by so-called university institutions. Corvinus University offers courses on bachelor, master and doctoral level. The language of the education is mainly Hungarian, but one of the strategic goals of the university is internationalization so as to raise the number of courses in English, to employ well-known lecturers from abroad, to invite guest lecturers and to accept students from all over the world.

With the 1st of July 2019, the maintenance rights of the university have been entrusted from the Hungarian State to the state-sponsored but independent Maecenas Univesitatis Corvini trust fund of public interest. This form of funding and the accompanying organizational and operational rules are unprecedented in Hungarian higher education, and the transformation is still in process to this day. As a part of this transformation, the library has been designated as one of the university competence centers

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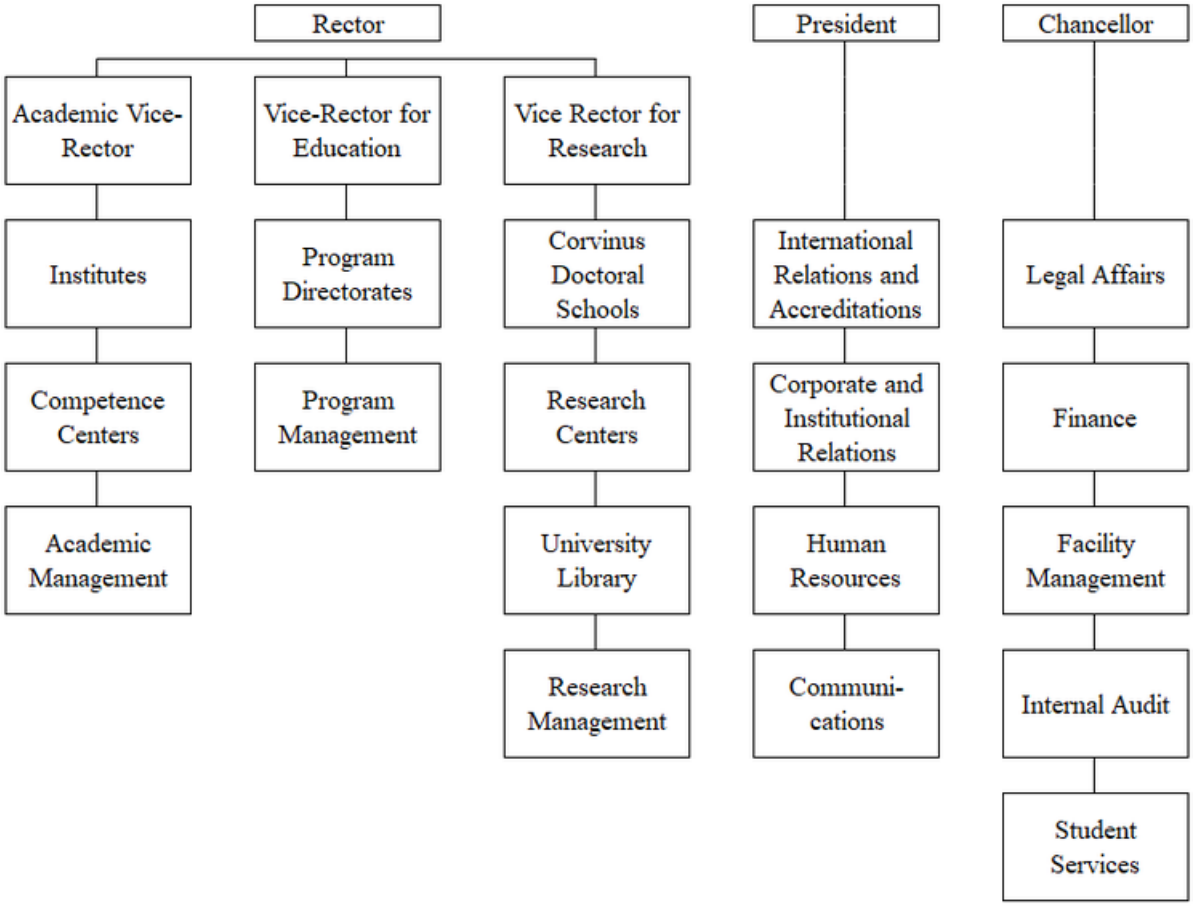
and placed under the control of the Deputy Rector for Science (Figure 1). Prior to this, the library was under the control of the chancellor, the Chief Financial Officer of the university.

Figure 1. Organization chart of Corvinus University Budapest (Corvinus University Budapest, 2019)



The mission of the Corvinus University of Budapest is to maintain an international standard of creating and transmitting values in the form of teaching, research and consulting activities, all in the context of academic freedom. The Corvinus University of Budapest regards its students, faculty, and researchers as the most important creators of value in the institution. The University pledges to promote their creative professional involvement in Hungarian and international scientific life in every possible way (Budapesti Corvinus Egyetem [BCE], 2018). In the realization of its mission, the University aims to maintain excellence in education and research and to meet the standards of international quality. The number of staff and students is represented in Table 1

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Table 1. Staff and students statistics of Corvinus University Budapest

Number of teaching staff:	538
Number of administrative staff:	462
Total number of students (2019/20):	11,341
Number of international students (2019/20):	1,878

The Corvinus University of Budapest seeks to strengthen its international presence by utilizing all potential opportunities for cooperation in international education and research. It is a core objective of the University to offer an increasing number of foreign language training and joint degree programs. A further goal is to increase student and staff mobility and to adopt a more active role in encouraging international research.

The strategic goals of the university (including research, development and innovation targets) are promulgated in the Institutional Development Program (IDP), which was adopted in 2016. The IDP envisages the development of a pronounced research profile and the identification of fields of research which will make the university not only excellent within Hungary, but also visible and significant on the international level. This includes improving the visibility and accessibility of the journals published by the university (or its units), and, equally important, improving the visibility of all research output of faculty and researchers affiliated with the university. The library's research support activities provide assistance in accomplishing this. Further goals are the development of a university-wide research database, as well as the creation of an evaluation system for the publications and the research activities of departments and other organizational units.

As of today, the library plays an active part in the development and operation of the faculty information system *Academ*, set up as the tool to handle data concerning university-related research projects. It is the library that provides data for the evaluation of the organizational units' and the researchers' activities, based on the national publication database. As a prominent element of institutional performance evaluation, improving publication results is one of the highest priorities of the university strategy. Table 2 reflects the number of publications of authors affiliated to the CUB in the last three years, as reflected in the Hungarian Scientific Bibliography[1].

Table 2. Research Output of Corvinus University Budapest. (Data source: MTMT, 2020)

	Publications	**Journal articles**	**Q1**	**Q2**	**Q3**	**Q4**	**D1**	**Books**	**Chapters**
2017	1607	655	34	36	43	25	26	111	464
2018	1914	685	21	35	59	17	28	106	631
2019	1760	714	46	60	48	16	29	102	607

The University leads the domestic higher education rankings and the national student excellence chart. The Corvinus brand is well-known both in Hungary and abroad. In 2015, the University won the *Superbrands* classification for the fifth time. The University was listed in the top 50 in the Financial Times European Masters in Management rankings. Several programs are internationally accredited:

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the International Business Program received its European Programme Accreditation System (EPAS) accreditation in 2009, the EMBA Program in 2012. The Business School is currently taking part in the Association of Advanced Collegiate Schools of Business (AACSB) American accreditation process and in the EFMD Quality Improvement System EQUIS institutional accreditation process as well (where EFMD stands for the European Foundation for Management Development).

The Library

The transformation and the strategic goals of the University discussed above have significant consequences for the service strategy, tasks and position in the organization of the Library. From February of 2016, the library, under the name University Library, is the only organizational entity of the university that provides library services. Based on its purpose and tasks, it is both a university library and an academic reference library of economics. Its foundational goal, as stated in its mission statement, is the support of education (individual and team learning) as well as scientific research through providing access to high-quality literature and academic sources and through wide-ranging, international dissemination of academic achievements. For this purpose it aims:

- to discover, make available and organize the national and international literature of the disciplines taught and researched at the University into a unique collection;
- to provide services that anticipate the needs of the 21st century, enriching research activity and learning experience;
- to preserve and present the heritage and intellectual value of the University and the disciplines taught at it; and
- to provide a community space for individual and group learning, research and communication.

The library places university students and faculty at the center of its efforts. With its efficient and collaborative services, it serves to enhance student experience and performance, to increase the research performance of faculty, while helping to achieve the University's strategic goals. The core values of the library are the following:

- serving users at the highest level;
- ensuring accessibility, equal opportunities and diversity;
- culture of collaboration both within the library and university community and with society;
- promoting knowledge, learning and innovation; and
- professionally committed, ethical and responsible work.

The library is a full member of the European Business Schools Librarians' Group (EBSLG) in order to take part in the international flow of information and disseminate best practices of academic libraries. It has a unique collection in Hungary on economics and the economic sciences, including both modern and historical literature. At the time of its foundation (coinciding with the founding of the university), it received old library collections from venerable institutions, some 105,000 volumes. Its current collection, including periodicals, is 460,000 items.

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In addition to paper-based content, subscribed electronic information sources, specialized and disciplinary search engines / platforms play an increasingly important role. Through the Hungarian National Electronic Information Service Program (EISZ), the library provides access to essential international databases (like Ebsco, Elsevier ScienceDirect, Scopus, journal bundles of Springer, Taylor & Francis, Emerald Publishing, etc.). Outside of EISZ, the library subscribes to a number of quality information sources (like OECD iLibrary, EMIS Hungary, MarketLIne, Statista databases, journal bundles of Sage Publishing, etc.).The library is the depository library of Organisation for Economic Co-operation and Development (OECD) and a member of the European Documentation Centre (EDC) network.

In 2007, the library moved to the newly-opened university building, with an area of over 4,000 m^2. In addition to the lending services space, there are 3 academic reading rooms, a journal reading room and an e-laboratory equipped with 32 workstations. The courses and training offered by the library are held in the e-lab, a room equipped with LCD screens as well as whiteboards. The library seats 631 people with Wi-Fi access and 90 computer workstations. There are five consultation rooms for 4-6 people equipped with computers and wall-mounted LCD screens, providing an opportunity for teamwork and co-learning. The Financial Laboratory, operated by the Department of Investments and Corporate Finance, equipped with Bloomberg terminals, is also part of the infrastructure but not one of the services of the library.

The Historical Research Library, accessible to researchers on appointment, serves the professional storage of the library's valuable museum collections and facilitates research for the university community.

In 2019, the number of registered users was 18,815. There were 293,457 visits from users in person and 258,299 online (using the catalogue or the web). Opening hours are 71 hours per week, which are further extended during exam periods.

The library operates with 35 employees, most of whom possess a master's degree in a relevant field of knowledge. The size of the staff is small compared to that of university libraries of similar size.

The library also has a more limited physical presence on the Székesfehérvár campus in the form of a reading room with 23 computers, 56 seats and 2 employees. The changes in the channels of library use as well as the digital information services based on the electronic collection, justify the predominance of back-office jobs, without personal interactions, and the appearance of hybrid scope of activities in the University Library. The diversification of jobs reflects the decline of traditional information services in the reading rooms and the increased emphasis on research and learning support services. The hybrid jobs created provide the opportunity to meet users and user needs, to renew the dynamics of the organization, to support the transfer of knowledge within the organization and to reduce the risk of burnout.

Parallel to the transformation of the university, the library organization was also transformed. Currently, it is divided into three departments Collection, Research Support, Reader Service (Figure 2). This structure is completed with training project teams and with the content provider and publishing activities covering the current library activities. Project work increases the role of individual initiative and collaboration, induces new learning processes and promotes a new organizational culture instead of thinking in traditional hierarchical classes and assignments.

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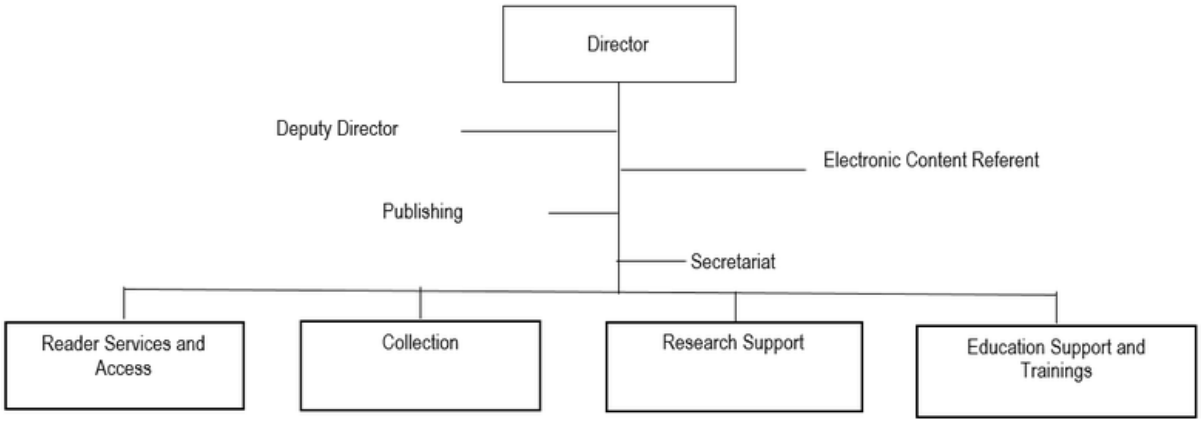
Figure 2: Organization chart of Corvinus University Library. (Source: Corvinus University Library)



The library offers a wide range of services that support education and research at the university. Taking into account the needs of each user group and taking advantage of the capabilities of advanced technology, the library provides basic services, such as lending and reference, which are offered face-to-face and in various virtual ways. In the structure of activities, there has been a shift from the basic activities of the library to, on the one hand, personalized services for university faculty and, on the other hand, to essentially unified but increasingly segmented (not personalized) services for other users. To remain relevant as an actor in academic life, the library has to become an integral part of the digital ecosystem created and used by students and researchers (Nagy, Molnár, & Kokas, 2017).

RESEARCH SUPPORT

The library's support activity to the university's ongoing research is in line with the university's Institutional Development Plan. Its aim is to help researchers shortening the phases of the research process, releasing their publications, and reducing their increased administrative burden by providing background services and developing adequate research infrastructure.

Research Support by the Library Within the Ecosystem of Corvinus University: The Institutional Framework

The most important research support activities implemented are the following:

- Extending research support to the entire research process, from design through dissemination to preservation and archiving. The library assists in the search for and acquisition of scientific information and literature, in the development of a publication strategy (providing training and consultation facilities, science metrics analysis) and in the storage, publication and dissemination of research results (operation of repositories).
- Assisting with the management of research data sets, running an advisory service;

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- Technical management of university's individual and periodical electronic publications (platform operation, acquisition of identifiers, deposit service, archiving).
- Public display of the University's knowledge map and the unique expertise of the faculty, on the university website (currently undergoing a radical redesign).
- Full responsibility for the university's publication process, both in print and electronically. This includes registration by ISBN, ISSN, and DOI. Publication rights are always vested in the University, and the person responsible for publishing is the Rector of the University. The librarian, responsible for publishing issues control and evaluates the operation of the university's publishing house, also monitoring and updating its administration, is liaising with editors and/or authors, and insuring professional liability for the quality and external appearance of the volumes, the production of the signed manuscript, and the page-setting works.
- Promoting new forms of scientific communication and the principles of open science and providing the necessary methodological support to the University, as an organization, and to researchers (participation in the development of university policies, open access publishing, scientific networks, and the dissemination of alternative metrics).

Certified publication data serve as basic information for the university's own performance evaluation system both on the level of the individual and of the organization. Such data also provide valuable input for the emerging research information system. By participating in the administration of scholarly publications providing analyses of publications, the Library supports the university in international accreditation processes and in developing its research strategy. It collaborates with faculty research committees, and the director of the library is a member of the University's Research Committee, which shows that the academic sphere within the university sees the library as a partner in achieving research goals.

The primary means of registering the data of publication and the citations that these publications receive is the Hungarian Scientific Bibliography (MTMT) database, established in 2008. Entering publications' data is the responsibility of the authors, but the CUB library supports this activity by providing group training sessions and personal consultation. Besides that, selected CUB librarians fulfill the duties of institutional administrators. They are verifying, supplementing and validating the publication data entered in the MTMT database.

Research Support: The Theoretical Framework

As stated by Linda Bergman (2010) "writing centers can be important sites for engagement with larger academic and civic communities and with other institutions, seeking to work with the university" (p. 160). They are able to do this by fulfilling the role of supporting campus culture for scholarly research and writing (Farrell, O'Sullivan, & Tighe-Mooney 2015). In her practical guide on starting a university writing center, Lotte Rienecker (2009), founder of the Academic Writing Centre at Copenhagen University, underlines that not only graduate thesis writers, but also doctoral (PhD) students are the target audience of writing centers' activities. She enumerates some concrete functions fulfilled by writing centers:

- providing courses, tutorials and workshops, in or across the disciplines, with or without cooperating with disciplinary faculty members;
- producing written materials (handouts and textbooks) on academic writing;
- offering Online Writing Lab (OWL) services, and/or online tutoring;

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- networking and building up a knowledge base with other writing programs and centers nationally and internationally; and
- providing courses, consultations and written materials to faculty.

Education for academic writing is inextricably connected to information literacy. According to Epstein and Draxler (2020) there are two main points of contact between writing center studies and information literacy. Both stem in two frames, described in the *Framework for Information Literacy for Higher Education (ACRL, 2015) are:*

- Research as [a process of] inquiry and Scholarship [is a] conversation. Taking this as a starting point and harmonizing with these frames, writing centers should set the learning goal of recognizing the components of scholarly work and that scholarship can take many forms.
- Demonstrate persistence and employ multiple strategies in research and discovery processes.
- Identify gaps in someone's own knowledge and formulate appropriate questions for investigation in academic settings.
- Evaluate the quality of information and acknowledge expertise.
- Use information effectively in their own work and make contextually appropriate choices for sharing their scholarship.
- Use information ethically and legally" (Mabrey, Clarke, & Schubert, 2018, p. 59).

Another common denominator of information literacy and writing is formed by the ideas of the Writing Accross the Curriculum (WAC) movement, which points towards the understanding of how disciplines construct their knowledge and how this can be used to make students better writers, who also possess the appropriate research skills. The question, therefore, is not only who should teach students to write and do research, but – as James K. Elmborg, one the distinguished proponents of WAC emphasizes it – we should focus on writing as an essential component of critical thinking and problem solving by switching our emphasis away from the mechanics of writing. This includes recognizing the role and importance of discourse communities that deeply influence assumptions about producing knowledge (Elmborg, 2003). This is true for doctoral students and faculty members, as well.

Indeed, language has the power to facilitate entrance into discourse communities and access knowledge. On a more practical level, today there is a need to teach science and non-science discipline specific writing skills in order to promote data literacy (Shome, 2019). As the concept of data literacy is relatively new, thus less known, let us give some details about it. It can be defined as "human competence to locate, analyze, organize, present and evaluate" research data (Schneider, 2013, p. 136). In this quality, it is cognate with information literacy as it is shown by the new definition of information literacy, which includes not only print, but data, images, and the spoken word (CILIP, 2018).

As in a discussion with Caroline Sinkinson, Rolf Norgaard underlined, information literacy education should expand across domains, as well as to new information modes and formats. If librarians as educators hold their focus on textual information only, they ignore the presence of other media that shape our everyday activities in many ways. As to data literacy, it is worth to say that it requires includes the following competencies:

- discovery and acquisition;
- management;

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- conversion and interoperability;
- metadata;
- curation;
- re-use;
- preservation;
- analysis;
- visualization;
- ethics; and
- citation (Carlson, Fosmire, Miller & Nelson, 2011).

Data citation requires distinguished attention because, at present there is no overall view that would bring together diverse aspects of it (Silvello, 2018). Moreover, it is on its way to become a source of reward and acknowledgment for researchers, thus motivating them to share and publish their data (Candela, Castelli, Manghi & Tani, 2015). From among numerous other literacies let us mention digital literacy, defined as awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources (Martin, 2006).

As Whitmire, Boock and Sutton (2015, p. 382) put it, "the increasing ease and speed with which researchers can collect large, complex data sets is outpacing their development of the knowledge and skills that are necessary to properly manage them. These skills are crucial to ensuring data quality, integrity, shareability, discoverability, and reuse over time." In contrast to metadata of publications, mainly produced by libraries, a substantial part of metadata is created by researchers themselves. In addition to this, metadata standards usually vary by discipline. However, this fact does not mean that researchers should cooperate with their libraries.

We cannot be satisfied with the traditional view of the library as a location for study or as a resource for accessing course materials. Its image as a traditional storehouse of resources obscures the work of librarians, especially of teaching librarians. WAC programs and writing center activities, however, offer genuinely useful environment to exceed such views and enable meaningful discussion about information literacy (Norgaard & Sinkinson, 2016). Writing support in academic libraries is not a natural continuation of reference services, because it is necessary to build bridges between research and writing by emphasizing the iterative nature of the research process that has the quality of making clear what one needs to know. Nonetheless, the activities of the library staff should not be restricted to helping students to find sources, but it is also necessary to explain to them what they might do with them. However, this dual role can ideally function in writing centers that are integrated into the library (Schmersal, Elder, & Detar, 2018). Writing centers should be wary of opinions that science does not belong to their spaces (Shome, 2019). Last, but not least, we should not forget that the help offered by a writing center is a means of teaching, but does not equal to doing students' work instead of them (Schmersal, Elder, & Detar (2018).

Research Support: Important Milestones

Liaison Librarians

In the development of current research, supporting activities there are three important milestones. The first of these is the creation, during the transformation of the organization in 2007, of the job post of Department Liaison Librarian. These professionals were assigned responsibilities in both research and

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educational support. The purpose of creating this system was to ensure a smooth flow of information and needs, a direct needs assessment, and to help the emergence of latent demands. In line with the system, determining the university's institutional units, a single librarian was responsible for several educational units. The librarians attended the meetings of the given institute and department, and offered personal consultations for the academic staff. They shared the current news of the library with the researchers and provided information about the principles and practices of the new culture of scientific communication and sharing.

The lecturers and researchers turned to the librarians of the given institute, department with every question concerning the library. The liaison librarians were mediating in between the lecturers and researchers and the library's responsible organizational unit or colleague of the given service. The assistance included the acquisition of specialized literature, training for students to help to search for specialized literature, publication registration tasks, and the use of the library's infrastructure. In some cases, the liaison librarian was indeed fully involved and integrated into the research process, providing assistance in searching for and managing research literature, suggesting the selection of a publication channel, and assisting in archiving and recording the publication. This kind of role and job design suited the library strategy. However, there were also some unforeseen consequences of these contacts. Parallels and detours appeared in the working processes. Depending on the personal relationship between the lecturer and the librarian, the realization of a given service varied in depth and content. Therefore, in line with the organizational goals the need for delivering services of the same content in a uniform manner became a quality assurance issue.

Due to the dysfunctionalities, this scope of activity was transformed in 2019 when the organizational structure of the library has changed. The librarians who worked as liaison librarians now work as academic support librarians. They take part in learning support activity as a project work, and provide information literacy training, as well.

The Corvinus Research Repository

The second milestone is the creation of the Corvinus Research Repository, which facilitates the archiving, management and open access to the university's research results, including publications. An important statutory task of the library is to manage and publish the content generated by the University and to act as its owner. A paradigm shift in research support activities took place in 2011. It has become evident that library functions are changing, and their role acquiring and maintaining specialized literature in support of education and research needs to be gradually supplemented by new activities adaptive and responsive to the digital ecosystem. The first step was to participate in the dissemination of research results and to create an open access digital institutional repository in line with the new science communication principles and practice.

The library operates three repositories:

- The doctoral theses defended at the university are stored in the Corvinus Dissertation Archives since 2007, which is part of the Dart-Europe E-theses Portal. Today it contains more than 1,000 dissertations and includes retrospectively the theses defended between 2004 and 2006.
- The theses, as well as the papers produced under the auspices of Student Research Societies, a unique form of cooperation between students and faculty developed in the Hungarian higher education – with limited access to the public – contains nearly 10,000 papers.

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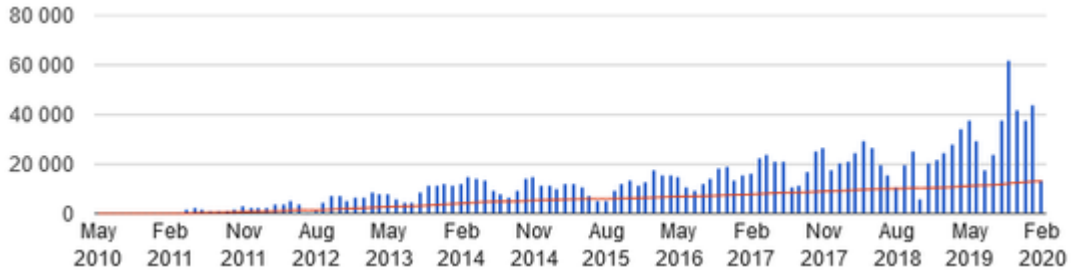
- The Corvinus Research repository, created in 2010 is a tool for the dissemination of the intellectual products, research results and publications of the University. The establishment of the repository serves the University's strategic goal, which is to increase the visibility of research activities and results, and to increase their dissemination and impact.

By operating it, the university meets the international trend to shift scientific content from print to digital. With the open access movement, more and more content is freely available not only to the scientific community, but also to the general public. According to the Rector's order, all university publications must be placed in the Repository with the appropriate permissions for service or archiving purposes. By uploading to the database, authors can also meet the open access disclosure requirements of OpenAIRE, the National Fund of Research, Development and Innovation and other research funding organizations. The repository works with the Eprints3 software. The publications in Corvinus Research are harvested by several search engines, such as Google Scholar, EconBiz, BASE, Baidu Scholar and CORE. Currently, over 4,300 publications are uploaded, with 2019 downloads exceeding 1.5 million. Along with Hungary, the number of downloads abroad is increasing, and accounting for nearly 50% of them.

Figure 3. Corvinus Research Repository Usage Statistics (Source: Corvinus University Library)



The operation of the repository ensures the impact of the research results on the university community, increases the citation of publications, and increases the prestige of the university, its units and researchers by making the results visible. It facilitates the development of national and international research communities and collaborations, accelerates the exchange of scientific information, and ensures the primacy of results. The repository is developed and operated by the colleagues of the research support department. There are two webmasters and two repository administrators in this team.

It is also a clear goal and mission of the library to train autonomous users who are familiar with the digital environment and able to adapt to the rapid changes in information technology and scientific communication habits, and to help students and researchers navigate this ecosystem. The librarian is not only meant to meet the demands of the research process (e.g. accessing full texts, keeping track of his / her own publications) but also to show the solutions, support researchers and students in information literacy, publishing management and in other learning or research related activities. The library, as a center of competencies and information hub, has the basic task of sharing knowledge (Nagy, Molnár, & Kokas, 2017).

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The Writing Center

Taking into account both the fundamental, though special place of the library in the educational environment, and the infrastructure (group study rooms, eLabs, training room) and experience of the library staff, consisting of librarians and non-librarians, the decision was taken in 2017 to establish the Writing Centre as a functional unit of the University Library. Since then, the Writing Center has been operating as the library's project-based unit, which is responsible for a broad range of training and consultations. Since the Fall semester of 2020, the Writing Center is in charge of a compulsory, credit-giving course, which is included in the official curriculum of PhD students. This is an important milestone in terms of the institutional embeddedness of the Library's research support activities, which is meant a basis, on which we plan to capitalize on and further expand in the future.

Through its activities, the Writing Center develops transversal, primarily information related and learning skills necessary for the academic and workplace success of students and faculty. There were several other factors, which justified the establishment of the Writing Center. One of the main reasons was to offer personalized counseling services both to students and to faculty members of the University. Obviously, the Writing Center must provide expert support for researchers from the ranks of CUB, of doctoral students, and members of research and innovation centers (faculty members, emeriti, and researchers employed primarily by other institutions). We place particular emphasis on the cooperation with the 10 doctoral schools at CUB: PhD candidates and early career researchers are one of the key demographic targeted by our research support activities.

The Writing Center in Action

The Educational Contents

Fostering publication activities is in accord with the main strategic goals of the University: the improvement of publication efficiency, the raising of the number of English-language publications, especially in Q1 journals i.e. falling within the quarter of journals that have the highest values in the Scopus, Scimago Scientific Journal Ranking (SJR). However, prior to the establishment of training and consultations in Academic Writing by the library in 2017, there has been no institutional support for faculty in this regard. In other words, this strategic hiatus has been filled by the library, involving activities to a substantial amount by the Writing Center. There are a number of skills and knowledge, related to the preparation of future researchers, early career researchers, and experienced ones.

In addition to expanding faculty member's literature searching and information management competencies, the focus of our activities on providing support for the academic staff's publishing activities. Distinguished attention is given to early career researchers' needs.

The information – group training – personal counseling pyramid is tailored to the needs of the users and to their motivational levels. In general, the Writing Center offers personalized service and individual consultations to those who have already participated in one of the group pieces of training. Students of doctoral schools and faculty members are exceptions, as in their cases we provide personal consultation for answering questions if stuck at any point of the research (e.g. collecting literature, managing publications, etc.).

The library has participated in supporting the development of a teaching methodology that is in line with the digital and information skills of students and supports future and early career researchers. This

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includes a recent, a university-wide project, funded in the framework of the Human Resources Operative Programme by the European Union), which aimed at turning young talents into professional researchers. This project was administered through the Writing Centre.

Training courses are also offered for early career researchers both in the fall and spring semesters. In the fall semester, we provide Database Usage and Learning Development Training aims to enable them to become familiar with and make effective use of available subscribed and external, freely available resources. We aim to train our doctoral students to the following skills and abilities:

- Finding journals that are important for the development of their research and for fostering their careers,
- Getting to know the databases of science metrics, in order to acquire the ability to set the rank of journals in their field according to their own criteria;
- Mastering the basic concepts of science metrics and be aware of alternative metrics.
- Gaining insight into the general practice of Open Access and the criteria for research integrity.

During the two-day training session, the morning lectures will be supplemented by afternoon consultations, where specific user issues, raised during the lessons, will be discussed. With intensive weekly training days in the spring semester, we focus on university practice to support the publication activities of early career researchers.

With the intention to foster ethical research behavior, the Writing Center provides publishing management training both on an ad hoc and on a systematic basis, focusing mainly on knowledge about copyright issues and publication registration methods. The training is provided with the assistance of the Hungarian Intellectual Property Office, every semester in the form of lectures and consultations. In order to place particular emphasis on ethical research behavior and the legal use of resources, online assistance and ad hoc training are provided to support academic practice. In this regard, our series for researchers explores several aspects of publishing practice. The series was created in cooperation with faculty members (primarily but not exclusively from the Institute of Business Economics, the Institute of Sociology and Communication, and the Institute of Mathematics and Statistical Modelling). This series covers publication strategy, visibility of publications, alternative science metrics, and publishing and editorial advice.

Promoting the effective ways of searching for relevant literature and datasets, and their integration into research processes and practices is needed not only for doctoral students, but also for many faculty members. Even if it may sound surprising – despite the efforts made by liaison librarians and library staff – even faculty members are not always aware of searching tools and databases to which the university subscribes. Moreover, many of them do not know how to search efficiently for information in general and in these databases, in particular. It is often difficult to change their longstanding habits, because some senior researchers keep on relying exclusively on narrow sets of well-known journals and databases.

The goal of our Academic Writing courses and training is to help students and faculty improve the communication of their ideas and findings in an academic environment. In addition to academic writing itself (i.e., the stylistic and structural conventions of academic writing and the means of efficient argumentation), our courses and training also cover oral presentations skills, and, crucially, the broader context of developing and maintaining one's academic profile as a researcher. This includes publication strategies, digital identity, networking, volunteer activities etc. We know that many doctoral students

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and faculty members have acquired presentation skills. Nonetheless, some of them want to deepen these skills, thus making use of training covering topics such as Prezi, LaTeX, and web design.

Researchers often face information overload of all kinds. This justifies the involvement of librarians as information specialists, who can help reduce this burden by advising faculty members in the choice of search strategies, and by promoting the efficient use of search tools. The Writing Center staff acknowledges the existence of information overload (IO) that influences several areas, including academia by impacting faculty, researchers and students, as it represents a challenge to make effective use of information. IO has two levels. The macro level is caused by the excessive quantity of information, and it is much more visible than the micro level. This latter level is qualitative, being essentially caused by a failure to filter information (Davis, 2011). In other words, looking critically at information provides a feasible framework for alleviating the symptoms IO. This framework involves a number of different literacies, especially information literacy that helps to understand the digital world better and to take meaningful courses of action, by making information a subject to human agency and to human understanding (Koltay, 2017). There is not only information overload, but data overload as well (Virkus & Garoufallou, 2019).

Literacies operate on a collective, societal level. Personal information management (PIM) operates on the personal level, where the needs and the role of the user appear more markedly, because here an individual stores personal information items in order to retrieve them later (Bergman, 2013a). PIM can be defined as "the practice and the study of the activities a person performs in order to acquire or create, store, organize, maintain, retrieve, use and distribute the information needed to complete tasks (work related or not) and fulfil various roles and responsibilities" (Jones, 2008, p. 453). PIM practices consist of finding information and retaining this information for future re-use. It also includes disposing of information, if it is judged to be unusable or nor worthy of the effort and/or physical space to archive it. Among PIM tools, different reference management software, such as EndNote, RefWorks, and the open source Zotero also have to be mentioned.

In their professional roles, as researchers, our faculty members and doctoral students are affected not by general social media services (SNS), not even by the employment-oriented services of LinkedIn, but by services that target scholarly researchers. ResearchGate, Academia.edu, and Kudos represent these sites. The preferred form of participating in these is uploading full texts, but they offer a wide range of services. For instance, Mendeley is not only an SNS, but also a free reference manager. We deem it important to draw attention to Google Scholar, not forgetting about its weaknesses, but pointing out that it offers value added functions and is different from Google as a general search engine.

We aim to fine-tune our offers to the various levels of our customers (undergraduate, graduate, post-graduate and faculty). In addition to providing two 4-lesson pieces of training (one for students and another for researchers), we also offer academic writing consultations, where students and faculty receive personalized advice on their current writing projects. While these training and consultations implied no credits, they have proved popular with students and faculty alike. As said above, faculty are under increasing pressure to improve their publication performance and welcome these training and consultations as a means of increasing their chances of success.

In addition to offering our own training and consultations, we are glad to cooperate with other units of the university. This includes guest appearances, such as invited presentations integrated into credit-giving courses offered by various university departments. These occasions are also useful as a means of advertising the library as a competence center when it comes to academic writing and research skills in general. A sign of success and increasing recognition within the university is the increasing number of

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such invitations is increasing, and the invitations to participate in extracurricular programs (such as for example, to give a presentation at a training, organized by a national professional association).

The Example of a Course

The training, called *Dissemination of Academic Results* provides insight into the university's Open Access practice and support, new publishing opportunities and changes in publishing habits, university publishing policy, and publishing activities. The library promotes Open Access (OA) journal and book publishing by familiarizing doctoral students and faculty members with Gold OA, which depends on Article Processing Charges (APCs) paid by the authors or their organization. For Green OA self-archiving, we remind them that some publishers require authors to delay such deposition for an embargo period. We recommend the Directory of Open Access Journals (DOAJ), which not only indexes open access, peer-reviewed, quality journals but gives access to them, especially because it can serve as a tool for filtering out predatory journals.

The lectures are followed by practice-oriented training modules in writing and presentation. Abstract writing, conference poster creation, and popular text formatting styles at the University are all presented in interactive teamwork-based lessons. When it comes to abstract writing, there is some terminological difficulty, because the word *abstract* is an umbrella term, which covers both author abstracts (abstracts produced by the authors of original papers) and abstracts written by abstractors, who are not authors of the original texts, but professionals commissioned to write them. An abstract is a text that serves to inform (informational) goals and reflects the most important information of an existing text in a form shorter than the original.

Conferences and papers abstract are very important in scientific communication. It is a good opportunity to awaken the interest of the reader. However, they did not exist in an earlier form as the full text for the other types of abstracts. Author abstracts have a number of problematic issues, first of all because some many researchers find it difficult to write adequately abstracts of their own work. The reasons for this are manifold. Authors are often too close to their papers to be able to give them an objective treatment. Besides that, very few authors are trained in writing abstracts, usually, there is a lack of knowledge of the principles, techniques and rules of abstracting. There may be insufficient experience in writing abstracts. In order to compel authors in writing better abstracts and helping them in this, several journals require structured abstracts, i.e. abstracts that are arranged according to prescribed headings (Koltay, 2010). To educate doctoral students and faculty members there is a short handbook on the theory and practice of abstracting available in Hungarian (Koltay, 2003). In line with the university's strategic goal of internationalization, we offer training in Hungarian and in English as well. The internationalization process is well illustrated by the fact that English training courses are more popular than Hungarian ones.

The intensive, weekly training courses, partly for PhD students and partly for undergraduate and master students, can be split into short lessons, fit into regular classes and cover modularity built in various areas of knowledge. Modules included in courses can be requested through a form. The inquiries are coordinated by the Head of the Research Support Unit and the Training and Learning Support Coordinator. The training tasks are fundamentally carried out by colleagues involved in information service and research support, occasionally by employees from other fields (e.g. publishing) and there are some courses held by invited lecturers. In 2019, more than one-third of the employees, 12 people, participated in educational activities. The majority of our pieces of training are conducted by academic librarians. However, courses such as Academic Writing and Research Support require specialized com-

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petences beyond their skills. For these courses, we have recruited practicing researchers. The topics and the methodology of the academic writing training are being constantly updated and the development of methodology is supported by a system of internal training, organized by the Corvinus University Teacher Training and Digital Learning Center. Table 3 offers an overview of the training, consultations and classes.

Table 3. Trainings, consultations and courses offered to researchers by the Writing Center. (Source: the authors)

	Trainings	Consultations	Courses
PhD /Researchers	Academic writing for Researchers Basics of Copyright LaTeX and Document Preparation Systems Hungarian Scientific Bibliography Database	Statistical and business databases Database Usage Academic writing for Researchers LaTeX and Document Preparation Systems Hungarian Scientific Bibliography Database	Database Usage Dissemination of Academic Results Academic Writing

We use several information channels (both university and library platforms, Facebook, and Twitter) in order to promote our training courses. The library's website provides quick access to the Writing Center, it delivers information about the training program, calendar of events and guides about services. Evaluation of training, user feedback and involvement with services are the basis of the library's quality management activity. Training evaluation was launched in the framework of university projects where there is a legal requirement to document the project, including its efficiency.

In the 2018-2019 academic year, we launched a survey in order to acquire information about the source usage habits of doctoral students. We used questionnaires, focusing on Open Access practices. On the base of 70 fulfilled forms, it turned to be evident that the students, despite their curriculum based courses and information on the library website, do not know about the green and gold access nor the reading and publishing agreements, and they use pirate pages instead of using legal browsers extensions. This feedback confirms that library training has a special role in knowledge transfer and it is able to support publication and search strategies and dissemination of research results.

PLANS FOR THE FUTURE

Our vision for future developments and the decisions resulting from it are based both on international trends and on our users' feedback.

Service Development

In general terms, monitoring the user experience increasing quality control (using both quantitative and qualitative data) and establishing channels of support and feedback between peers are important priorities for the future. In addition to knowledge transfer activities, we also envisage a role for the library in shaping the attitude and outlook of researchers. This includes increasing motivation, fostering an ethical research behavior and by conveying the current trends of international academic discourse. We plan to

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develop varied study-aids as part of the library's User Experience activities, a university-wide project involving communication students and early career researchers.

The appearance of the fourth, data-intensive paradigm of scientific research (Research 2.0, Science 2.0, eScience), brought about by the capacity of computers to search, aggregate, and cross-reference large amounts of data (Cox, Kennan, Lyon, & Pinfield, 2017), induces the need for Research Data Services (Tenopir, Sandusky, Allard & Birch, 2014). These services are highly complex as they include among other research data management, data curation, and data literacy, mainly offered by libraries (Koltay, 2019). These developments call for introducing a new range of programs at the Writing Center, as well. This means that in the future, there will be a definite need for elaborating and gradually introducing them.

Scholarly Research

There are two, planned directions that lead to outspokenly research activities. The first one is to provide a textual analysis of the opponents' reviews on doctoral dissertations. This program could uncover gaps in competence of the doctoral students and typical mistakes in the dissertations. The results from such investigations could then be incorporated into the Writing Center's training. The second aims to develop measures that display the impact of our research support activities on the success of early career researchers. This could be based on examining the citation in dissertations. Such an exercise could allow drawing conclusions about the use of doctoral students' use of the literature, success and imperfections in the way of communicating when providing research support.

CONCLUSION

As of today, Corvinus University is in the middle of large-scale structural and operational transformation. This presents both risks and opportunities for the library. Our objective is to go beyond simply maintaining our current status and to increase our role as a competence center that supports teaching and the research activities at the university. This means that the library should take an active part in the development of the brand-new research strategy of the university, supporting Open Access. The 2017-2020 strategy of the library is in force, however, the new strategy will have to adapt to that of the university.

As far as the services of the library and especially its learning support and information literacy training the quality assurance and control are the key elements of the strategy. As a part of this process, the monitoring of user experiences and employing it as feedback of training will be a crucial point of this year's agenda of work. It is also important to improve and update tutorials, to develop and provide online and multimedia content in order to support intuitive searching practices and to improve user experience.

In the shorter term, a new promotion plan is urged as part of this year's program. Though we are convinced that the university cannot function properly without the library and its research and learning support activities, we know that our services should be promoted through several communication channels. In addition to being presented in the university news stream, personal and institutional collaborations have a particularly high significance in information flow. We have to take part in research forums, research weeks, conferences, workshops and research committees working on new collaborations in order to strengthen our position and to promote our services. While our services and training are highly valued by those who have experienced them, the overall visibility of our study and research support activities still needs improvement.

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In order to provide high-quality services, the organizational culture should be shifted toward learning organization, which is in the process of considering organizational changes (hybrid scope of activities) and quality assurance and control. Acceptance of individual and organizational performance and the efforts to improve skills and knowledge are the base of this new organizational culture. The library staff is highly involved, but it should be able to acquire new competences in order to complete research support services and to launch new ones (such as research data management, publication data service to installation of a CRIS, and general support in terms of Open Access). The language skills of the staff also have to be improved, since the internationalization of the university is in process.

Currently, we can identify the following strengths, weaknesses, opportunities and threats:

- **Strengths:** strong reputation in the eyes of the university leadership and the general university community; central location on campus, state-of-the-art facilities, own content, publication management solution, driven and motivated workforce;
- **Weaknesses:** PR and communication, slow adaptation to quickly changing challenges, outdated or inadequate skills, lack of project management approach, data management inadequacies, weak language skills;
- **Opportunities:** strengthening our position by supporting the university's new strategic directions, the adaptation of new teaching and study methods, cooperation with service units of the university, organizational culture change, growing into learning;
- **Threats:** ongoing organizational change at the university and the possible emergence of other organizational units with parallel responsibilities.

Final note**:**

Due to the actual Covid-19 epidemic, the library had to move its training online. While we obviously plan to return to the traditional venues once possible, we are also determined to use this experience of digital teaching, learning, consulting and tutoring – and to use these channels creatively and judiciously in the future as well.

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KEY TERMS AND DEFINITIONS

Academic Literacy: The set of skills and abilities, needed for critically using, interpreting, and producing information valued in academia, especially for study purposes.

Data Literacy: A set of skills and abilities based on information literacy, designed to assess critically and use research data.

Information Literacy: A set of skills and abilities enables recognizing information need, finding the needed information, critically evaluating and using it for different purposes.

Information/Data Overload: A set of subjective and objective difficulties, caused mainly by the amount and complexity of information/data available and people's inability to filter out unnecessary or irrelevant information/data.

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Personal Information Management: A set of skills, applicable for collecting and maintaining a personal collection of documents produced by the given person, or acquired from other sources.

Research Support Services: A set of services, provided by a unit of a higher education institution (e.g. the library) that allows members of academic staff to spend less time on things that are not research related, in order to enable them to concentrate on research roles. Services may cover assisting in the search for and acquisition of scholarly information, in the publication process, in storing and disseminating research results.

Transversal Skills: Skills that are typically considered as not specifically related to a particular task, academic discipline or area of knowledge, thus can be used in a wide variety of situations and settings.

ENDNOTE

[1] The Hungarian Scientific Bibliography is a database maintained by the Hungarian Academy of Sciences, known by its Hungarian acronym MTMT (Magyar Tudományos Művek Tára) is a bibliography of publications of authors affiliated to Hungary. It is available at https://m2.mtmt.hu/gui2.

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Chapter 6
Research Support at University of Porto Libraries

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EXECUTIVE SUMMARY

This case study describes the research support services provided by the libraries of the University of Porto (U.Porto). The university is composed of 14 teaching units (each with its faculty library), and each faculty has a wide range of research units. U.Porto has a high research activity, which compels libraries to keep pace with the evolving researcher needs, adapting and creating new services that respond to those requirements. From a global perspective, the overall mission of these libraries is to ensure and promote access to information resources made available by U.Porto to the academic and scientific community, both in physical and electronic supports. More specifically, this case will detail the services already provided in the context of research support, ranging from specialized training sessions in scientific publishing, reference management software, or search in bibliographic databases to the creation of thematic guides, support on the publication of scientific journals from within the university, and bibliometric studies.

INTRODUCTION

With more than one hundred years of history, the University of Porto (U.Porto) is one of the largest universities in Portugal, covering teaching and research in all areas of knowledge (social sciences, humanities, applied sciences, natural sciences, and arts). Starting with two faculties (Science and Medicine), and growing especially after the Portuguese revolution in April 1974, the University increased the number of

DOI: 10.4018/978-1-7998-4546-1.ch006

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faculties to fourteen. Considering the historical and structural evolution of the University, faculties have a significant management autonomy, and libraries depend almost exclusively on the faculty director and the faculty budget (which results in very different size faculty libraries).

Despite the distributed management approach of the libraries, which promotes the proximity to each community by its specialized library, the development of information technologies and communication infrastructures, the institutional participation in consortia (as a whole and not only as single faculties), and the proximity of processes with the development of joint programs, all resulted in the creation of central services at the Rectorate (implemented in a shared services approach). For the libraries, this rationale allowed the collective acquisition of information resources and the share of systems: ALEPH is the management system used by all libraries; DSPACE is the shared institutional repository; and participation on B-On national consortium is managed by central services.

This case study aims to describe the Research Support Services provided by the Libraries of the U.Porto and how they contribute to the research output and success of the University. Following the evolution of U.Porto from a teaching school to a research orientation university, libraries are adapting their services to the development of the needs of their users: from centrality in management of local spaces to study and collection development oriented by scholar curricula, libraries implemented services to support online identity, research results publication geared by Open Access policies, and management of new electronic systems to support the evolving research processes.

To compile information from the different U.Porto Libraries, an online questionnaire was developed and sent to each library director. The survey starts with a brief characterization of the library including data about the collection, the spaces, and the staff. Next, it requests information on the services provided to support research, organized in services oriented to the research processes, then services adapted to the researcher and finally services oriented to the science communication and publication. Two additional sections, considering the specificity and current relevance, were added: research data management and infrastructures.

The questionnaire analysis confirms the perceived libraries' orientation of the services to support the publication process, clearly contributing to the growth of the number of published papers in international journals with top relevance in each research area, and the leading position of the U.Porto as a science producer in Portugal. Another result of the analysis of the questionnaire is the evidence of the evolution of library spaces to adapt to the new needs of the users is already in place or being planned by most of the libraries. Also, it is observed that collection development processes are adapting to the research needs involving researchers and research structures in the selection processes (more and more in electronic supports).

A set of new services to support research data management is required in the libraries' services portfolio, and should be developed as a common service from all U.Porto Libraries with centralized services, but also a manifest local faculty presence to manage the direct researcher and research groups' proximity should be considered. Online presence is referenced as an issue, and communication with the community has to be improved: both the university libraries' website and each library's one should be improved with a clearer presentation of the services to support the research processes (none of the sites has a research specific access point).

This case study is organized in three sections: the first section briefly presents the University of Porto and its organization, with particular focus on research and innovation infrastructures; the second section characterizes the U.Porto Libraries, their information resources, and information professionals; and the third section presents the research support services reported by libraries directors in the online

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questionnaire; libraries websites information and other promotion materials, and the personal knowledge of the authors. In each section, a brief literature review provides the context for the subsequent analysis developed.

The case concludes that the U.Porto Libraries are evolving from an organization centered on the teaching and learning processes to an organization more focused on research processes. Support for publication and online curricula management are the most implemented services, and research data management is the most required service by users (not yet formally implemented in none of the libraries). Communication with the users, especially with researchers, is seen by librarians as an urgent improvement issue, resulting in the lack of knowledge of the services already provided.

ORGANIZATION BACKGROUND: UNIVERSITY OF PORTO

With more than one hundred years, the U.Porto was formally founded on 22nd March 1911, immediately after the Portuguese Republic was established. However, the roots of the institution date back to 1762, when D. José I created the Nautical Class. This school, along with subsequent schools also created (Sketching and Drawing Class, established in 1779; Royal Academy of Maritime and Trade Affairs, in 1803; Polytechnic Academy, in 1837), were to be responsible for training students in Porto over the course of the eighteenth and nineteenth centuries, responding to the need for qualified staff in the fields of naval affairs, trade, industry, and the arts.

U.Porto was initially structured around two faculties (Science and Medicine). Over the course of the twentieth century, diversification of knowledge arose, and schools gained autonomy. Even during the 1st Republic, in 1915, the Technical Faculty was born (renamed the Faculty of Engineering in 1926), along with the Faculty of Arts in 1919 and the Faculty of Pharmacy in 1921.

After the revolution in April 1974, and until the end of the century, the University of Porto finally began to expand. The six existing faculties at the time were completed by a further eight: the Abel Salazar Institute of Biomedical Sciences (1975), the Faculty of Sport (1975), the Faculty of Psychology and Education Science (1977), Faculty of Architecture (1979), Faculty of Dental Medicine (1989), Faculty of Nutritional and Food Science (1992), Faculty of Fine Arts (1992) and Faculty of Law (1994). Today, the University of Porto has fourteen faculties and one post-graduate school, the Porto Management School, created in 1988 and whose name changed to University of Porto Business School in 2008 (University of Porto, 2014).

U.Porto is located in the city of Porto, north of Portugal, and is one of the largest universities in the country. The mission of the U.Porto is to create scientific, cultural and artistic knowledge, to provide higher education that is firmly rooted in research, to valorize knowledge both socially and economically, and to actively participate in the progress of the communities in which we are involved (University of Porto, 2020d).

U.Porto vision reinforces sustainable and transforming research, with growing influence and recognition at regional, national, and international levels, as the first pillar; the ability to provide students with an educational experience capable of promoting their capacities as the second pillar; and, as the third pillar. The current strategic plan enunciates as activities in the three main strategic areas:

- Teaching and training – with pedagogical innovation approaches contribute to the integral development of students and develop the best conditions to a full expression of their full potential; hav-

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ing internationalization as a transversal goal to all activities, both reinforcing European leadership position and strengthening relations to Latin America, Asia, and Africa.

- Research – the European Research Space in development imposes internationalization as a need and a demand, requiring human and material resources and the adoption of international quality criteria; the internal organization needs to clarify current research structures that result from 30 years of strong but unstructured growth.
- Third mission – it is urgent to promote the robust growth of UPTEC (Science and Technology Park of University of Porto) and continue to develop initiatives that promote proximity to the society, contribute to the economic valorization of knowledge and promote social responsibility (University of Porto, 2019).

The university is organized in three main campuses around the city (Polo I, City Center; Polo II, Asprela Area – extreme north of the town; and Polo III, Campo Alegre Area – western bank of the Douro River), and totally merged with the local community. Providing training in all knowledge areas, U.Porto is organized in fourteen faculties (Table 1) and one business school, The Porto Business School. These faculties offer 34 bachelor's degree programs, 142 master's degree programs, and 84 doctoral degree programs to the approximately 30.000 students at the university.

Just like the world's best universities, the U.Porto combines teaching with top scientific research. Indeed, it is the umbilical relationship between these two dimensions, creating knowledge and sharing it, that justifies its classification as a Research University (University of Porto, 2020b).

Research and Development (R&D) centers at U.Porto are part of the organic structures of the University or the interface associations that involve[1]. Besides the University, different public and private entities (industries, government agencies, etc.) also integrate these centers (University of Porto, 2020c). As a result of the efforts led by 51 research units evaluated by the Foundation for Science and Technology (FCT), the U.Porto is an essential producer of science in the country, responsible for over 23% of the Portuguese scientific articles indexed in the ISI Web of Science. From the 51 Research and Development Centres in the university, 30 have been rated as "Exceptional," "Excellent," or "Very Good," according to the last evaluation promoted by the FCT.

As the seat of learning that trained some of Portugal's leading scientists and entrepreneurs, the U.Porto also combines high levels of scientific production with a relentless commitment to the economic exploitation of its research activities. Research, Development, and Innovation (R&D+i) follow the strategy designed by the U.Porto to promote the socio-economic development of the city, the North region, and the country as a whole, a core concern of the University's Third Mission (University of Porto, 2020a). Innovation at U.Porto is regulated by the principles of intellectual property created in 2005 (University of Porto, 2005). Currently, U.Porto has 242 active patents, 31 communications of inventions processed, and 245 spin-off or start-ups companies under the Science and Technology Park of the University of Porto. U.Porto was the second Latin American university with more international patents registered between 2007 and 2010.

Research and learning activities at U.Porto are supported by Information and Communication Technologies (ICTs) and physical structures with services for students and staff. Libraries, Archives, Repositories, journals, and other materials to support research can be accessed through Documentation and Information Resources Portal[2]:

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Table 1. U.Porto Faculties and Internal Communities (Source: the authors, 2020)

	Students	Academic staff	Researchers
Polo I: City Center Campus			
Faculty of Fine Arts (Faculdade de Belas Artes, FBAUP) https://sdi.fba.up.pt	1417	76	4
Faculty of Law (Faculdade de Direito, FDUP) https://sigarra.up.pt/fdup/pt/web_base.gera_pagina?p_pagina=2306	1565	63	2
Institute of Biomedical Sciences Abel Salazar (Instituto de Ciências Biomédicas Abel Salazar, ICBAS) Faculty of Pharmacy (Faculdade de Farmácia, FFUP) https://icbas-ff.up.pt/biblioteca/index.php/pt/	2435 1270	562 81	22 1
Polo II: Asprela Campus			
Faculty of Dental Medicine (Faculdade de Medicina Dentária, FMDUP) https://sigarra.up.pt/fmdup/pt/uni_geral.unidade_view?pv_unidade=39	583	77	0
Faculty of Economics (Faculdade de Economia, FEP) https://www.fep.up.pt/servicos/sdi	3144	160	15
Faculty of Engineering (Faculdade de Engenharia, FEUP) https://biblioteca.fe.up.pt	8394	675	228
Faculty of Medicine (Faculdade de Medicina, FMUP) https://biblioteca.med.up.pt	4051	931	38
Faculty of Nutrition and Food Science (Faculdade de Ciências da Nutrição e Alimentação, FCNAUP) https://sigarra.up.pt/fcnaup/pt/web_base.gera_pagina?P_pagina=1024990	670	42	3
Faculty of Psychology and Education Science (Faculdade de Psicologia e Ciências da Educação, FPCEUP) https://sigarra.up.pt/fpceup/pt/web_base.gera_pagina?p_pagina=BIBLIOTECA_HOME	1945	105	73
Faculty of Sports (Faculdade de Desporto, FADEUP) https://biblioteca.fade.up.pt	1464	84	18
Polo III: Campo Alegre Campus			
Faculty of Architecture (Faculdade de Arquitetura, FAUP) https://sigarra.up.pt/faup/pt/web_base.gera_pagina?p_pagina=18183	1229	94	177
Faculty of Arts and Humanities (Faculdade de Letras, FLUP) https://sdi.letras.up.pt	6160	201	61
Faculty of Sciences (Faculdade de Ciências, FCUP) https://sigarra.up.pt/fcup/pt/uni_geral.unidade_view?pv_unidade=252	4320	384	131

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- The eighteen libraries of the university are structured as a network of services on the campus and occupy an area of more than 20.000 m2 providing access to more than 800.000 publications in paper, training facilities, and research support, improving the quality of the processes in teaching and learning.
- The archive services and documentation centers aim[3] to collect, acquire, and to store materials of documental value according to the institution's mission. A large part of these spaces is open to the academic community after prior authorization. The services provided are the consultation and research of information, as well as document reproduction. Historical and special collections can also be accessed in digital format.
- The Open Repository[4] is a service that provides a technological structure to collect, store and preserve intellectual production, in full text and most of the documents in Open Access, of the academic community of U.Porto.
- A wide range of scientific and educational materials, such as scientific magazines, books, and reference works in electronic format, databases from the most referenced publishers in the world can be accessed by all university community. The selection of the resources is made with the support of librarians, researchers, and all community in general.

U.Porto also provides Information and Communication Technologies (ICTs) for teaching and learning activities, with an e-learning platform (based in the open-source software Moodle) to complement or replace in-person classes. This e-learning platform is also used to provide Massive Open Online Courses (MOOC) to increase research skills (named AcademiaUP). These systems and services are all supported by the Information System for the Aggregated Management of Resources and Academic Records (SIGARRA). SIGARRA offers the academic community a set of digital resources to support their daily activities (access to the personal page and Institutional email account; information about timetables, classes, and rooms where courses are held, among other features).

U.PORTO LIBRARIES

U.Porto Libraries are today a vast universe, resultant of an evolution driven by many technological changes. Technological development led to a joint effort to standardize policies and integrate resources, and it has made Libraries broaden their scope, resulting in varied and multifaceted functions and activities.

The University has eighteen libraries:

- one for each teaching unit, with two of them sharing the same space and staff - ICBAS and Pharmacy, organized into the three geographical polos in the city;
- one from a research institute (Institute for Research and Innovation in Health – I3S Consortium);
- one for the Porto Business School;
- two libraries part of foundations (Instituto Marques da Silva e Casa Museu Abel Salazar), not considered in this case; and
- the old collection preserved at the Rectorate.

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Study Areas

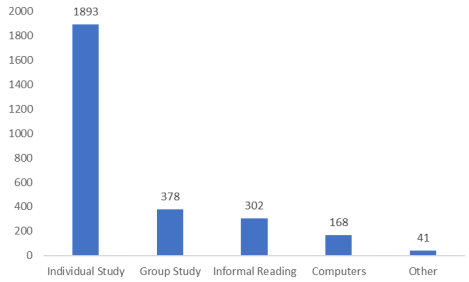
The academic environment is in continuous evolution. Academic libraries, in their role of serving students and faculty, have been following this evolution and trends. They are developing and redesigning services and library areas to make them more suited to the needs of their community in its academic activities.

At U.Porto, academic libraries have been transforming their study areas to the possible extent, adopting a more user-centered perspective. They are trying to accommodate what can be summed up as "a range of environments aimed at catering for both group and individual study, as well as a variety of learning styles; more space for social interaction; (…) good Wi-Fi connectivity and computer availability" (Ellison, 2016). All faculty libraries are open to the public, which means they can be used by any member of the U.Porto community, or even by users from other schools.

Overall, the spaces can be categorized into individual study and group study, the latter currently being one of the most sought by students to be able to do group work at the library, without disturbing those who study individually. Gayton (2008) adds the concept of communal use of library spaces: communal activities are understood as solitary and quiet but with the presence of others studying the same disciplines. The use of library spaces tends to evolve to be communal at most of U.Porto Libraries.

A factor that must be considered is that users go to the library not only for academic purposes but also for personal and social reasons (Trembach, Blodgett, Epperson & Floersch, 2019). As such, almost all libraries have been investing in the creation of informal reading areas, where users can relax, read literature, or the daily newspaper, for instance. Figure 1 presents the total number of seats available at all U.Porto Libraries.

Figure 1. Number of Seats Available (Source: the authors, 2020)



One point that cannot be overlooked is the fact that academic libraries are making the definitive transition from being only information providers to becoming also service providers. This development results from the ability to develop and deliver services that support faculty, especially researchers, in the creation of new knowledge (Sewell & Kingsley, 2017). Thus, several services have gradually been incorporated into library spaces, to which users can have access. As examples, we can refer to the Library of Engineering and the Library of Arts and Humanities, since both have a booking service for individual and group study rooms respectively, which are restricted to the community of each school only.

Other more common complimentary services are available to users. For instance, all libraries provide access to the Eduroam Wi-Fi network, accessible to the entire U.Porto community (and most academic institutions all over the world). All of them also have computers, mostly desktop ones, as well as print-

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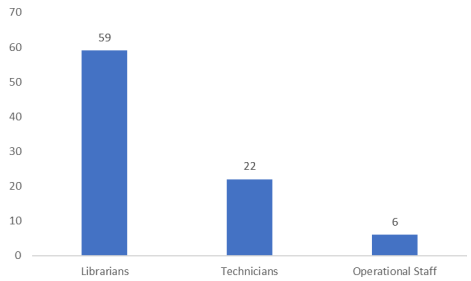
ing and digitization devices that work on a self-service basis. The Faculty of Arts and Humanities and the Faculty of Sports have laptops to lend for use in the library only. Also, the Library of the Faculty of Arts and Humanities has a loan service for other portable equipment for use in the library (ipads, kindles, and iriScans).

Information Professionals

A widely discussed topic is the profile of the information professional, that has been reinventing itself over time, evolving to meet users' needs. It is currently acknowledged that, in an academic environment, information professionals need to have a multifaceted profile, with skills and knowledge suited to the reality of its context. The American Library Association (ALA) defined the Core Competencies of Librarianship, centered on height areas of expertise: foundations of the profession; information resources; organization of recorded knowledge and information; technological knowledge and skills; reference and user services; research; continuing education and lifelong learning; and administration and management (American Library Association, 2009). This diversity of roles strengthens the theory that information professionals can perform different activities, from operational tasks to management positions, according to their level of specialization, and reflects the current situation of the U.Porto Libraries.

At U.Porto, from an organizational point of view, each library presents a similar structure, with a service director and technicians of different categories that ensure the services provided (Figure 2). Considering what was previously mentioned, it can be verified that the U.Porto Libraries have a highly specialized team of technicians, namely the superior technicians. These are required to have a degree (or higher), and their degree of specialization ranges from library science and information science to engineering and management. The combination of these areas of knowledge, and such multifaceted profile of the technical staff makes it possible to ensure traditional services across all libraries, but also to expand the libraries services portfolio with innovative methodologies, and thus, provide new services, namely those related to research support. In changing contexts (as in the pandemic context of the COVID-19 outbreak), this multifaceted profile stands out, showing the quick adaptation of all teams to remote work, and, more importantly, to remotely support users and develop support services and contents, up against the clock.

Figure 2. U.Porto Libraries Staff (Source: the authors, 2020)



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Information Resources

Whenever U.Porto students, researchers, or faculty need information for their academic assignments or scientific projects, they are likely to find it in the network of libraries existing in the University's schools, both in physical and electronic formats. Overall, the University's libraries occupy an area of more than 20 thousand square meters and have their physical collections distributed by free access shelves and closed or restricted access deposits (Universidade do Porto, 2018). Most deposit documents can be consulted or even borrowed on request.

A critical step that academic libraries are taking is to strengthen their strategic position on the challenges their institutions are facing and provide the informational resources their community deems necessary (Si, Zeng, Guo & Zhuang, 2019). Covering all areas of knowledge taught in U.Porto, it's possible to consult about 800 thousand titles of publications (Universidade do Porto, 2018), which cover books (technical and literature) and scientific journals from different thematic areas, but also the thesis and dissertations published by each faculty. There are also other types of information sources, namely multimedia, such as CDs and DVDs which are made available in several libraries.

However, technological development has largely reshaped how information is accessed and disseminated, which increased the available online information sources. All libraries provide a comprehensive set of electronic resources that can be accessed locally or remotely. As part of the B-On consortium (Online Knowledge Library), U.Porto has been experiencing a gradual expansion of access to shared electronic content, particularly, multidisciplinary subjects. However, the specificity of each thematic area and the needs of each school require local licenses in several areas.

For scientific journals, the transition to online dictated that, within the scope of the U.Porto research activities, the acquisition of titles in paper support decreased and almost disappeared. Mainly since 2007, the phase in which there was a significant transition to the online subscription's models, this revolution of the access translates in an easier way to find more information, more quickly and more up to date. However, scientific journals in paper still represent a significant and valuable volume of information that libraries keep for the sake of scientific knowledge preservation and for the usefulness they still represent, and also by considering the investment made over the years on their acquisition. Some of these titles are accessible to the public for consultation and, in other cases, due to their historical value and antiquity, are in restricted access.

As for books, U.Porto Libraries have the mission of providing the titles that are part of the mandatory bibliography of the courses, making efforts to strengthen the engagement with the academic staff to keep these resources as up to date as possible. As a Research University, part of its book collection is acquired for research projects, and, after its completion, these return to the library shelves, and can be used by the rest of the community. Having already been mentioned that libraries have informal reading places (even though no distinction is made here), a part of this number of books also refers to literature and other similar collections. The books available in U.Porto Libraries can be borrowed by users from different schools of the U.Porto University.

Thesis and dissertations are the concrete results of research carried out by students of different degrees. At U.Porto, libraries always followed the established policy of making these resources available, initially, on paper, but gradually on electronic format, since submission on this support became a requirement (Figure 3). So, the public dissemination of this type of documents has adopted new standards through the years, being made available through the individual catalogs of each of the libraries, and, also, through the integration in the University Institutional Repository (which will be presented ahead in more detail).

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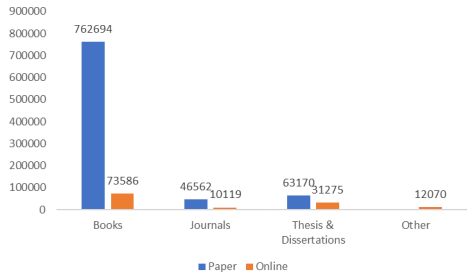
Figure 3. Number of Available Documents in Paper and Online



Considering the different access levels of online information (B-On at a national level and U.Porto central services) mostly centered in journals, collection development at U.Porto Libraries is mainly oriented to books. Whenever possible and suitable to the users' needs, the acquisition choices tend to evolve to digital formats.

RESEARCH SUPPORT SERVICES

The universities are increasingly evaluated by the research developed and its impact (Parker, 2012), so the libraries as support services must engage more with research support. The position of the universities and faculties at international rankings (which mostly use research results as indicators) decides how their quality and prestige are perceived, and research support becomes a central area to libraries that add value to the community they serve (Pritchard, 1996).

Also, U.Porto Libraries are investing time and resources to engage in the research support at the different U.Porto Faculties, after redesign and consolidation (with the Bologna Process and consequent changes to curricula) of support to teaching and learning activities and information literacy training. For convenience, we define research support services as all the activities developed by academic libraries with the objective of supporting the research activities and scientific production contributing to the improvement of their results and impact (González-Solar, 2016).

One of the first pieces of evidence of the importance of the research support services is the highlight they receive at libraries' websites, being the easy access one of the most relevant keys to their success (González-Solar, 2016). None of the eighteen U.Porto Libraries websites has a section oriented to research support. All websites (excluding the Biblioteca Alberto Saavedra da Casa-Museu Abel Salazar and the Biblioteca da Fundação Instituto Marques da Silva, which have different purposes) are organized around the information resources and the general services provided. One particular case is the I3S Library, being part of a research institute, it only provides resources or services to research activities, and its presentation reflects this unique profile at U.Porto Libraries.

For this analysis, we mostly follow the organization of the research support at libraries presented by González-Solar (2016): services to support the research process, services to support the identity management and services to support the publication and evaluation of the results. But considering the current relevance and the U.Porto institutional organization, we added three distinctive categories: evaluation and bibliometrics, research data management, and infrastructures management.

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Support for the Research Process

This category includes a set of services mostly oriented to support the process of knowledge creation and construction. We can identify some traditional library services that are provided by all U.Porto Libraries:

- Access to the document, including both the collection development, considering not only the teaching and learning but also the researchers' needs, and conducting the bureaucratic administrative process of documents acquisition on behalf of the researcher or the research units and projects. Interlibrary loan complements the library collection, and all libraries provide it.
- Availability of spaces, none of the U.Porto Libraries reports to provide library spaces oriented to the research, and they are mostly used by degree students (and the exams period corresponds to the top usage). Still, they give especially priority to younger researchers in the use of individual cabinets or access to meeting and group study rooms. Some Libraries identify the need for spaces to research and are redesigning their spaces to accommodate those unique needs.
- Reference service, reference is provided as an essential service, and special care is dedicated to the academic staff and researchers (including by email and online chat), mostly supporting the particular needs of each research project, but also supporting and conducting bibliographic searches. It is also essential to refer that as most of the libraries are associated with a faculty or research unit, the librarians are specialized in the research areas of the faculty and naturally constitute subject librarians.

Information literacy training was one of the most relevant investments by all libraries in the last years. Mostly oriented to introductory competences of the degree students, but several are already providing training sessions oriented to the research process. Advanced use of bibliographic management software (EndNote and Mendeley), databases search (WoS and Scopus), and ethical use of information are the most frequent topics.

A training course developed by the Faculty of Engineering (FEUP) Library with two academics deserves a special mention: Publishing and Scientific Writing (PEC). This course is a 3 ECTS program planned for early career researchers or first-year PhD students. It has a theoretical component presented by the library staff and one of the involved academics which covers an introduction to the scientific publication process, the main information literacy competencies, and the scientific writing specificities. This theoretical part is complemented by a practical component of writing, publishing, and reviewing a paper, providing the students with a first experience of the complete process of a journal paper publication. As a result, FEUP Library started the edition of the U.Porto Journal of Engineering (Figure 4)

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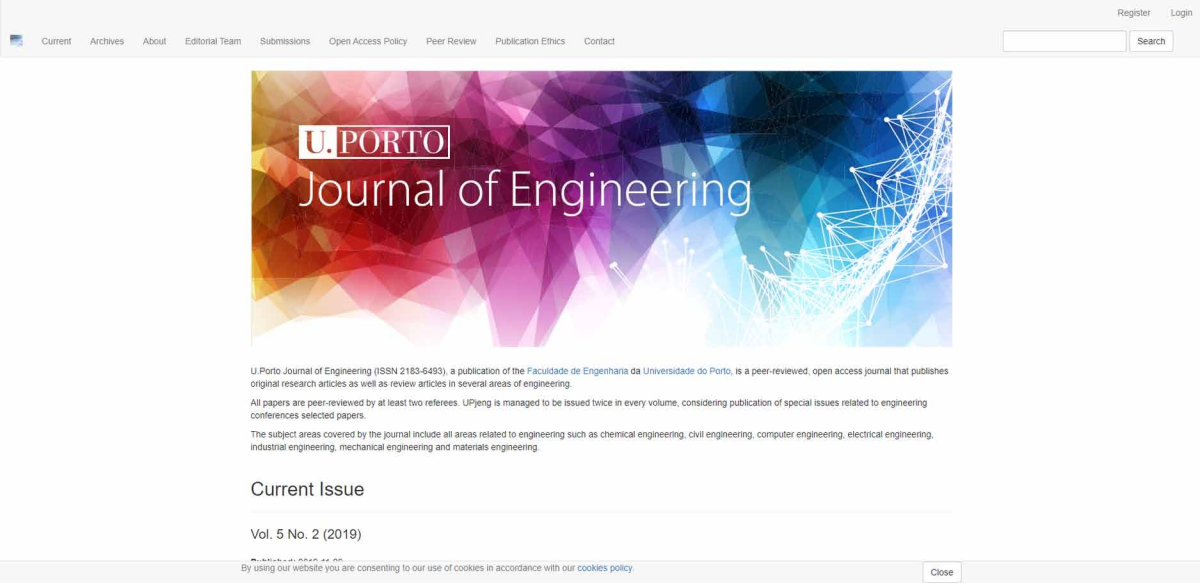
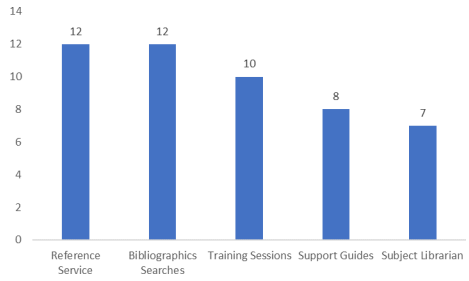
Figure 4. U.Porto Journal of Engineering (Source: Website of the U.Porto Journal of Engineering)



Complementing the training sessions, several of the U.Porto Libraries are developing self-learning guides, mostly oriented to reference software management, citation styles, bibliographical databases search tutorials. FEUP Library also developed two special guides, one about scientific publication and another specific to the selection of a journal for publication(Figure 5).

Figure 5. Services to Support the Research Process at U.Porto Libraries (Source: the authors, 2020)



The answers to the questionnaire confirm the reference service and the specialized bibliographic searches as the most common services provided by U.Porto Libraries to researchers. Despite the resulting specialization of the organization as faculty libraries, only a fraction (43%) of the librarians see themselves as subject librarians. This perception may result from the growing interdisciplinarity that obliges librarians to support different areas of research and from the support to the faculty services and teaching and learning processes, much more generic than usual research requests. None of the libraries reports acting as embedded librarians, which demonstrates that the proximity to the research processes is distant and by individual request.

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Support to the Online Identity and Curriculum Vitae Management

The growth of scientific publishing created an issue with the unique identification of authors, resulting in the need for the development of disambiguation services. ORCID is the most spread service, but many others are used in different contexts. This "personal identification codes" area associated with curricula management platforms, and researchers must use all of them to assure the correct attribution of their publications or projects and their visibility in the research community.

The role of academic libraries supporting online identity management has three main areas: promote the use of the most relevant online identification codes in the context of the institution, develop training materials (both training sessions and self-learning guides), and personal support to researchers (González-Solar, 2016). Other ways to promote the use of the online identification codes is to use them in the systems the libraries manage, such as the library catalog, the institutional repository, or the publication systems, and enrich the system's data with linked data available through those identification codes.

U.Porto Libraries are supporting researchers in the most relevant systems, even supporting the curricula development at social networks like ResearchGate, LinkedIn, or Academia.edu. This support is provided mostly by individual request as academics and researchers have no availability to complete training sessions or follow instructional guides. It is possible to identify as supported systems U.Porto Libraries (Figure 6):

- SIGARRA[5] which stands for "Sistema de Informação para a Gestão Agregada dos Recursos e dos Registos Académicos", is the U.Porto internal information system and also the CRIS system (Current Research Information Systems), registering more than 180.000 publications from U.Porto authors and almost 7.500 projects;
- Authenticus[6] is a project developed at the University of Porto and CRACS/INESC TEC, co-funded by FCT, that aims to build a national repository of publications metadata authored by researchers of Portuguese institutions;
- CienciaVitae[7] is the Portuguese scientific curriculum management system developed and managed by Fundação para a Ciência e Tecnologia, and in combination with the Ciênca ID constitutes the central system to support the modernization of the science administrative processes supported by a CV;
- ORCID promotes transparent and trustworthy connections between researchers, their contributions, and affiliations by providing an identifier for individuals to use with their name as they engage in research, scholarship, and innovation activities;
- ResearcherID, Web of Science ResearcherID integrates Publons, an environment where authors can add their publications, track citations, and manage their Web of Science record;
- Scopus Author ID, authors with publications indexed in Scopus are automatically assigned a Scopus Author ID and an author's profile, which includes the identifier, references, citations of work, h-index, and subject areas;
- Mendeley (started as a reference management software but rapidly evolved to a researchers network system with the option to claim personal publications with their statistics when integrated with Scopus;
- Google Scholar Profile allows authors to identify their publications with the usage statistics and citations so that others can find them and often find an available copy that they can read.

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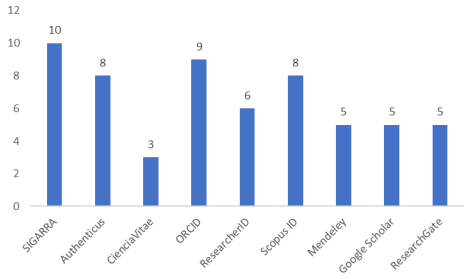
Figure 6. Online Identity Management and Curriculum Vitae Support Services at U.Porto Libraries (Source: Rthe authors, 2020)



Almost all libraries report supporting the management of SIGARRA authors' publications information, as the system constitutes the CRIS system to the U.Porto; as well as Authenticus that integrates directly with SIGARRA to import metadata from international databases (SCOPUS, Web of Science and Crossref). CienciaVitae is a new Portuguese service, researchers are starting to use it so support from libraries will be more requested with the spread of the usage. ORCID is (not surprisingly) the most supported international service, as FCT requires it to all researchers in any supported research project. Scopus Author Identifier is more supported than Researcher ID, probably explained by the more complete publication's coverage by the Scopus database when compared to Web of Science.

Science and Researcher Evaluation

Directly connected to the (online) identity of the researcher and its affiliation is the concept of prestige and reputation, a result of the quality, visibility, and impact of the publications. The institutional reputation is mostly measured by international rankings (like ARWU, Times Higher Education, or CWTS Leiden Ranking). Personal researcher indexes are evolving from the traditional bibliometrics of blind citation to new indexes of productivity and social impact (usually designated as altmetrics). At U.Porto, the institutional international rankings presence is followed and managed by the Evaluation and Quality Service at Rectorate, which spreads to all faculties and research institutes the indexes and evaluation information. Most of the faculties have internal services to manage and evaluate more detailed data.

U.Porto Libraries are progressively getting more involved in the institutional evaluation, supporting the evaluation processes of academics and researchers (career progression contest, merit awards), and providing individual citation reports by request (productivity and citation indexes). The Answers from the libraries confirm the relation established is more with individual researchers than institutional: the services related to science evaluation mostly provided are citation reports and productivity indexes, typically requested by individual researchers.

Services to Support Research Results Publication

The involvement of academic libraries with scientific communication processes has always been a reality, contributing to the visibility and impact of the research results. In this sense, the Publication services develop different services as shown in Figure 7. U.Porto Libraries are committed with authors, constituting the support to the selection of journals or conferences to submit the papers as an extension

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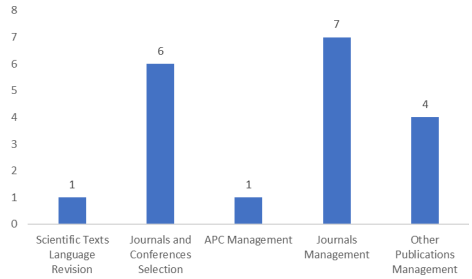
of the current reference service. A frequent requirement from academics and researchers is the identification of predatory journals and publishers and the review of the publishing agreements, recognizing the experience with Open Access and the knowledge about licenses and copyright.

Figure 7. Publication Support Services (Source: the authors, 2020)



Open Access is a long-time commitment to the University of Porto and its Libraries. The U.Porto Repository was publicly presented in 2006 and is organized in two platforms: Open Repository, which collects, preserves and provides the intellectual production, in full text and open access, of the academic community of U.Porto; and Thematic Repository, which stores, preserves and provides informational resources produced by U.Porto in specific areas or for particular audiences. The Open Repository (the Institutional Repository for the Open Access Green Route), with more than 84000 digital objects, is the largest Open Access repository in Portugal. The infrastructure is managed by UP digital and the contents deposited by authors, in close integration with SIGARRA. The U.Porto Libraries intervention consists mainly of mediating the authors' auto-deposits and validating the data submitted, assuring (as possible) data quality and consistency.

Complementing the U.Porto Edições[8] ole, several of the U.Porto Libraries contribute to the publication of books, journals, and conference proceedings, both in traditional support and online. It is possible to identify different approaches, for example: the Faculty of Sport (FADEUP) Library manages the Edições FADEUP, publishing exclusively in paper; and the Faculty of Arts and Humanities (FLUP) Library, that has a long tradition of publishing for the Faculty and developed an open access online publishing system and also supports the publishing of almost 30 current journals in Open Access

Several of the U.Porto Libraries identify as a service the attribution of publication identifiers (mostly ISBN and DOI). As important as the unique identification of authors is the unique ID of publication, assuring the quality of citation data. Handles are used by the Open Repository, being automatically attributed to the deposited publications. This unique identification is especially relevant to the thesis and dissertations that do not have another unique identifier.

The APCs (Article Processing Charges) management complements the support to publish in Open Access. Only two U.Porto Libraries are at the moment supporting the APC management: I3S Library and Faculty of Medicine Library. This is one of the areas U.Porto University needs to establish a clear policy, integrating the APC possibilities resulting from the B-On national consortium for electronic journals negotiations.

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Research Data Management Support

The research data management support is not yet a current service at U.Porto Libraries. Only the I3S Library reports supporting the publication of research data. Occasionally libraries are required to help in the definition of research data management plans for projects, as they become mandatory; however, they are not yet considered as partners either by researchers or Research and Projects Service. U.Porto is currently developing a research data management strategy combining UP digital, U.Porto Libraries, and InfoLab, the Information Systems Laboratory from FEUP and Institute for Systems and Computer Engineering, Technology and Science (INESCTEC)[9] The vision is to have DENDRO [10], an open-source platform designed to help researchers describe their datasets, entirely built on Linked Open Data and ontologies, to manage the research data inside project teams with an internal curator (a researcher from the group). The curator assures the description of research data as long as they are produced to have FAIR data at the end of the project. At the U.Porto ecosystem, UP digital will manage the DENDRO infrastructure, and Libraries will support metadata generation. People from the InfoLab research team should integrate the new service team.

Infrastructures Management

U.Porto Libraries don't report to manage physical infrastructures or spaces directly related to research support. Computer infrastructures or systems are managed by UP digital that support the informatics at all University. Examples are ALEPH, the integrated library system used, DSpace, the system used by Open Repository (U.Porto Institutional Repository), and EndNote, the reference management software, all managed by UP digital but supported by U.Porto Libraries.

To develop online publication services, FEUP and FLUP Libraries are managing systems by themselves: the PKP publication solutions (OJS, OCS, and OMP) and a locally developed system to publish non-journal documents (at FLUP Library). With the consolidation of these services, centralization (and rationalization) tends to occur, assuming UP digital the management of the systems and libraries the support.

FEUP Library reports acquiring to the FEUP community some Grammarly accounts, to help improve the quality of the English used in documents. Grammarly is an English grammar and spelling checker with some plagiarism detector functionalities.

One particular reference must be acknowledged to the digital preservation system that is being implemented at U.Porto (Libsafe). The system is managed by UP digital and intends to serve as a backend for all electronic systems at U.Porto, but the implementation started integrating libraries, archives, and repository systems. This new "hidden" layer provides additional functionalities to these management systems, assuring the long-term preservation of the documents.

CONCLUSION

As a conclusion, we can observe that in general, U.Porto Libraries present visible developments in terms of service provision regarding research support. In contrast, traditional services are not neglected and are ensured across all libraries. However, it is still necessary to go that extra mile and build on what is

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already on offer, being essential to introduce models in the libraries' organizational structures to enhance service innovation.

From a research point of view, universities are facing several challenges, specifically concerning research requirements. The new research challenges drive the need for academic libraries to innovate, providing more support to research activities, in such a way that allows them to integrate with its institutions at a strategic level (Si et al., 2019). As stated previously, U.Porto is classified as a Research University; thus, the U.Porto Libraries are compelled to follow this vision. This context creates an opportunity for them to show their relevance and to pursue a more strategic alignment with institutional objectives related to research. And can work as a catalyst for U.Porto Libraries to restructure themselves, and emerge in a new context, providing services more aligned with institutional policies and adjusted to their users' needs (Fernandez-Marcial, Costa & González-Solar, 2016).

To achieve this level of restructuring, it is urgent to rethink and renew several aspects of their structural foundations: invest in the renewal of human resources and broad even more their areas of competences and specialization (which are intended to be increasingly varied and multifaceted, to allow for an out of the box vision). The number of senior technicians in the different libraries of U.Porto is a good indicator of the level of competence of their human resources staff. However, it is necessary to invest even more in the renewal of these skills, so that libraries can be prepared to provide new and differentiated services, focused on the needs of those who do research. The absence of embedded librarians still represents a gap, which, in addition to the renewal of personnel, will require a more significant investment in hiring and training. But the recruitment of new personnel with specialized competencies will also translate into a higher level of expertise, and in creating a greater connection to faculty and students, which is something urgent to develop, particularly in the larger faculties.

Greater cooperation with other university and faculty services, such as project offices, IT units, and accounting services, is also needed so that libraries are aware of what is going on, and somehow integrate that vital part of the research life cycle. Update of U.Porto policies regarding Open Access publishing and APC (Article Processing Charges) management support must be developed in a combination of the different services supporting research activities. The revision of the Open Access policy must also include the research data publishing to adapt to most science funders' requirements.

The libraries' spaces themselves, despite having already undergone some changes, still lack specific areas for research work (rooms that allow discussion and realization of interactive sessions, spaces to create, build, and construct projects, makerspaces, presentation training rooms, 3D printers). Libraries are not always perceived by faculty administrations as the local to manage these services, but removing unused documents (as old paper journals) can create opportunities for spaces renovation and reposition libraries' perceptions.

A very crucial aspect that also needs to be worked on is building a closer relationship with researchers. A marketing approach can help libraries in the design of products and services directed to this target audience. In this context, this concept must be applied, since it is urgent to go beyond what librarians think is ideal for researchers, but tailor libraries' offer to their needs (Atkinson, 2016). For that, it is necessary to build bridges and establish relationships with them, to get to know their real needs and pain points, and co-develop services, counting on their contribution.

U.Porto Libraries already provide a consistent offer of services regarding research activities but centered in traditional library services. A new strategy, developed by all faculty libraries in cooperation with the other university and faculty services also supporting research, has to be designed to create the basis for the development of the new services required by researchers.

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Evidence of the impact of the services already provided by U.Porto Libraries to research emerges especially in publication processes, with growth both in quantity and in quality:

- This is clear in the evolution of annual publications registered in SIGARRA, with a registered growth of one thousand new publications per year from 2000 to 2010 and five hundred per year from 2010 to 2019. This growth directly results from U.Porto Libraries' contribution to the Institutional Repository investment and academic staff's evaluation support.
- Also, it is reflected in the increment of the quality of the papers published, with evidence in the number of annual papers included in Web of Science, evolving from 2.950 in 2010 to 4.881 in 2015 and 5.684 in 2019. InCites analysis also confirms this quality evolution, reporting total citations per paper of 6,10 in 2010-2014 and 9,80 in 2015-2019.

Considering the evolution of provided information resources to U.Porto users, it is also possible to infer the quality of libraries collections with the growth of citations of top documents reported in InCites, evolving from 39.672 in 2010-2014 to 57.94 in 2015-2019.

Future directions of the research support services point to the development of the communication with researchers and partnership with research project infrastructures, especially with the creation of specific areas at libraries websites. Also, the introduction of a specific service for research data management is required by the users and essential for the continous internationalization of U.Porto research.

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KEY TERMS AND DEFINITIONS

Authenticus: Is a project developed at the University of Porto and CRACS/INESC TEC, co-funded by FCT, that aims to build a national repository of publications metadata authored by researchers of Portuguese institutions.

B-On: The Biblioteca do Conhecimento Online (Online Knowledge Library) is a Portuguese national consortium that makes unlimited and permanent access available, within the research and higher education institutions, to full texts from over 16.750 scientific international publications from 16 publishers, through subscriptions negotiated on a national basis with these publishers.

CienciaVitae: Is the Portuguese scientific curriculum management system developed and managed by Fundação para a Ciência e Tecnologia, and in combination with the Ciência constitutes the central system to support the modernization of the science administrative processes supported by a CV.

DENDRO: An open-source platform designed to help researchers describe their datasets, entirely built on Linked Open Data and ontologies, and to manage the research data inside project teams.

OMP: Open Monograph Press is an open source software platform for managing and publishing scholarly books. It can be used for managing the editorial workflow required to see monographs, edited volumes and scholarly editions, through internal and external review, editing, cataloguing, production, and publication (https://pkp.sfu.ca/omp/).

Open Repository: Is the U.Porto Institutional Repository for the Open Access Green Route. With more than 84.000 digital objects, is the largest Open Access repository in Portugal.

PEC: Publishing and Scientific Writing is a training course developed by the FEUP Library with two professors. This course is a 3 ECTS program planned for early career researchers or first-year PhD students.

SIGARRA: The System for the Aggregated Management of Resources and Academic Records is the integrated information system used by all Organic Units of the U.PORTO to facilitate access to information relevant to the institution, of a pedagogical, scientific, technical and administrative nature, and to streamline internal cooperation and cooperation with the academic and business communities outside the U.Porto.

U.Porto Journal of Engineering: Is an Open Access journal published by FEUP Library developed to support the practical training of young researchers, providing a first experience of the complete process of a journal paper publication.

ENDNOTES

1 U.Porto R&D Units can be consulted in https://id.up.pt/eng/index.html

2 U.Porto Documentation and Information Resources Portal accessible in https://srdi.up.pt

3 U. Porto Archive services and documentation centers accessible in https://arquivo.up.pt

4 The U.Porto Open Repository (https://repositorio-aberto.up.pt) and the Thematic Repository (https://repositorio-tematico.up.pt) are the two repositories included in the service named U.Porto Repository (http://repositorio.up.pt)

5 SIGARRA can be consulted in https://sigarra.up.pt

6 Authenticus is accessible in https://www.authenticus.pt

7 The system CienciaVitae is accessible in https://cienciavitae.pt

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[8] U.Porto Edições can be visited in https://edicoes.up.pt

[9] The main page of the INESCTEC can be accessed in https://www.inesctec.pt/en/laboratories/information-systems-laboratory

[10] The space for DENDRO in GitHub is accessible in https://github.com/feup-infolab/dendro

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Chapter 7
Teaching Digital Competence and Scholarly Communication:
Ten Years Moving Researchers to Digital Scholarship at Pablo de Olavide University

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Universidad Pablo de Olavide, Spain

EXECUTIVE SUMMARY

The objective of the Research Support Services of the Universidad Pablo de Olavide Learning and Research Resource Center is to contribute to the improvement of the research processes as well as to maximize the results obtained and their evaluation. To this end, it offers bibliographic information and reference services, advice on the processes of publication, and evaluation, both individual and collective; standardization and digital academic identity; and, of course, training in all these areas within the context of the intensive use of digital media. For some years now, the LRRC's training of researchers has focused on the use of digital media as a part of the research process and has also integrated into the research staff training plan of the university that manages the corresponding service with which the LRRC collaborates very actively.

INTRODUCTION

The intensive use of digital tools in research processes, knowledge creation and communication are, at this stage, a reality that no researcher should ignore. However, the rapid changes that occur, both through the automation of old procedures and by the birth of new ones in the use of digital techniques can cause those researchers who do not possess the right skills to be affected and be distanced from those who do have them (JISC & British Library, 2012; Secker, 2012; Tsatsou, 2018).

DOI: 10.4018/978-1-7998-4546-1.ch007

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University libraries, which have traditionally trained their users in managing sources and information resources, have been trying for years to improve the training of researchers in the digital field with ambitious programs and initiatives.

In 2013, the Association of College & Research Libraries of the American Library Association put the matter on the table in the so-called *Intersections White Paper* (Association of College and Research Libraries. Working Group on Intersections of Scholarly Communication and Information Literacy, 2013) to address what was obvious: the need to try to transform the way in which competences are perceived and transmitted in information in the academic environment, assuming that what is digital permeates everything.

It is around this time that some authors began to highlight the change in the strong link between what is digital and new ways of scientific production and communication, including the movement for open access to science, as one of the most obvious manifestations of open systems (Basili, 2017; Friesen, Gourlay, & Oliver, 2013).

At this point, authors such as Smith-Rumsey started to define digital scholarship in the following terms:

What is new-model scholarly communication? By scholarly communication we mean the authoring, publishing, stewardship, and use of scholarship. Digital scholarship is the use of digital evidence and method, digital authoring, digital publishing, digital curation and preservation, and digital use and reuse of scholarship. And new-model scholarly communication is what results when we put those digital practices into the processes of production, publishing, curation, and use of scholarship. (Smith-Rumsey, 2011, p. 2).

As proof of this are the results of the study conducted in 2015 by Kramer and Bosman (2015). Moreover, recent European works have connected digital competence with the processes of scientific research and communication and, more generally speaking, with the context of Open Science, in this case from the perspective of the DigComp framework (McCaffrey et al., 2020).

This paper describes the efforts that are being made by the Universidad Pablo de Olavide Learning and Research Resource Center (LRRC) to make researchers work properly in the digital environment, through formal training plans and on-demand information actions.

RESEARCH SUPPORT SERVICES IN ACADEMIC LIBRARIES

But what form do library services take to respond to these changes?

Using as an example the case of Spanish academic libraries, there is a first work in which Varela-Prado and Baiget (2012) proposed services information search skills, advice on scientific publication, repositories and data curation, open data and linked data and cooperation and multidisciplinary actions as the future trends in research support.

Numerous later works continued in this line. One of them, published in 2015, referring to the Universidad de Navarra, lists the services that have been provided so far by thematic librarians:

- *review and ensure the availability of the recommended literature of the subjects in their respective areas.*
- *control magazine budgets.*

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- *provide training sessions at all levels (1st graders, preparatory sessions for the preparation of end-of-degree and master's degree work, in graduate programs, and academic staff).*
- *develop thematic guides with the SubjectsPlus program.*
- *validate the items* [sic] *of scientific production included in the University's research management database, científicacvn, which we will explain later* (Iribarren-Maestro, Grandal, Alecha, Nieva, & San-Julián, 2015, p. 133)

Also, from this year is the work of Tovar Sanz (2015) who, through the direct and selective observation of the information displayed by the Spanish libraries on their websites, emphasized the following:

- Access to the document
- Training users
- Editorial orientation
- Bibliometric guidance
- Copyright
- Institutional repository
- Calls for evaluation
- Research profile
- Bibliographical search
- Thematic advice
- Support for research funding

At the same time, another work analyzed the specific case of the Library Rector Gabriel Ferraté (Universitat Politècnica de Catalunya) concerning the scientific production portal of researchers, FUTUR (2020), mainly highlighting three axes of action (Codina-Vila & Íñigo, 2015):

- Boosting unique identifiers
- Open Access Publishing Advice
- Analysis of scientific publication on campus

Although published later, in 2015 as well, Fernández Marcial and González-Solar (2017) presented a study on the services of digital identity management in which they also analyze the research support services that would be provided by the academic libraries. More recently, in 2018, a new work provided a new analysis of Spanish university libraries, in this case (Rey Martín, Camón Luis, & Pacheco, 2018).

The integration of skills, first computer and informational, and later digital ones, in university teaching, has been one of the main objectives that has been marked by the Conference of Rectors of Spanish Universities (CRUE[1]) through the sector commission of libraries, REBIUN. In 2016 DigComp was adapted by REBIUN in order to be included in the training of undergraduate and postgraduate students from Spanish universities. For this purpose, an adaptation of DigComp (2016) and Digital Competency Descriptor Equivalence (DigComp) with the CI2 (2015) has been carried out to establish the equivalence between the objectives, contents, materials and evaluation systems of the three CI2-based levels to the new three that do so in DigComp[2].

Universidad Pablo de Olavide is a young Spanish public higher education institution founded in 1997. It is located in Seville, where it shares an area of influence with the Universidad de Sevilla, one of the

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Spanish university system's historical institutions of higher education, founded in the sixteenth century. Compared to this, and other Spanish universities, Pablo de Olavide is a small organization.

The University is in a campus on the outskirts of the city of Seville but connected to it by road, bus and a metro line. In addition, it has two more offices, one in the neighboring town of Carmona, mainly for its Summer School, and another, for institutional representation, in the center of the city of Seville. In addition, there is an associated center, located in the city itself, that teaches some undergraduate degrees.

This unique campus was built by reusing the premises of a former educational institution that occupied them until the late 1980s. It is an area of 126 hectares, in which all the teaching and research infrastructures of the University are located, and also the Andalusian Center for Developmental Biology (CABD). This includes classrooms, offices, laboratories, management areas and sports facilities. In addition, within the campus is also the Instituto de la Grasa (the Institute of Fats), a research center of the Spanish National Research Council (CSIC). Most of the buildings have been rehabilitated and adapted to the different activities that take place at the University.

Currently, just over 12,000 students are enrolled, in undergraduate and graduate programs, including master and doctoral programs. The degrees taught belong to the fields of Science, Humanities and Social Sciences, including Legal and Economic and Management Sciences. There are currently 39 undergraduate and 51 graduate degrees, including 9 doctoral programs which depend on 6 faculties and the Higher Polytechnic School, as well as the Postgraduate Studies Center and the Doctoral School in the case of these degrees.

Around a thousand academic staff(including assistants and associates) work at this university, although just over 40% are hired part-time, as associate lecturers. They are organized in 15 Departments and 10 research centers, some mixed, such as the Andalusian Center for Developmental Biology, in collaboration with the Spanish National Research Council (CSIC) and the Andalusian Regional Government (JA); and the Andalusian Center for Molecular Biology and Regenerative Medicine, which is also sponsored, in addition to the JA and CSIC, by the Universidad de Sevilla.

There are 98 research groups, many of them focused on the field of Humanities, but also a part of them on Biotechnology and Biology, Health Sciences, Experimental, Environmental, Social, Economic and Legal Sciences, as well as in Information Technologies and Production and Construction.

These groups participate in numerous research projects. During the 2018-19 academic year, there were 20 international projects that they led or collaborated on (Universidad Pablo de Olavide. OTRI, 2019, p. 16). In fact, it is one of the universities in Spain that usually obtains the most R&D projects in proportion to the doctoral faculty number (Buela-Casal, Guillén-Riquelme, Díaz-Román, Carneiro-Barrera, & Quevedo-Blasco, 2019, p. 358).

Despite the great weight of Social Sciences and Humanities at the University, in 2018 the scientific production amounted to 657 papers, with an international collaboration rate of 42.47% and with a rate of articles published in first quartile journals of the Journal Citation Reports of 52.08% (Universidad Pablo de Olavide. Biblioteca/CRAI, 2020).

In research, the main lines of work are those of strengthening the presence of the University in the mixed research centers, as well as the improvement of the international collaboration of research groups and centers. In terms of human resources, it is proposed to implement actions of attraction and stabilization of talent. The transfer of research results and knowledge is another line of work which is trying to be prioritized through the creation of technology-based companies and the increase of collaboration with the close social and production environment (Universidad Pablo de Olavide, 2018).

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Excellence and internationalization are the hallmarks of the institution. They are what aspires to strengthen it to become a benchmark at the national and international level. Both teaching and research do so by taking advantage of the agility of being a small institution. However, this is sometimes also a handicap, due to the lack of own resources that allow it to soundly deal with the circumstances that have arisen, such as budget cuts or the lack of flexibility for hiring staff and attracting talent.

There are currently two services which exclusively support research: The Research Results Transfer Office and the Research Area. In addition, in part, both the Teaching and Research Staff unit and the Learning and Research Resource Center (LRRC) have some services dedicated to this task.

The Universidad Pablo de Olavide LRRC is the result of the aggregation of a number of services, facilities and staff to the university library, which has taken place in recent years. Its main mission is to provide quality information services to the entire university community as a support to study, teaching and research. The users it serves are mainly students, and the University's teaching and research staff, although all the facilities, collections and services are available, at least in part, to the general public.

This LRRC is part of the Consortium of Andalusian University Libraries (CBUA), which enables having an excellent collection of electronic resources that connect the collection with the analog media that has existed since its creation (Consorcio de Bibliotecas Universitarias de Andalucía (CBUA). Grupo de Trabajo de MAP y ERM, 2006; Duarte Barrionuevo, 2004). Currently, the collection consists of 548,682 monographs (70.04% electronic), 30,685 titles of electronic journals and 393 printed journals, 87 bibliographic databases, and a good number of open access resources that have been selected for their incorporation into this collection. In addition, this alliance has brought about a collective catalogue (González-Fernández-Villavicencio et al., 2005) which has been in use until recently, a loan system between these institutions (Chamorro Rodríguez, 2012), and even a collaboration in the acquisition of a library management system and discovery tool (del Pozo Redondo, 2019) and the implementation of the ORCID identifier for all its researchers (Cámara-Aroca et al., 2015).

The Service is centralized in a single building of 15,000 square meters. All the services, collections and facilities are located here. More than 10,000 are dedicated to the reading room. A large part of the analog collection is also arranged in the reading area. The rest of the building is divided between undergraduate rooms, teaching seminars, computer labs, group work rooms, collaboration spaces, a work area for librarians, offices, document warehouses and general warehouses. However, the building is located far from the center of the campus and the main area of classrooms and offices, which hinders its access. In addition, the building hosts the Campus of International Excellence, CEI Cambio, and the International University Center, which is responsible for the international students' exchange programs.

In total, the LRRC employs 41 people: librarians (14), technicians (17), administrative staff (1), an eLearning technician (1), and trainees (8), mainly distributed in three areas: collection management (including the acquisition, selection and processing of materials); access to documents and spaces (including services such as the loan of all kinds of materials and the use of facilities); and services (supporting learning and research, including audiovisual services). As the structure has been evolving very slowly in recent years, the organizational chart still has dysfunctions related, above all, with the lack of personnel to cover and make all the action areas visible (Figure 1).

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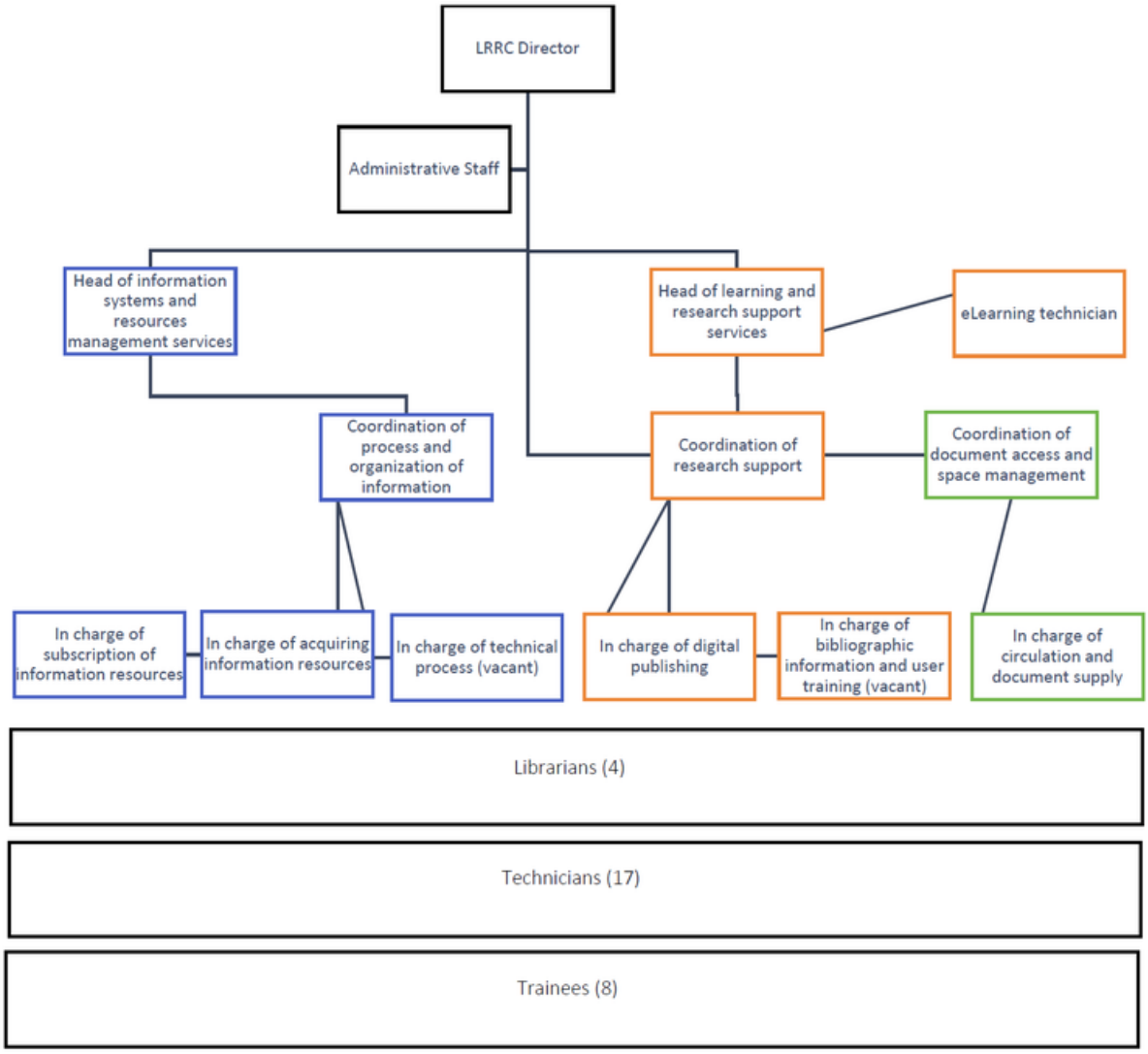
Figure 1. The Universidad Pablo de Olavide LRRC Staff. (Source: the author)



THE RESEARCH SUPPORT SERVICES AT THE UNIVERSIDAD PABLO DE OLAVIDE LEARNING AND RESEARCH RESOURCE CENTER

As has been seen, there is a strong current within the scope of academic libraries to try to provide research support services. The objective is to meet the challenges inherent in the intensive use of digital technologies and the mass production of information in the scientific field. This is, moreover, driven largely by the increased pressure to position university institutions in an increasingly competitive and global environment.

Some big questions emerge in this context:

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- What has been the implementation strategy of the Research Support Services at the LRRC of the Universidad Pablo de Olavide?
- What services are included?
- What resources does the LRRC have at its disposal to serve researchers?

Ten years ago, work began on a change that, through various avatars, has not yet been completed. At the heart of this change is user orientation as opposed to traditional orientation to information resources. The following describes this process of change in the case of attention to researchers, taking as an example the strategy of training in digital competence.

Mission, Services and Resources

The main goal of the Research Support Services of the Universidad Pablo de Olavide LRRC is to contribute to the improvement of the research processes that are carried out within the institution, as well as to maximize the results obtained and their dissemination.

Two services were created to achieve this goal: The Service of User Training and the Bibliographic Information Service, both through the former person Responsible for Information and User Training, who is since this year the Coordinator of Research Support. There are, therefore two separate services which, however, are, however, closely related. First, because they share a team: the person Responsible for Bibliographic Information and User Training, and now the Coordinator of Research Support, the librarians and the team of technicians are the same people for both services: the User Training Service and the Bibliographic Information Service, although both the librarian and the technicians have shared tasks in various procedures of other services. They also share a physical location in one of the areas of the LRRC building. However, the similarities go further. In the last few years, the synergies between the training of users, and the response to their information demands are linked by the willingness to always respond to their needs from the perspective of information skills.

Many authors have already made this relationship clear. In 2010, at the 76th IFLA Congress, Sheila Corrall held a presentation analyzing this relationship (Corrall, 2010) and reviewing previous works that affect the same relationship, such as those of Grassian & Kaplowitz (2001), Harding (2008) and Devlin (2008). These works emphasize the common approach to training in information literacy in both services. The presence of both services previously mentioned is, then, justified as being the same Responsibility. We now describe them.

As can be seen, the structure of the staffing template follows a classic scheme and is oriented toward the technical process and the use of information resources. It should be noted that, until recently, most librarians, technicians and trainees were engaged in these tasks. However, in recent years some changes have been taking place to try to change that orientation.

The first was the endowment of the person Responsible for Information and User Training position, non-existent until 2015. In this way, the training and reference tasks that were already being carried out were visible, while a structure project began to be carried out that is still under construction. With this premise, the second step was that a librarian began to perform tasks in the services of bibliographic information and user training. The third of the milestones was the specialization of the technical staff dealing with the reading room, the attention to users and the loan of materials. Thus, the technicians were divided into specialization groups: the monograph process, the process of periodicals and, finally, information and training, in which the technicians were integrated in an equal proportion. In this way,

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together with the tasks that they usually carried out, they begin to take on new ones that are much more specialized, which are coordinated from different responsibilities: the Information and Training of Users; the Circulation and Document Supply; the Acquisitions of Information Resources; the Resources Subscription; and the Standardization and Technical Process. In the case of the user information and training group, its components are mainly dedicated to three task groups: that related to user training, mainly undergraduate students; that which has to do with responding to demands for basic information via telematics; and that framed in the library's communication strategy on social media. Finally, the training plan for trainees has been modified, so that they also spend part of their two-year training period learning how training and information tasks are carried out.

2020 has brought some important changes in terms of staff, since, on the one hand, it has allowed the incorporation of another librarian for these tasks and, on the other hand, the Coordination of Research Support has been created, which has been occupied by the previous person Responsible for Bibliographic Information and User Training, whose place has been left vacant. Thus, in addition to increasing the human resources available, the structure has continued to grow in order to accommodate other previously dispersed research support services and staff. However, the group of technicians continues for the time being with its specialization tasks that are much more oriented to learning and teaching support. As a result, research support services are currently provided by the Research Support Coordinator, the person Responsible for Digital Publishing, two librarians and, in training tasks, two trainees who take turns in their shifts.

Regarding services, those currently grouped under research support are:

- User training, including training for graduate students and teaching and research staff
- User information, which encompasses specialized (copyright and intellectual property, communication and scientific evaluation, digital academic identity, open access, etc.) and bibliographic information
- Digital publishing: open publishing of institutional scientific and academic journals, open publishing of scientific, academic and institutional production in repositories, and support for the holding of congresses, conferences and seminars

The User Training Service

As mentioned, this is answerable to the Head of Learning and Research Support Services. Its mission has been evolving to incorporate the view of supporting research services and digital competence. In 2005 the mission was "to facilitate and promote the training of members of the university community in the use of the services and information resources of the Library" (Universidad Pablo de Olavide. Biblioteca, 2005). Now, in the new document, the new mission includes facilitating and promoting the training of students and the teaching and research staff to develop digital competence and the use of the information resources, and topics related to the development of the communication, visibility and evaluation of the scientific production and the development of multimedia materials (Universidad Pablo de Olavide. Biblioteca/CRAI, 2019).

The User Training Service, as part of the services offered to the teaching and research staff and students of the University began to gestate in 2010. Until then, training was underdeveloped, notably because there were no staff specifically in charge of these tasks. Training actions had been carried out within the framework of some sporadic collaborations in undergraduate subjects and master and doctoral

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programs; guided tours for new entry students; and face-to-face and online training offered by information resource providers directly, with their own staff. In any case, these actions were focused on the perspective of traditional bibliographic instruction and teaching on how to use the collection and library services, especially those which are analog and face-to-face.

At the beginning of the 2010-11 academic year, a more comprehensive training plan for researchers was started, including a series of courses on information resources by subjects and fields of interest, as well as the use of bibliographic reference management tools, specifically RefWorks. The main goal of these courses, beyond the obvious fact of training or recycling the attendees' knowledge, was to find out the degree of training and general interest of researchers regarding the use of the information resources available in the Library. At the same time, they were offered the opportunity to initiate collaboration for the delivery of these contents in their undergraduate, bachelor's or diploma courses and master's degree by the Library, logically focused on students. In addition to the specific training in scientific fields, in the same year took place the first support workshop for the submission of applications to obtain recognized six-year research periods (also known as *sexenios*), one of the main calls for evaluation of the research activity to which researchers from Spanish universities and research centers can (and in some way, must) periodically apply.

Since 1989, this has been evaluated by the National Commission for the Evaluation of Research Activity, created ad hoc as an independent body and now integrated into the National Agency for Quality Assessment in Higher Education (ANECA). This Commission annually publishes the criteria to be met by the contributions (5, in general), which must be presented in the application for the different fields and subfields into which the distinct areas of knowledge are grouped. However, the passing of the Royal Decree-Law No. 14/2012, of April 20, on urgent measures to rationalize public spending in education, introduced the possibility of using obtained *sexenios* as a scale to modulate the teaching load of academic staff and, further, in some universities, as an essential requirement to, for example, direct theses, be in tribunals, or even for tenure. This fact marked a milestone because it meant having to deal with, since then, dozens of researchers who want to participate in this call and need very specialized advice.

As a result of this intense work, the number of applications for collaboration in different subjects grew exponentially in the following academic courses. This peaked in the 2012-13 academic year, in which more than 300 face-to-face hours of training were taught.

In parallel, in the 2011-12 academic year, an offer of training was made for postgraduate degrees, including official master degrees and doctoral programs. This offer, which included a program with at least ten hours of face-to-face training per program, was also very well received, attaining almost 50% of the titles from the first year. Since the 2012-13 academic year, a specific training offer was also held for teaching and research staff training, which replaced the previous unique and fundamental one offered by the Library which, on the other hand, was based on competences and managed in collaboration with the Teaching and Research Staff Training Unit. This new catalogue includes, in addition to information skills, computer skills linked to research and competences in scholarly communication, including those related to the evaluation of research activity. In the 2013-14 academic year, we worked on the redesigning of the entire training offer, with new proposals that were launched in the 2014-15 academic year, based on another of the objectives attained: to achieve the presence of the Computer and Information Competences (CI2) in the Strategic Plan of the Universidad Pablo de Olavide 2014-2016 (Universidad Pablo de Olavide, 2013). Since 2015, different plans have been undertaken with the aim of systematizing the activities carried out in both services and with the inflows of the daily activities of other staff serving the Library.

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There is no doubt that the dedication of the specialization group to the tasks of user training was a spur to the offer that was being carried out, since it allowed generalizing it at the degree level, while enabling the release of resources to devote them to postgraduate studies and research. During the 2017-18 academic year, the transformation of this training program from the conceptual framework of Computer and Information Competences, CI2, to the European Framework for Digital Competence, DigComp, was launched. The results of implementing the framework change and the training actions designed from this change were presented in poster form to REBIUN's 17th Workshop of Digital Projects: Connecting technologies, linking content, innovating services (Delgado-Vázquez, 2018).

In the case of master students, there is also the possibility of doing the training offered by the Library that is carried out in collaboration with the academic staff in charge of this degree. Similarly, at the doctoral level, there is also a systematic and annual offer for all programs that includes not only digital competence, as in previous cases, but also those related to scientific communication. The teaching and research staff and the administration and services personnel are served by training sessions given by the Library together with the Multimedia Lab and the support of the Teaching and Research Staff Training Unit. Of all the training offers listed above, the one that is clearly defined as research support is that which is carried out for both researchers and PhD students.

Training at the doctoral level has been given for more than a decade (Delgado-Vázquez, 2015) and was systematized a few years ago through a common offer offered annually to the commissions of all doctoral programs. Beyond the obvious interest of the applicants in obtaining the degree of doctor, who then starts a serious research career, being trained in all the details related to the competences in information and scholarly communication, this offer responds to the requirements established in Article 5 of the Royal Decree 99/2011, of January 28, which regulates the official doctoral studies, including the competencies that must be acquired by candidates (España. Ministerio de Educación, 2011).

In the same way, the National Plan for Scientific and Technical Research and Innovation 2017-2020 (Gobierno de España, 2017), related to aid convened in the State R&D 2017-2020 training subprogram for pre-doctoral training, includes the following paragraph:

The design of the convocation resolutions will take into account and incorporate the present and future needs of the main institutions, companies and R&D&I agents, also incorporating aspects necessary to promote both international and institutional mobility; attracting young foreign researchers, including those linked to bilateral and multilateral scientifically collaborative agreements; the participation of doctors in training in research projects (national and European) and the acquisition of digital skills and skills necessary to apply the principles of open access to results and data from publicly (p. 45).

Beyond the generic references, the provision of training in information skills for PhD students was, as has already been said, endorsed through its inclusion in the Strategic Plan 2014-2016, within Strategic Line 1.4: Strengthen external *practices and skills training, Action 1.4.3. Integration of computer and information skills in undergraduate and postgraduate studies* (Universidad Pablo de Olavide, 2013).

The main goal is to respond to the demand by the academic commissions of the doctoral programs to include digital competence and scholarly communication in these degrees. However, only 4 of the 9 programs request this collaboration each year, while the others do so sporadically (Table 1). This is a face-to-face training program of 15 eminently practical hours in which the aim is to give a global introduction to the world of research from the perspective of scientific documentation. Most of the materials

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Table 1. Training provided in doctoral programs per academic year (Data source: Universidad Pablo de Olavide. Biblioteca, 2003-)

Program/Year	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
Business Administration and Management				X					
Biotechnology, Engineering and Chemical Technology			X	X	X	X	X	X	X
Law and Politics					X	X			
Social Sciences				X	X	X	X	X	X
Physical Activity and Sport Sciences									
Migration studies					X	X	X	X	X
History and Humanities: Europe, America, Arts and Language				X	X	X			
Society and Environment	X	X	X	X	X	X	X	X	X
Neuroscience									

have been developed using *LibGuides*, a web content manager specialized in Libraries for the design of information guides (on services, facilities, etc.), thematic guides and training materials.

The content is deployed around five units based on information literacy and scientific communication:

- Doctoral theses and digital competence: national and university regulations on the elaboration of doctoral theses, their deposit in open access, an international mention, the professional career at Spanish universities, the evaluation and accreditation systems
- Scientific information: the process of production, editing and distribution of scientific information: quality guarantees, documentary types and search tools
- General and specialized information resources, coverage and advanced use: advanced search methods, search equations, use of documentary languages, criteria for evaluation of scientific information, bibliometric tools and their applications, creation of summary and search alerts
- Working with the information: writing abstracts, tabs and annotations, management, creation and online publication of documents, writing of papers and reports, intellectual property, copyright, citations and bibliographic references, reference managers
- Publication and dissemination of works: standardization of author names, digital academic identity, scientific social networks, self-archiving and open access, impact evaluation with traditional and alternative metrics

From the 2015-16 academic year, those attending these training courses voluntarily have completed a satisfaction survey in which they have evaluated various aspects of the sessions. The content, duration, methodology, the usefulness of the course and the knowledge of the trainer have been subject to their scrutiny. The degree of general satisfaction has been above 4 out of 5 on average each year and in each edition.

As mentioned, the other major area of activity of the User Training Service in terms of research support is the training of the teaching and research staff. This training means to respond to the demand by the teaching and research staff of the University to improve their skills and knowledge in topics related

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to the search, access and use of information; the communication and visibility of their publications; scientific assessment based on bibliometric indicators; designing multimedia materials; and the use of computer tools for information management and improvement in the performance of their teaching and research activities. These are training actions that, at least since 2010, have been part of the LRRC's own offer in collaboration with the Teaching and Research Staff Training Unit. This Unit is responsible for including the LRRC's training proposals in the teaching and research staff Training Plan for each year and in the calendar. According to the dates, the Teaching and Research Staff Training Unit also takes over the reservation of spaces (physical or virtual), makes calls, selects the attendees and, finally, certifies the attendance/passing of the course after the fulfillment of the requirements. For its part, the User Training Service is assigned for the tasks of the planning of the training offer, the design of materials, and the delivery of the training actions.

Regarding the content of the training sessions, this is once again a question of emphasizing the skills and technologies related to scientific research processes and scholarly communication, including everything regarding research planning, its management, publication, dissemination and evaluation (Table 2). Sessions related to bibliographic reference managers, digital notebooks, software for collaborative work, and the use of information resources, such as databases, journal and ebook portals by topic areas. In addition, courses are also organized to support the processes of the evaluation and progress of academic careers at Spanish universities. In terms of the dissemination of research, sessions on academic profiles, academic search engine optimization and the standardization of author names, open access and repositories are included.

Table 2. Training Topic by Research Step Examples. (Source: the author)

Research Step	Training Topic
Planning	Information and Data Searching
Management	Reference Management Software
	Online and Collaborative Word Processors
	Digital Notebooks
	Cloud Tools for Collaborative Work
Publishing	Open Access and Repositories
	Copyright and Intellectual Property
	Journal Selection
Dissemination	Social Media for Academic Purposes
	Author IDs & Profiles
	Slide Presentation Tools
Evaluation	Bibliometric Indicators and Tools
	Research Activity Evaluation and Accreditation Processes

These are in most cases two to three-hour face-to-face sessions, although some of them have begun to rely on the University's virtual teaching platform. This platform uploads all materials for the course and a Q&A forum is opened, so that many of the queries that were previously made to the LRRC on

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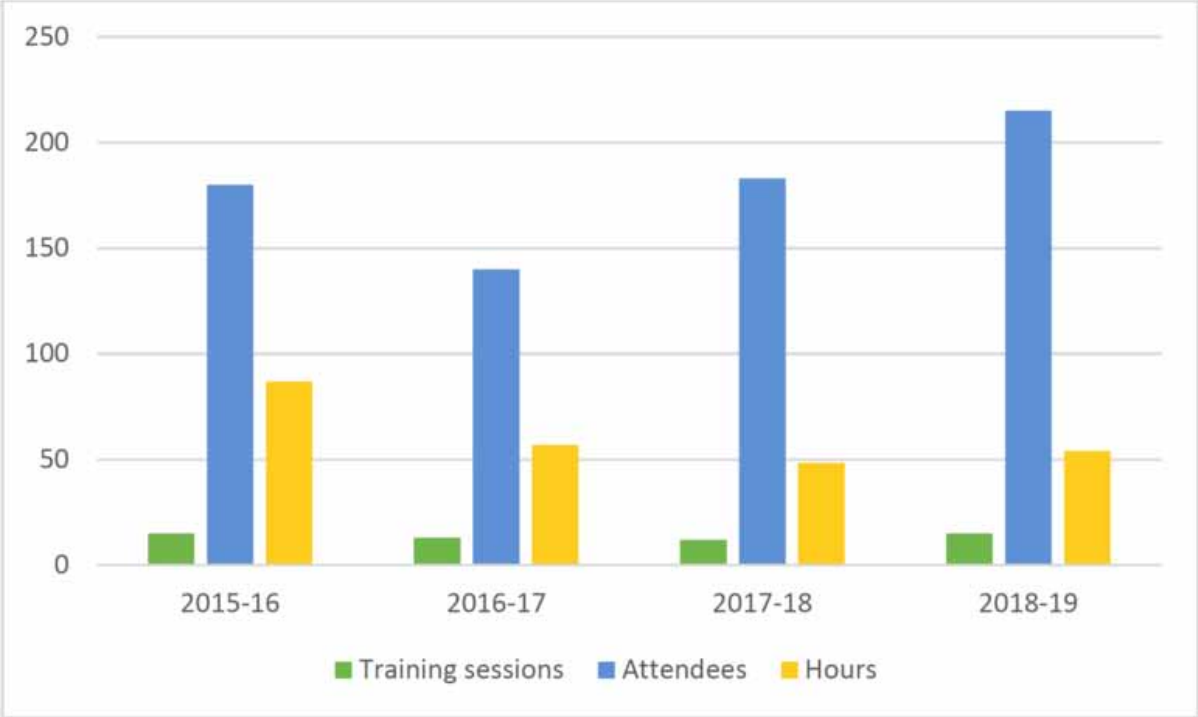
this subject are now channeled through the specific classroom created in the platform. Some sessions have begun to be taught through the video conferencing tool *BlackBoard Collaborate Ultra*. Such is the case of courses on the accreditation of research activity (*sexenios*) or updates on the use of the discovery tool, *Eureka*.

This type also includes the training sessions offered by different information resource providers. Most of them offer both face-to-face and online sessions that are disseminated and offered to researchers. These are organized through the CBUA Electronic Resources Group. They are intended for both researchers and library staff. In all cases these sessions are always coordinated and evaluated by the Library. Figure 2 provides an overview of the main data concerning the training of researchers.

Figure 2. Training for researchers, main data (Data source: Universidad Pablo de Olavide. Biblioteca, 2003-)



As in the case of doctoral students, researchers who have attended these training sessions have also filled out the corresponding satisfaction survey. In it they have evaluated the interest of the subject, the development of the sessions, the materials handed out, etc. In this case, the evaluation has also usually been higher than 4 points out of 5 on average.

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Bibliographic Information and Reference Service

The main goal of this service is to handle requests for information received by the LRRC. These requests can occur in different ways (in person, by email, contact forms, by telephone, social networks, and so on) and can be answered synchronously or asynchronously. The procedure covers general information related to the LRRC (opening hours, location, services, available information resources) and specialized information, which is obtained from proven quality information sources. In the scope of the Service is the university community and, in the case of basic information, society as a whole. Since the staff involved in the Information Service are also involved in the User Training Service, many of the information demands originate from prior training. In-person and telephone demands are managed directly at the loan/information desks by technical staff. The resolving of these demands usually involves any of the technicians who normally provide service at the desks, although, increasingly, and when the type of information requires it, these technicians are responsible for meeting these demands.

The technicians also have several jobs in the internal work area, together with the librarian who also carries out her work in Information and Training and the person Responsible for Information and User Training.

The topic of these requests for information is commonly related to the opening and closing times of facilities, location and access of documents, loan rules, sanctions, library services, available information resources, general information searches using multidisciplinary tools, environmental conditions of the building, and so forth. Technicians have been trained to resolve basic information demands. In addition, those who belong to the Information/Training Group have received more hours of training and get daily information on all these topics, as well as how to resolve the demands for information. However, many of the requests for information require more specialized knowledge and are usually sent to the internal work area of the LRRC, where they are dealt with by the Coordinator of Research Support or the librarians. These demands for specialized information have been growing in recent years, both in the number and in the thematic dispersion and complexity of their solution. Thus, in the first instance, demands were resolved on the advanced use of certain information resources, as well as requests for information searches and references.

Over time, the type of applications has varied in terms of their topic and, these days, they are more related to scholarly communications, evaluations of research curricular and other topics to do with research processes. The Information Service resolves inquiries regarding intellectual property and copyright, self-publishing, the selection of journals for publication, the location of quality and bibliometric indicators, evaluation and accreditation processes, the writing of academic papers, techniques and tools to increase visibility (scientific production profiles, repositories, social networks, scientific dissemination), both individually and from groups of researchers and/or journals staff, etc.. Yet there are also others concerned with information management: bibliographic reference managers, content managers, digital notebooks, data management, etc.; and of course, those to do with searching for information in the broader sense of the concept from very basic questions about how to examine information resources (databases, for instance), to the location and selection of sources of information specialized in very specific topics, through the elaboration and correction of search strategies, the creation of alerts, and so on.

Both specific questions and queries that require the preparation of some type of report are answered. Applications are also reviewed and corrected for the various accreditation and evaluation processes. This type of consultation consumes a greater part of the resources and, due to the depth and complexity of the queries, many of them end up with one or more face-to-face appointments, individually or in groups,

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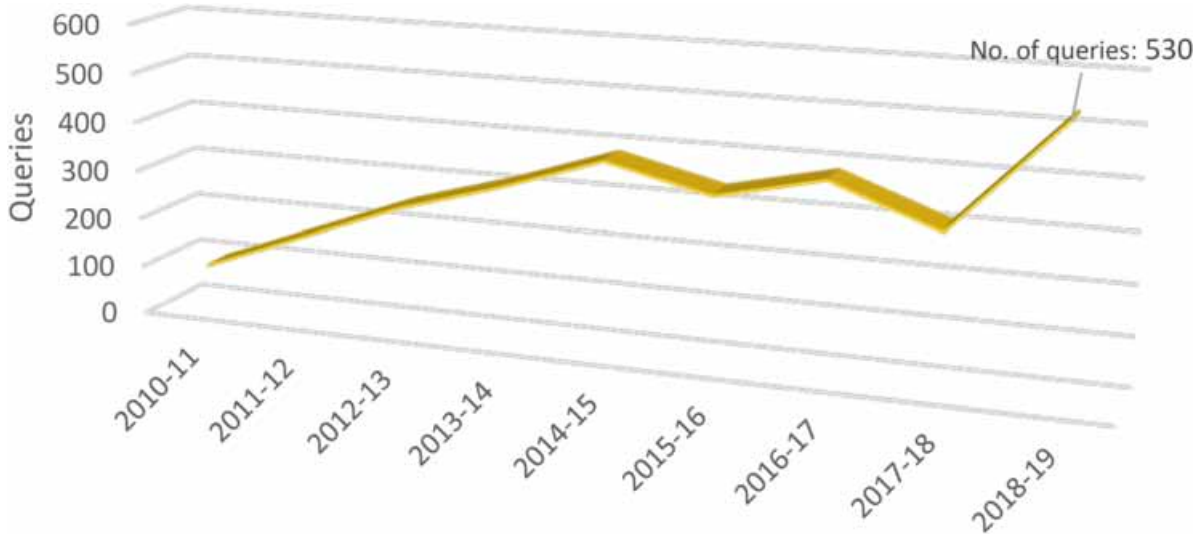
in which the main topics are covered. In this sense, since the Service began advising the accreditation calls of the faculty of the Academia program for associate lecturers and lecturers (ANECA), the PEP program for associate lecturers (tenure track) and lecturers, (ANECA and the Andalusian Regional Agency for Quality Assessment in Higher Education, DEVA) and *sexenios*. However, there have recently been many consultations related to other evaluation processes and funding calls from Regional, National and European Funding programs. Finally, consultations from other areas and services of the University are also answered and resolved, as well as from sole-member and collegiate bodies, usually related to intellectual property, visibility, publication and scientific evaluation.

The year 2018 was a landmark in what attention to researchers implies due to the call of the Knowledge Transfer and Innovation *Sexenios* (Delgado-Vázquez, 2019). With the leadership of the LRRC (in permanent communication with the Vice-Chancellors of Academic Staff and Research and Technology Transfer, and with the Research Area) a number of applications were processed, not without problems since it was the first call of its kind at the national level, which accommodated all scientific disciplines and that could be presented by any academic staff who already had a *sexenio* granted and this was, therefore, a relatively new topic, given that the call was only known a few days earlier and the criteria were outlined during the application period. Without reference documentation and having no similar processes to rely on, this has been a real challenge whose results should begin to be seen in a few months. It should not be forgotten that in addition to the extraordinary call, applicants for the ordinary call were also served, as every year. No records are kept of this synchronous attention that provide us with information about the number of queries, typology, user satisfaction, etc., beyond those that have to do, as has been said, with the request of appointment by the user in the case of specialized queries. However, data is collected from the queries that arrive through digital media. This information pathway has also experienced remarkable growth in recent times. Thus, since its launch in 2008, the number of requests for information has continued to grow, year by year (Figure 3).

Figure 3. Number of queries through Infobib, per academic year (Data source: Universidad Pablo de Olavide. Biblioteca, 2003-)



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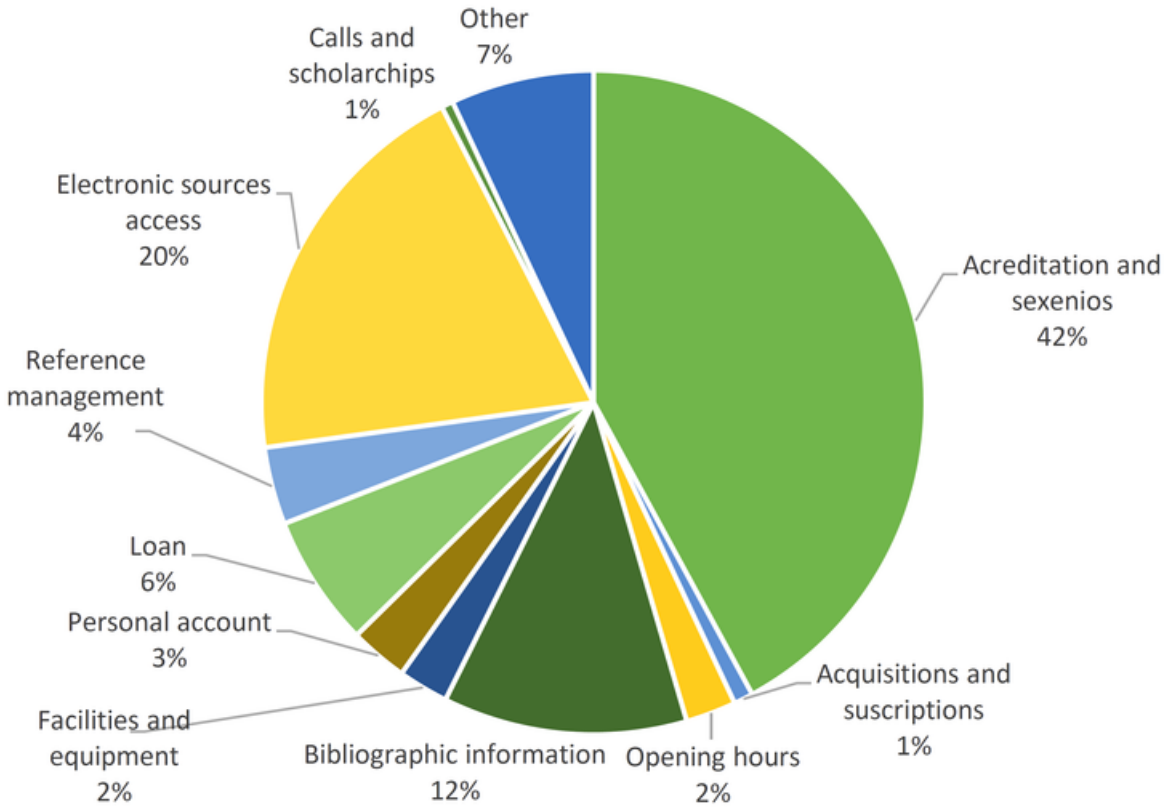
In the case of an asynchronous response service, that is, by definition it allows the users to make their demands for information at any time, regardless of the hours of service and the availability of personnel, an important aspect to take into account is that of response times. This is an aspect which the Service places special emphasis on, since it is understood that many of the questions raised by users need a quick response as they interfere in the development of their research, learning, teaching and management, as the case may be. Thus, in recent years these response times have been gradually decreasing to an optimal percentage of immediate response. As far as the topic of consultations is concerned, it does not really differ too much from the topics demanded in face-to-face and telephone consultations, both at the basic and specialized levels. Figure 4 shows the main topics of the queries for the 2018-19 academic year, the last for which we have complete data.

Figure 4. Main topic of queries through Infobib (Data source: Universidad Pablo de Olavide. Biblioteca, 2003-)



Specialized queries are coded in Accreditation and *Sexenios*, Bibliographic Information, Reference Managers and Electronic Resources. Thus, during the last course these accumulated 76% of the consultations.

Regarding the type of user using this Service, the data are presented, again based on the 2018-19 academic year, divided by groups: undergraduate and master students; researchers and PhDs; administrative staff; and external users (Figure 5).

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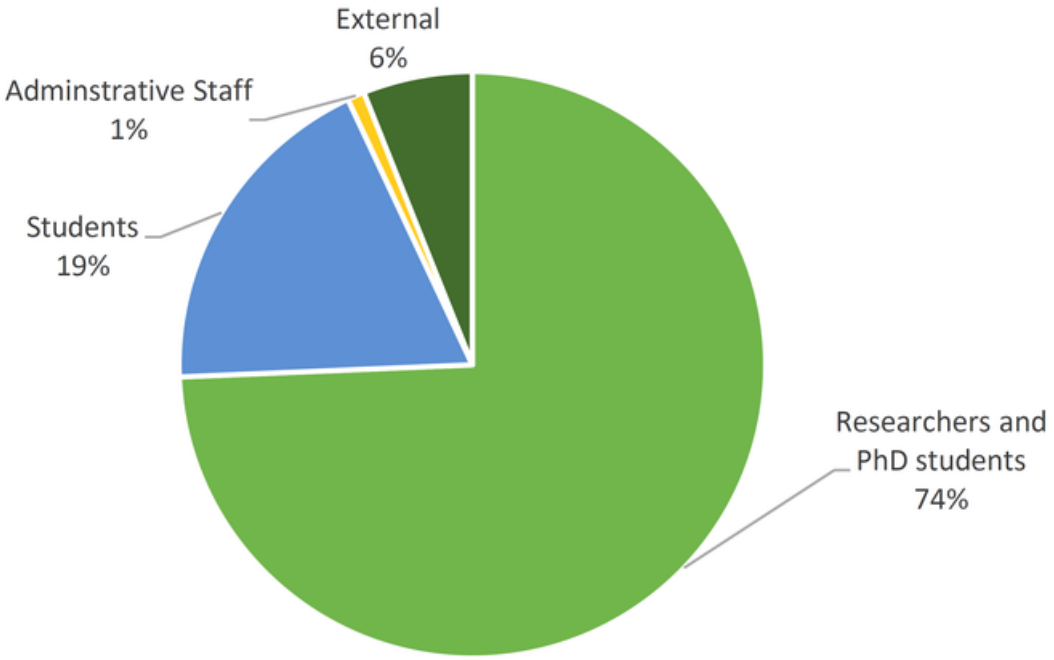
Figure 5. User Typology of Infobib (Data source: Universidad Pablo de Olavide. Biblioteca, 2003-)



As can be inferred from the last two graphs, the researchers and the topics related to the processes of production, communication and scientific evaluation are the ones which contain most of the resources dedicated to providing this Service.

Users of this service were not invited to make their assessment until 2017. After that date, an online survey has been available asking them about their level of satisfaction with the response and the service. Measured out of 5, all items have been on average close to the maximum score.

Another highlight is the creation of guides and tutorials as support elements for autonomous information and self-learning by users in general and, especially, researchers. In this sense, since 2017 work has been carried out on the implementation of a portal dedicated to hosting three types of content: thematic guides, resource guides and subject guides. The software chosen was *LibGuides* which, as has already been explained, is a web content manager specialized in serving libraries and has a very wide implementation at a global level, particularly in the field of university libraries. The portal "Guías y tutoriales de la Biblioteca/CRAI de la Universidad Pablo de Olavide"[3] presents, firstly, the visualization of all the available content. There are two complementary classifications or visualizations: by subject, based on thematic descriptors extracted from the UNESCO Thesaurus; and by type, which uses the native *LibGuides* classification to divide the guides into:

- General Purpose: contains the guides for the use of the information resources subscribed to and/or selected by the Library, as well as tools for managing bibliographic information.
- Subjects Guides: these are materials designed to guide researchers and students from the perspective of the use of information and focused on a disciplinary perspective.
- Theme Guides. These are materials aimed at compiling information, tools and materials around a topic, usually related to research, or a service provided from the Library. Thus, in this section, 13

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guides are currently published on topics such as Open Access, APCs, Standardization of Author Names in Scientific Publications, ORCID and *Sexenios*. These guides have a freer format than the previous ones since they are very conditioned by the subject that they are dealing with.

The guides incorporate both textual and multimedia material, including graphics, videos, infographics and, of course, links to reference material

As explained above, *LibGuides* is also being used to develop guides as teaching material for user training, both undergraduate, master and doctoral students, as well as researchers and administrative staff. These are public access guides that, however, are hidden, so access to them is conditioned by the knowledge of the URL of each of them. One of the main features of this type of guide is to have a very pedagogical approach. Thus, the design of each of them is conditioned by the contents included in the training programs of the different levels. Likewise, the content of each of them is highly conditioned by the establishment of learning itineraries and balanced in depth and in load by the amount of content in each course level in which they are included.

LibGuides provides enough flexibility to be able to reuse in courses of different levels not a complete guide, but small fragments of them, which saves a lot of effort, considering that changes in the copy object guide can be automatically reflected in each of the copies that are made (this also applies to the other types of guides). Another forte of this system is being able to embed content from other sources. For training, this is being used not only to integrate training content as such, but also to include tutorials, demonstrations, exercises and self-assessment questionnaires from different sources. The most obvious examples of this are *Google Forms* quizzes and *Educaplay* (2020).

Finally, the latest component of the Library/CRAI Guides and Tutorials portal is a directory of scientific-technical information resources, which is the complement to all the above. This is a database in which each entry corresponds to a different resource, which can be described identifying its main characteristics: title, producer, subject, chronological and linguistic coverage, documentary typology, volume of records, etc. In addition, the URL access has, logically, been incorporated, as well as the link to the corresponding user guide, hosted in the portal of Guides and Tutorials, as already explained. The resources included in this directory come from the LRRC collection or have been selected by the staff of the Bibliographic Information and User Training Services. All the content included in the portal is harvested from Eureka, the discovery tool of the LRRC.

Finally, the Digital Publishing Service has recently been incorporated into the structure of the Research Support Services, so that, to date, it has remained outside the working strategy followed in the services described above.

FUTURE RESEARCH DIRECTIONS

Academic libraries are now a key part of university research support. The multitude of services which they offer are indispensable not only for the creation of knowledge, but also for its dissemination, evaluation and reuse.

However, as we are currently immersed in a state of constant evolution the transformation cannot stop. Right now there are several challenges that academic libraries must face that will affect all their services and functions across the board: research projects and data management (Féret & Cros, 2019; Tenopir, Kaufman, Sandusky, & Pollock, 2019); the implementation of the policies inherent in PlanS,

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at least in the European context (cOAlition S, 2019) and the expected change of model in the scientific evaluation with the implementation of the San Francisco Declaration on Research Assessment (ASCB, 2012) and the Leiden Manifesto (Hicks, Wouters, Waltman, de Rijcke, & Rafols, 2015).

Libraries must be prepared to train their users and to ensure that they are able to perform adequately in this context.

CONCLUSION

Digital tools and techniques have a key role in all research processes. Libraries have been working to help researchers for decades. To this end, they have carried out substantial transformations in some of the traditional services that they already provided, while generating new ones to respond to both these changes and the demands of researchers.

In the case of the Universidad Pablo de Olavide, its LRRC has been working for almost a decade to bring about this change. In this case, research support services have been designed that previously did not exist or were provided in an isolated manner. Thus, bibliographical information and references, as well as user training, were practically testimonial. In these years, both services have grown hand in hand, allowing the LRRC to be placed once again on the agenda of researchers, as well as academic staff and students.

One of the main issues has been the transmission of digital competence, in alignment with what is being promoted by different national and international organizations. To this end, training programs have been transformed to accommodate a broader approach, going beyond the classic training of library users.

Despite having managed to place these issues in the University's strategic plans, the economic situation and a certain lack of interest in the decision-making bodies have minimized the potential impact of these initiatives. This can be seen, for example, in the insufficient development of human resources. Although these have undergone some substantial changes in the distribution of functions, proving a certain shift in the mindset of the librarians themselves, the LRRC has remained at the same level of staffing since this transformation began. This is undoubtedly a weakness, as many of the projects launched are supported by meagre resources which at any moment can be allocated to other tasks or not be available at all.

Nevertheless, user satisfaction statistics seem to indicate that the LRRC is indeed increasingly valued by researchers and that its services are undeniably meeting their expectations.

The Universidad Pablo de Olavide LRRC means to take the steps to continue providing research support services in line with the new challenges and needs of researchers. Yet, thorough transformations must be carried out and this involves changing even the vision that its employees have of the service itself.

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KEY TERMS AND DEFINITIONS

Digital Competence: Digital competence involves the confident and critical use of electronic media for work, leisure, and communication. These competencies are related to logical and critical thinking, high-level information management skills, and well-developed communication skills.

Digital Scholarship: Is the use of digital evidence and method, digital authoring, digital publishing, digital curation and preservation, and digital use and reuse of scholarship.

Learning and Research Resource Centers: Is a dynamic environment that accommodates all IT and information facilities, resources and services that support learning, teaching and research within higher education institutions.

Research Assessment: A set of procedures aimed to measure the performance and quality of scientific research processes, affecting both the researchers themselves and the institutions in which they work. Research assessment embraces both qualitative and quantitative methodologies, including the application of bibliometric indicators and mapping, and peer review.

Research Support Services: A set of services, tools and facilities that aim to facilitate research tasks.

Research Training: Actions aimed at training researchers.

Scholarly Communication: The authoring, publishing, stewardship, and use of scholarship.

ENDNOTES

1 CRUE stands for Conferencia de Rectores de las Universidades Españolas, now known as Crue Universidades Españolas. Rebiun stands for Red de Bibliotecas Universitarias Españolas (REBIUN) as the sectorial commission on library cooperation of Crue Universidades Españolas.

2 CI2 is the acronym for computer and information competences, which for years has been used by Spanish university libraries as the identifying mark of the training programmes for users in these competences.

3 The LibGuides portal "Guías y tutoriales de la Biblioteca/CRAI de la Universidad Pablo de Olavide" can be accessed in https://guiasbib.upo.es

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Section 2
America

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Chapter 8
Academic Library Supporting Research: The Case of Universidade Federal do Paraná Law Library

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EXECUTIVE SUMMARY

The purpose of this chapter is to examine how the provision of research support services by the Law Library at Universidade Federal do Paraná (UFPR) in Brazil contributes to achieve the university research goals. The chapter develops a case study taking a qualitative, exploratory, and descriptive approach. The UFPR Law Library provides research support services such as classes on research support, bibliographic research support, orientation on research tools. Those research support services are not part of a formal and strategic program. It is recognized that the existence of a data repository, the UFPR Scientific Database, is an opportunity to provide scientific research data management support services at UFPR libraries. The chapter concludes that the existing research support services have an impact on research at UFPR Law School. However, there is an opportunity to create other services that will meet the user's expectations, considering the new research trends at the university.

DOI: 10.4018/978-1-7998-4546-1.ch008

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INTRODUCTION

Universities are fundamental institutions that produce new knowledge to be applied for the benefit of society. Research is one of the pillars that sustain Universities. In that context, academic libraries have an important role to play, for example, providing research support services and contributing to achieving university research goals.

Libraries have been supporting the creation of knowledge at universities for a long time since the organization of knowledge in libraries reproduced the university curriculum (Burke, 2003). There is a long history of changes in academic libraries spaces through time: removing book chains and providing public access to stacks; moving from manual check out to robust library management systems; providing coffee, couches, and increased collaborative spaces as study preferences have shifted; and, most recently, implementing maker spaces and innovation labs (Andrews, Downs, Morris-Knower, Pacion, & Wright, 2017).

Even considering all those changes, the reference service in libraries continues to be the main door that leads the patrons to many services that may help them to find the information they need. Accart (2012, pp. 3-4) explains that reference service embodies many activities and skills to provide services to the public, generally providing answers to their questions. They are research instruments available to the library users.

Over the years, librarians and patrons have become very familiar with services like borrowing library materials, teaching support, interlibrary loan, and the availability of studying and meeting spaces. More recently, other services and products were added to the reference service, such as accessing databases, scanning services, discovery tools, scholarly publication, open access and copyright support, and data management orientation. "These changes underscore the library's enduring and fundamental value in the research, teaching, and learning landscape on campus" (Andrews, et al., 2017, p. 146).

A good and resourceful library is the key to support research at any University. "Their relevance depends on the provision of a radically expanded suite of research support services" (Tise, Raju, Adam, 2015, p. 1). The law academic library, for example, is considered the laboratory where law students conduct their research. The Law Library from *Universidade Federal do Paraná (UFPR)* from Brazil started focusing on research support services in 2009, which meant a shift of paradigm to the whole institution.

This chapter examines how the provision of the research support service by the Law Library at *Universidade Federal do Paraná* in Brazil contributes to the university research goals. It also describes the university and the Law Library. It details the provision of classes on research support, bibliographic research support, orientation on the use of research tools as research support services. The chapter also addresses the planning and development of a data repository at UFPR, since many librarians were involved in that project, including librarians from the UFPR Law Library. Moreover, considering that libraries around the world are providing data research support service to their community, the authors believe that UFPR libraries should strategically engage in providing that kind of service, in a partnership with the data repository team from the research group responsible for the implementation. Finally, the case study outlines recommendations and future research direction on the scope of this case study.

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RESEARCH SUPPORT SERVICES AT ACADEMIC LIBRARIES

"Academic libraries have service at the core of their mission, with the needs of their client group influenced by global, national, and local contexts" (Brown, Alvey, Danilova, Morgan & Thomas, 2018, p. 340). As the research practices change over time, libraries have to adapt and create products and services that respond to those changes. It is important to remember that "the role of academic libraries is to support the teaching and research of their parent institutions" (Kennan, Corrall & Afzal, 2014).

According to the Association of College and Research Libraries (2020), "academic and research librarians increasingly recognize scholarly communication as a core competency of the profession". Developing that competency, librarians may guide responsible copyright practice, support the access to information on databases, teach about bibliometric indicators, and help them to access, to manage, and to share their data.

Research support services are an area of innovation at academic libraries. It poses high requirements on resources/tolls and technical conditions of libraries and wisdom/skills and expertise of librarians. Sometimes, "it is an uphill struggle for libraries to provide research support services, for which libraries have to deepen communication and collaboration with subject specialists and research management personnel/bodies, enhance their capabilities of intelligence analysis and think tank services" […] (Tang & Zhang, 2019).

Kennan et al. (2014) surveyed research support provided by academic libraries in Australia, New Zealand, the UK, and Ireland. They examined the professional and educational implications of current and emerging research support environments for academic libraries. The study shows that most academic libraries are already providing or planning services in the focal areas of bibliometrics and data management. However, while many academic libraries perceive increasing research support services, the authors stated that they were constrained by gaps in staff skills, knowledge, confidence, and resourcing issues.

The Office of Scholarly Communication at Cambridge University has the same concern about providing staff with learning opportunities that will prepare them to better provide research support services. They launched the Research Support Ambassadors Programme, an initiative which skills staff in areas such as Research Data Management and Open Access. "The Ambassador initiative is aimed at a self-selecting group of library staff from all levels who wish to gain in-depth knowledge of research support and offers a chance to learn theory while putting that to practical use by creating a training resource" (Sewell & Kingsley, 2017, p. 151).

Support to access information on databases is a well-known service provided by academic libraries for a long time. In recent years, systematic reviews are increasingly being used as a means of publishing research in the health sciences. Furthermore, the use of this type of research is also becoming popular in other domains. Foutch (2016, pp. 80–81) states that the participation of academic librarians into a systematic review team led to a better understanding of how faculty research projects operate. The author also showed that librarians "can be valuable contributors because of their specialized skills and knowledge about searching and proper utilization of databases".

Brown et al. (2018) presented a case study of the University of Queensland (UQ) Library's research support services, with a specific focus on functional teams. The authors described the current service and staffing model. Among the research support services at UQ Library are digitization and digital curation; research data management; scholarly publishing; bibliometrics; digital scholarship.

UQ Library has a "triangle" service model with layers, which seems to be an interesting option for the research support service implementation in academic libraries. Layer 1, in the base of the triangle,

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represents a basic service provider and it is composed of the library staff. They are aware of research support services but may not develop knowledge to deliver services. Therefore, they may provide information about those services (Brown et al., 2018).

Service providers are represented by layer 2 and related to the library staff who have an understanding of discipline research requirements. They provide the research support services to their patrons. However, the staff from layer 2 have support from specialists of functional teams from Layer 3. The functional teams (Layer 3) are involved in providing expert-level research support services. They have the capacity and responsibility of developing in-depth knowledge in these areas (Brown, et al. 2018).

There is an increasing interest from researchers on bibliometric approaches since governments around the world and other founding institutions have been using bibliometrics for research evaluation. Bibliometric indicators are used in Brazil, for example, to evaluate the graduate schools through the scientific literature they produce. Drummond and Wartho (2016) described the creation and importance of the Research Impact Measurement Service (RIMS) at the University of New South Wales (UNSW). They stated that the main focus of the transformation of research support services through the creation of RIMS had been the development of a service to provide valuable information for individual promotion, grant applications, and institutional comparison. The RIMS produces over 30 reports every month and employs 6-7 full-time equivalent staff.

Universities are facing what is called the fourth paradigm of scientific inquiry, the data-intensive research environment of scientific study (Hey, Tansley & Toole, 2009). Considering that context, Tenopir, Birch, and Allard (2012) explained that there are powerful reasons for librarians to explore how their academic libraries can better satisfy the needs of researchers in the new data-intensive research atmosphere. Both funding agencies and governments have new requirements that include detailed data management plans, data sharing, and data repositories. Therefore, libraries should be actively involved in providing an infrastructure of research data tools and services.

To inform the development of outreach strategies that will enable new opportunities for research participation and, at the same time, help library staff transform the model of research support and participation strategies, Nickels and Davis (2020) interviewed both librarians and researchers at North Carolina State University. They intended to gain an understanding of researchers' needs from both perspectives. The results of this research provide a solid basis for creating an awareness of researchers' behaviours, expectations, and workflows, as well as for presenting a unique picture of unmet and unarticulated needs. It shows the importance of recognizing patrons' needs to provide services that meet patrons' expectations.

The studies cited in this section show how important research support services are in academic libraries. Libraries that are not offering research support services should from now on, determine the path they will take. By doing that, libraries will build a new profile in their research community and expand the role of the library considering the new research environment.

UNIVERSIDADE FEDERAL DO PARANÁ (UFPR)

The *Universidade Federal do Paraná (UFPR)* is the oldest public university in Brazil located in Curitiba, Paraná State. In 1912, both politicians and society considered that Paraná State, in Southern Brazil, need more qualified professionals. Therefore, *UFPR* was founded on December 19th, 1912. The state of Paraná was progressing fast and that was an important accomplishment. Its mission states that the University engages in the pursuit of excellence through the promotion, building, and dissemination of

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knowledge, contributing in a meaningful way to the construction of a society of critical thinking, equity, and solidarity (UFPR, 2020a).

The University's vision articulates that UFPR intends to be a university recognized for its teaching, researching, extension programs, and institutional management as a shelter for innovative and cultural initiatives reaching an outstanding position among the best universities in Latin America. Research and technological development are one of its values, described as: "to develop innovative researches in different domains seeking a nationally and internationally prominent position for the Brazilian science" (UFPR, 2020b)

There are six cities in Paraná State where UFPR has a campus. Most of them are in Curitiba, the capital of the State. The university provides over 136 undergraduate and 88 graduate programs, distance teaching, certificate, and over 70 residency programs. They encompass a wide range of subjects from medicine to sociology. About 50.000 people are part of UFPR and made it one of the biggest universities in the country. Table 1 presents the number of people considering their role in the university.

Table 1. Distribution of people considering their role at UFPR (Data source: UFPR, 2019)

People at UFPR	Number
Undergraduate Students	28.802
Graduate Students	6.253
Distance Teaching Students	3.186
Certificate Programs	194
Medical Residency	368
Veterinary Residency	81
Other Residency Programs	237
Staff	4.747
Faculty	2.633

The UFPR is a large institution with a research performance profile that places it as the 13th university in Latin America at the Ranking Web of Universities (Cybermetrics Lab, 2020). Furthermore, UFPR is positioned as the 8th among other Brazilian institutions at *Folha* Brazilian Universities Ranking 2019 (Folha de São Paulo, 2019). UFPR is a research-intensive university, with high levels of international research collaboration and demonstrated global research impact.

The authors present in this chapter the study case of the Law Library from *Universidade Federal do Paraná (UFPR)* in Brazil. Thus, it is important to provide some information about the Law School of UFPR. The Law bachelor's degree and other five degrees were created in 1912 when the university was founded. The Law School from UFPR is very traditional and it is located at the university historical building, downtown Curitiba, Paraná.

The Law School of UFPR has done much to shape law and legal education in Brazil. Many talented people of different backgrounds, interests, and experiences are, after studying at UFPR, outstanding professionals in their respective fields, from lawyers to Supreme Court Judges. Approximately 1.307 students attend UFPR Law School (1.103 undergraduate students and 204 graduate students) in 2020 (UFPR, 2020c). The Law Faculty has 80 academic staff and the curriculum cover a broad range of

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courses on traditional and emerging legal subjects. A staff of 25 people supports the teaching, research, and extension activities inLaw School.

Furthermore, UFPR was the first public university in Brazil to create its data repository. The *Centro de Computação Científica e Software Livre* (C3SL). A laboratory of the Department of Informatics, in partnership with the management team of the UFPR Institutional Digital Repository (RDI), following the trends of open science movements, started in 2017 the development of UFPR Data Repository. The objective was to create a data repository to assist researchers access, store, preserve and share scientific data generated by their research.

Although the development of the data repository was not an initiative of the UFPR libraries, libraries can participate by providing services related to data management, as a research support service. In that context, libraries may offer training in scientific data management and assist students and researchers to find reliable data and sources for their projects.

Scientific research data represents one of the cores of science; it is a fundamental part of academic work, whether in the sense of input, when it is collected from an external base, or as a product, result of an analysis. The management of scientific data, although not a new subject, began to be discussed and understood in the early 2010s in Brazilian university libraries. The search and retrieval of data in several specific databases or repositories became part of the routine of the reference service, requiring librarians to acquire new skills related to e-Science and data literacy.

This chapter presents both the research support service at the UFPR Law Library and the planning and development of the UFPR data repository. The study is based on qualitative, exploratory, and descriptive research using the library documentation and its website as resources to develop the work. Since research and technological development is one of the university's values, this case study describes the research support services provided by the law library, its benefits, issues, controversies, problems. Solutions and recommendations are also presented.

UFPR LAW LIBRARY

Libraries are an important part of the university structure. UFPR has 19 libraries throughout different campuses. One of these is the management unit, the Central Library, led by a head librarian, who is also responsible for the other units. The other 18 libraries are specialized in the subject areas of the departments they serve. There is a head librarian responsible for each unit. A staff of 176 people works at UFPR libraries (78 librarians; 98 support workers) (UFPR, 2020c).

The UFPR Library's mission is to provide to the university community, and also to the community in general, control and access to information in Science and Technology. It is recognized that the control and access to information in Science and Technology are essential for the university activities and for the full exercise of citizenship, by strengthening our commitment to the libraries, the university and our patrons (UFPR, 2015).

The Law Library is located downtown in a historical building, the second one constructed at the university and considered a tourist and historical place of the city. The library has a staff of 11 people (five librarians and six assistants). The collection has about 40.000 books, 461 journals, 3.385 dissertations, and about 41.000 digital objects at its institutional repository. Its Special and Rare Collection is the most important in the law domain in Paraná and the oldest book is a Canon Law book in Latin from 1585. The Law Library is the oldest library at UFPR, since the undergraduate law degree was one of

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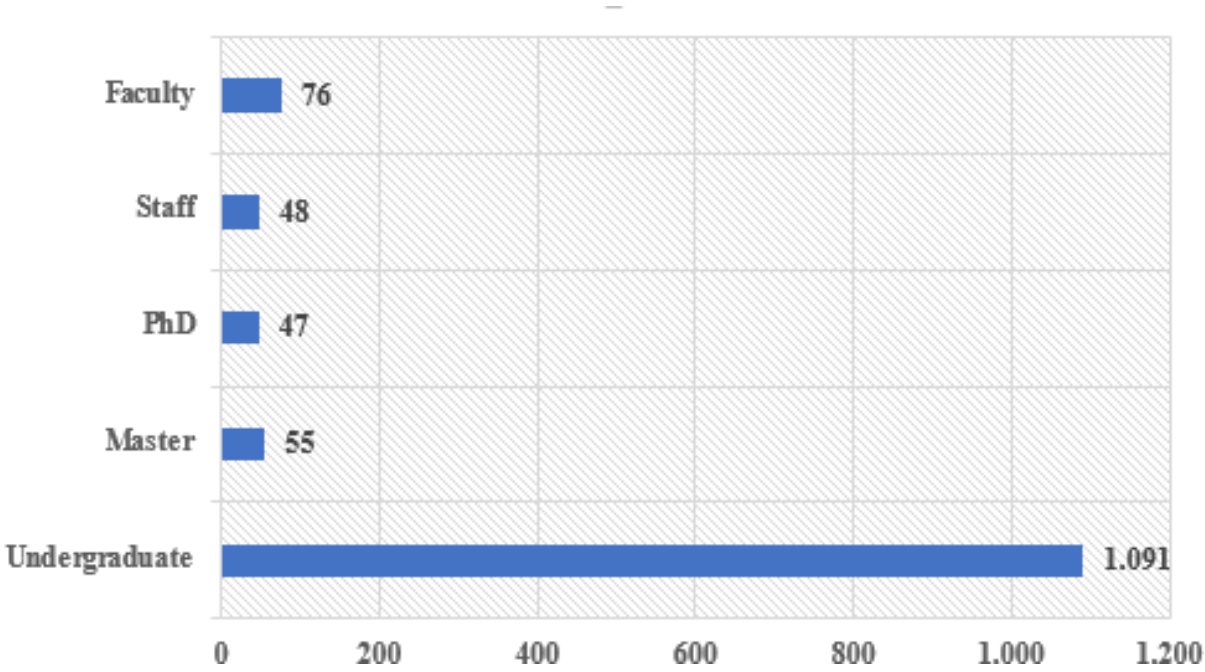
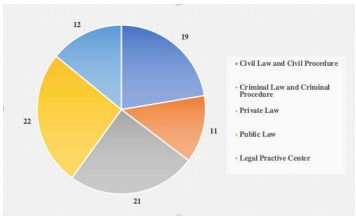
the first created at the university. There are 1.317 active users at the UFPR Law Library. The majority of users are undergraduate students, as Figure 1 shows:

Figure 1. UFPR Law Library Active Users (Data source: UFPR, 2020c)



The Faculty is organized in 4 departments (Civil Law and Civil Procedure; Criminal Law and Criminal Procedure; Private Law and Public Law) and 1 Legal Practice Center. Figure 2 shows the number of faculty in each department.

Figure 2. Faculty at UFPR Law School (Data source: UFPR, 2020c)



The Faculty of the Graduate Program has 62 faculties, 86 master students, and 98 PhD students. Research is the core principle of the graduate program and the library plays an important role in supporting their research. The UFPR Master and PhD in Law are considered of excellence in Brazil.

The agency responsible for evaluating the graduate programs in Brazil is the *Coordenação de Aperfeiçoamento de Pessoal e Nível Superior (CAPES).* This evaluation is carried out on a rating scale of

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three to seven points. The Law Graduate Program from UFPR scores six points since the 2010 evaluation and it is one of the best-evaluated law programs in Brazil. The library products, services, and structure are one of the variables considered in that evaluation.

The UFPR law library supports the teaching and research process and provides a set of products and services to its community, such as borrowing and access, study and meeting spaces, interlibrary loan and scanning services, computers, databases, classes on research support, bibliographic research support, orientation on the use of research tools. The research support services will be presented in the next section.

Research Support Service at UFPR Law Library

It is a fact that libraries need to be aware of the changes that impact the teaching and research process at the university, seeking to offer the best they can to their community. However, to follow these changes and paradigm shifts in science, librarians must develop new skills to provide research support services. Libraries are places for creativity, knowledge creation, and sharing. Thus, libraries must know the user's expectations to meet their needs and even overcome them.

In 2009 there was a significant change in UFPR's library management model. A Knowledge Management Program (PGC) was created to promote knowledge management practices considering an organizational culture regarded as the sharing of knowledge and information. Many actions were developed to achieve that objective, some of them contributing to the creation of research support services, namely: identification of workers' skills and information needs to better develop their activities; training of the staff and promotion of experience and knowledge sharing among workers; creation of working groups on specific subjects, for example, services and activities developed in the libraries.

The new collaborative working model created an environment that fostered creativity and innovation. One of the innovative initiatives resulting from this was the creation of the User Continuing Education Program (ProEduC) in 2013. The Program aimed to increase the use of information sources, products, and services provided by the libraries and to help users to develop their information literacy and research skills. The Program is integral training with workshops, and lectures on topics that may be of interest to the academic community.

The UFPR libraries provide a set of services that support the research process at the university, but they are part of the reference service and ProEduC. Therefore, each library may also develop actions orient to its patrons. Some libraries have a research support service to meet the patron's needs. This case study will describe the research support service at UFPR Law Library.

The library team engaged in identifying the patrons' needs to better provide library products and services in 2009. The development of a user study was the first step. The results showed, for example, patron requests for extended library hours and the need to improve the collection (Fujimoto et al., 2010). Library staff also discussed with faculty the future of library services. Furthermore, reference librarians also identified the research support needs of students and faculty by analyzing the research questions the reference service received.

Until then, the library was mostly used to borrow books and other materials. Access to databases and the use of other research tools was very low. Moreover, there was no connection between librarians and faculty to discuss opportunities to involve students in research and to identify their needs. Thus, the creation of the research support services at the UFPR Law Library aimed to increase the use of the library and access to online information sources and to help the Law School academic community to

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acknowledge and use research tools to improve their research process. The library staff pursued recognition of the library as a research hub of the university.

Within the UFPR Law Library, this service is located in the reference service and the reference librarian is the person responsible for it. There are another librarian and two assistants that also work at the law library reference service. Students from different fields attended the library since it is located downtown Curitiba. However, the library services focus on law students, faculty, and staff.

The research supports service based on the law library provides the following services since 2009: classes on research support, bibliographic research support, orientation on the use of research tools. Each service is described as follows:

Classes on Research Support

Since 2013, there has been a strong partnership between librarians from the law library and faculty that teach research methods classes to law undergraduate and graduate students. Each year, some hours of the research methods class are taught by the reference librarian. Students learn about law research methods during their first year. The reference librarian teaches about 24 hours to 200 students distributed in four classes. The classes are related to the research process through the contents using the library; accessing digital content that will support the research; using a reference manager; writing a research project, a paper or a dissertation; doing bibliographic research, and bibliometric indicators.

The students are required to do a final work for this course of law research methods, in most cases, it consists of writing a research project. After those classes taught by the reference librarian, the students usually go to the library to ask questions and to get support in finding bibliography for their research, to learn how to write an abstract, how to choose the keywords and, many times, to ask questions about the use of the reference manager.

Research methods and techniques are not common subjects taught in Brazilian high schools. When students enter university, they discover a whole new world. Sometimes, they are not even used to attending libraries and aware of the many products and services a library can provide. That way, it is a significant achievement that the library can create that kind of partnership and be closer to the students. It is also a good opportunity to learn about their needs, to plan, and to provide services that fit them. Research support lessons are also taught to other classes, depending on the faculty's demand. For example, the reference librarian gave some classes to Financial Law Course focused on the use of specific databases on finance and economy and the creation in them of search strategies adapted to their needs

There is also a program for senior students since they are expected to develop research and present a monograph as a final work. In this case, the library offers training and workshops focused on how to do a bibliographic search, what is the structure of academic work and how to create citations and references using a reference manager.

The focus on law graduate classes is different because their needs are different. The Research Methods Course is offered to Master and PhD students together and the reference librarian participates following the professor's lead. In this case, the librarian focuses on specific topics including bibliographic searches, use of databases (Web of Science, Scopus, Legal Source Complete, etc.), research in law, how to choose a journal to publish, the importance of academic communication, post-graduate evaluation in Brazil and bibliometric indicators (h index, impact factor, etc.). The library's involvement in the teaching process shows students they have a place to find help during the research process. Moreover, it represents a strategic collaboration with faculty aiming for a common objective. However, experience as a reference

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librarian shows that the library should have a formal research support service to all UFPR libraries, not just isolated services connected to the reference service in each library.

Bibliographic Research Support

Bibliographic research support is a service that covers the search for a subject or author in databases and other information sources. The user fills in a form and requests the search that will be made by a reference librarian who will send the results by email over 15 days. The law library provides the service to all the academic community, but the subject of the research must be related to law.

The form has three parts and it may be filled at the library or online:

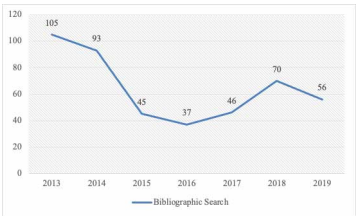
- **User's Identification**: full name, date, program, ID number, type of user (graduate student, faculty, etc.), phone number, email and the purpose of the research;
- **Research Description**: information about the subject, research area, keywords, language, type of documents and period;
- **Library Control**: it includes the request input in the library, the expected date for sending the response; the date of sending, the retrieval information, and, the databases used for search.

The librarian gets this form and analyzes if there is any doubt about the search. Sometimes, it is necessary to talk to the user to ask other questions useful for searching, such as the research method, the objectives, who is the advisor of the research, etc. Using all the information available, it created a search strategy and selected the best databases to search. In some cases, it is necessary to read about the research topic to properly select and combine the keywords and get the best results.

When the bibliographic search is finished, a report is a draft with the information the user needs to know both to know how that search was made and how he can get the same results: date of search, databases searched, number of results, types of documents, search strategy used and the reference list of the material located. The report is sent to the users by email. They also receive a link to an evaluation form of the bibliographic search support service. This form allows the user to give their opinion on aspects such as the response time to the request, the content of the search results, the sources of information, or the request form. A user study conducted in 2014 showed a positive assessment of the bibliographic search support service (Araújo, 2014).

When the users get the response to their request, they have the option to ask for help to locate the full text of the documents. Services like interlibrary loan and scanning services are provided in this case to allow access to all the material. Figure 3 shows the evolution of bibliographic search support provided by the UFPR Law Library.

Figure 3. Bibliographic Search from 2013-2019 (Data source: UFPR, 2020c)



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In the first year (2013) the service was offered, there were 105 responses to bibliographic search support requests. In 2015 and 2016 there was the lowest number of requests which may be justified by the fact that there was a staff strike in both years. In 2018, 70 bibliographic searches were answered representing an increase in the number of requests. However, in 2019 the number of requests decreased again in 2019. The reduction in requests may be a result of the shift in the managing model of the UFPR libraries, especially with the change of the head librarian. There is evidence that it is important to create marketing strategies to promote the service.

After starting to offer this service to the academic community, interest in learning how to properly search information in databases increased. Sometimes, students did not find the information they needed, and they assumed there was no content about the subject. But, when they used the bibliographic search support service and got a list of materials related to the subject of their research, they realized they needed help to improve their research skills. Which leads the library to guide individuals and groups in searching databases, library catalogs, and other information sources.

Orientation on the Use of Research Tools

The law library staff has helped students to access databases as a standard service since 2009. Through the years that kind of guidance is being improved. Students are trained individually at the library and also groups can request orientation. Besides databases like Web of Science, Scopus, Virtual Network of Congress Libraries Catalog, *Revista dos Tribunais* on-line, *Persée*, Dialnet, Legal Source Complete, other research tools are taught by the library staff: discovery service (EBSCO Discovery Service), reference manager (Zotero, Mendeley, etc.).

From 2014 to 2018 a significant investment was made in training in the discovery service since the tool facilitates the discovery of relevant knowledge in any kind of research. However, the tools are not available anymore due to budget cuts. The law library offered in 2015 an Extension Course called "Research Academic Workshop". The workshop addressed topics such as the general rules of academic work presentation, reference manager, guidance on writing papers, and a research project, methods in law research and plagiarism. Law School professors and librarians taught the different subjects of the workshop.

Most of the time, students go to the library searching for books. In the field of Law, as in other areas of Social Sciences and Humanities, the book remains the preferred medium for both publication and research (Spera & Mugnaini, 2019). That way, there is an opportunity to increase the use of other information sources and also research tools.

Regarding this research support service, the library also guides on the identification of the impact factor and the h-index, at Web of Science, CiteScore at Scopus, and the h-index, at Google Scholar. There is not a formal bibliometric support service, but the students do get the information they need about those concepts and sometimes tools. It is crescent the number of students seeking help to understand what is an ORCiD ID and how it works. Together with other libraries, some workshops on the use of ORCiD are being taught since 2019.

UFPR Scientific Database: Planning and Developing a Data Repository

The evolution of movements like open science and the discussion about scientific research data became a relevant subject in Brazil in 2010. The focus on opening data arose a gradual transformation in the

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scientific paradigm. There is a transition from the computational model to the data-centric model, the so-called e-Science (Lynch, 2009). The new scientific paradigm focuses on the massive exploitation of data generated by researchers, which can be structured and analyzed based on the intensive use of information and communication technologies and mainly supported by the areas of computing and statistics.

Many benefits are arising from the sharing of data: verification of the research results through data re-analysis; possibility of new interpretations or approaches; saving resources in data collection processes; transparency in the application and control of financial resources; and career benefits for researchers and teachers (invitations for collaboration, citation, increased visibility) (Tenopir et al., 2011; Borgman, 2012).

However, the greatest impulse for data dissemination and sharing came from the mandatory policies of development agencies, when public funding calls began to require both the development of a Data Management Plan (DMP) and the free availability of data produced in data repositories. Data Management Plans are planning, supportive, and also historical tools that detail the data management cycle in all phases of a project, both in the short term (while the research is being conducted) and in the long term (after the conclusion of the project).

Aware of the possible creation of those mandatory policies in Brazil, C3SL and the UFPR's RDI Steering Committee gathered its team for the debate around the development of its data repository, anticipating future requests from national development agencies and the university community. The name of the data repository is *Base de Dados Científicos da UFPR (BDC)* (UFPR Scientific Database). The development of the BDC took place in three stages:

- **First stage - Tactical approach**: interdisciplinary team meetings took place to discuss the scope, distribution of activities, recognition of the international and national scenario, and the outline of a proposal.
- **Second Stage - Operational approach**: technical aspects were considered, such as types of data that would be accepted, standards; selection of requirements, selection of metadata standards; selection of repository management software and other support systems, and definition of the persistent identification identifier for data sets. In this phase, a tool was developed to create aData Management Plan based on several models: DMPTool of the University of California, DMP of the Digital Curation Center (DCC), Horizon 2020, and the Inter-university Consortium for Political and Social Research of the University of Michigan (ICPSR). In the selection of requirements, it was considered the type of data that would enter the service through the use of the case matrix and functional requirements of the Research Data Alliance (RDA) selected for the data repository platform. Likewise, the selection of metadata considered the RDA metadata standards directory and also the most used standards for data repositories, according to a survey conducted at Re3data.org. The selected standard was Dublin Core (DC). The team also analyzed the software used in other data repositories, such as Zenodo, Fedora, Invenio, Open Science Framework, CKan, and DSpace. DSpace was chosen because it is open-source software with a consistent community of developers and also for its familiarity in use, considering that the DSpace is used at the university to manage the institutional repository.
- **Third stage – Strategic approach**: the proposal and the BDC Guidelines Document were drafted. The guidelines describe the objectives, submission services, storage rules, preservation, disclosure and embargoes orientation, typology of the data accepted, support, and considerations about copyright. The UFPR Data Repository was indexed at Re3data.org repository and other related

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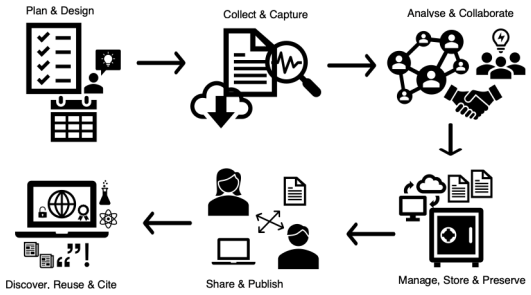
services. At this stage, the team also began to promote the service to the internal and external academic community.

BDC's general objective is to provide the scientific community and society with a reliable source for the storage, preservation, access, and dissemination of peer-reviewed scientific research data, to contribute to the visibility and transparency of institutional research in the various fields of knowledge. Thus, the UFPR data repository is both a reliable source of research and a quality product. All data submitted to the BDC come from research that has already undergone peer review. The data management service of BDC embraces the data management cycle to enable the discovery, use, sharing, and reuse of data, as shown in Figure 4.

Figure 4. Data management cycle (2020). (Source: the authors)



BDC provides the following services:

- Creation of DMP with possibilities for versions;
- Open harvesting protocol for data and metadata collection;
- Collaborative and analytical environment for university research group projects;
- Data with open licenses that allow the discovery, reuse, and citation;
- Process of self-submission of data and DOI, to guarantee metadata citation and retrieval; and
- Digital preservation processes to ensure the longevity of the data within the institutional environment.

The submission of data may be requested by researchers by email. The support team provides online assistance to the researcher's questions, requests, and doubts, and the possibility to conduct face-to-face and online training by appointment.

BDC is organized through communities, subcommunities, collections, and items, as shown in Figure 5. BDC has a community to store data for individual researchers and two subcommunities, one for data produced by UFPR research groups in separate collections; and the other to house scientific data from articles submitted to the digital library of institutional journals (*Biblioteca Digital de Periódicos - BDP*).

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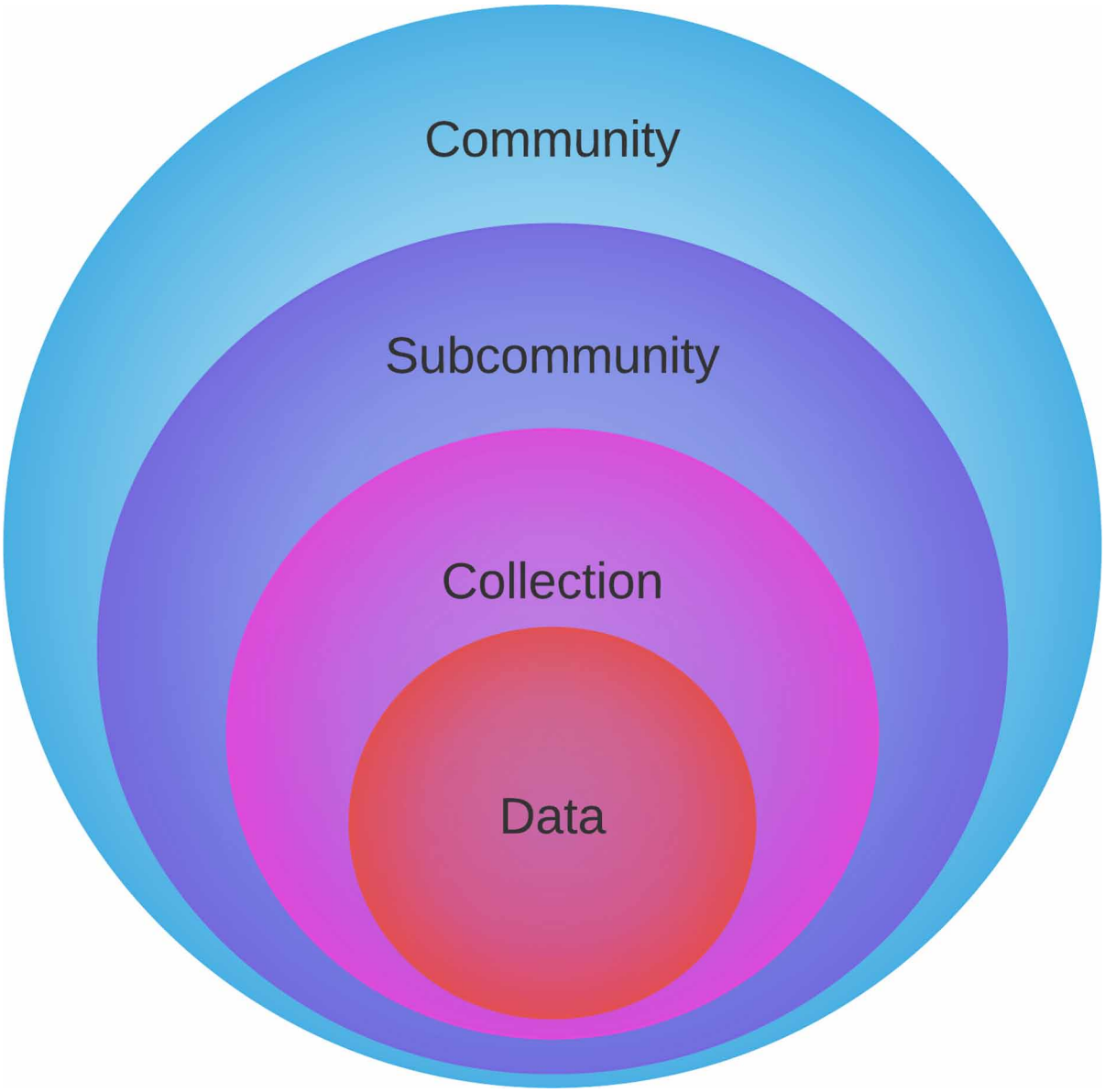
Figure 5. BDC structure (2020) (Source: the authors)



The management software is flexible to adapt to the structure of communities, subcommunities, and collections according to the needs of specific research groups or projects. There is the possibility to create specific policies for each collection, with specific assignments for different members of the research groups, such as a description of metadata, data submission, review, and publication. As it is a data repository that recommends openness, it encourages researchers to adopt open licenses such as CC0 (Public Domain) or CC-BY (which allows distribution, modification, adaptation, and use even if commercial, granting credits to the original author).

Although the BDC has been available to the academic community for about two years, researchers' adherence is slow. There are two possible causes for that:

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1. the discussion and promotion of open science and openness of datasets are still very weak at UFPR. The faculties workload and the lack of time available for data preparation can be an obstacle to sharing data, it dislikes with the studies conducted by Tenopir et al. (2011), Kim and Stanton (2015) and Curty, Crowston, Specht, Grant and Dalton (2017) on researchers' behaviour regarding data sharing and reuse. Another reason may be the lack of technological infrastructure allowing for the organization, treatment, and availability of data.
2. the need for the development of data literacy and investment in training of the staff of reference and auxiliary librarians.

SOLUTIONS AND RECOMMENDATIONS

Some many strengths and challenges influence the potential of academic libraries to deliver effective research support services. When The UFPR Law Library started providing the research support services, the objective was to turn the library into a research hub. The staff aimed to do increasing access to databases and the use of research tools. They also sought to establish a connection with faculty, seeking to better understand theirs and student's needs.

It turned out that the library achieved that objective. Figure 3 shows the acceptance and effective use of the new bibliographic research support service. There was a significant increase in the use of the interlibrary loan, from 37 requests in 2012 to 219 requests in 2019 (UFPR, 2012; UFPR, 2020c).

The authors state that the existence of a continuing education program, the ProEduC, that focuses on the development of research skills, is one of the strengths that may be highlighted. The ProEduC was created in 2013 and since then, the library has been training about 500 students a year on research skills (UFPR, 2020c). These teaching opportunities foster a strong relationship between librarians and faculty, which leads to the participation of librarians in faculty research groups.

The authors recognize that the UFPR Law Library staff achieved its objectives and the creation of the research support services represent an important achievement. Moreover, the library is recognized by patrons as a research hub at the Law School. There is a great potential to gather efforts and to create a more strategic plan, providing the research support service in all UFPR academic libraries.

In that context, the establishment of a data repository, led by the research group C3SL in 2017, is an opportunity for the UFPR library to create research support services focused on data management, access, and reuse. While there are still only a few datasets in the repository, as the university realizes the importance of an open science and scholarly communication policy, in the case of data collection growing up the BDC would gain local and national recognition.

There are many challenges to overcome. In this context, both the skills and capacity of the staff are a major challenge for the libraries. For this reason, the first recommendation is that a structured plan is established to develop research skills and competencies and that all reference librarian assistants be trained in these skills. The Research Support Ambassadors Programme from Cambridge University is a great example to follow (Sewell & Kingsley, 2017).

There is a consensus that librarians are educators and mediators. However, universities are now facing a time when librarians need to embrace the research role. Then they will be prepared to support the research process and contribute to the development of research more effectively at the university.

Considering the reference questions librarians get each day at universities, they realize the nature of the academic library is changing. Librarians are not expected to merely provide access to scholarly

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literature, but to assist in its creation. "Researchers are arriving at institutions with the skills to gather information and create new knowledge but face an overwhelming choice of methods to manage and promote their outputs" (Sewell & Kingsley, 2017, p. 148).

The second recommendation is the transformation of the traditional role of academic libraries, which still exists in the Brazilian context, into one of support for researchers at all stages of the research life cycle, for instance, in the UFPR libraries. That transformation may start with staff skills development and with the establishment of a work plan focused on the development of the research support service at all the UFPR libraries.

That may start by identifying isolated initiatives in different UFPR libraries, like the one presented in this case study. There are at least five research support services that may be part of that plan, they are scientific research data management (access, use, management, and reuse), scholarly publishing (publishing, open access), bibliometrics (indicators, network analysis, altimetric, bibliographic coupling, co-citation analysis), digital scholarship (research tools and digital scholarship Technologies) and bibliographic research support.

FUTURE RESEARCH DIRECTIONS

A quick search on the main Brazilian information science database, *Base de Dados Referencial de Artigo de Periódicos de Ciência da Informação (BRAPCI)*, shows that the concept of "research support service" is not common in Brazil, since it did not retrieve any documents. On the other hand, that is evidence of the need for more research on the topic to create a new service model, propose programs, and be part of a paradigm shift in Brazilian academic libraries.

This case study and the literature review provide insight into the future of research support services in Brazil. Research is one of the most important axes for universities and libraries must be prepared to have an active role in that context. There are isolated initiatives in different UFPR libraries, and this is an opportunity to transform them into a formal and strategic plan to provide the research support service. The existence of a scientific data repository at UFPR is also an opportunity to work together and offer research support services on scientific research data management.

Thinking about future research directions, it would be very interesting to know why academic libraries in Brazil do not have a formal research support service yet. Furthermore, the evaluation of the staff skills would be a good starting point to gain a clear understanding of what qualifications they need to be confident to provide a research support service of quality. Another interesting perspective would be to recognize the expectations of researchers about the research support services. What are their needs? Do they understand that the library has an important role in that kind of support?

The Brazilian academic libraries may become active partners in scholarship. Therefore, librarians should understand that scholarly communication literacy is a core competency for academic librarians and, that way, they need to take advantage of every opportunity to educate themselves in research emerging areas.

CONCLUSION

This chapter presents the case study of UFPR Law Library and the provision of three main research support services: classes on research support, bibliographic research support, and orientation on the use

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of research tools. The findings of this study suggest that UFPR Law Library provides these services, but they are not part of a formal and strategic plan. They certainly have an impact on the way law research is conducted at UFPR Law School since the services are recognized by faculty and developed in partnership with them.

Although the three research support services are part of the set of services offered by the Law Library, there is an opportunity and need to create other services that will meet the expectations of the users, considering the new research trends at the university. It would be highly beneficial to provide services focusing on bibliometrics, scientific research data management, and digital scholarship, for example.

Thus, the authors suggest the conduction of a user study to gain an understanding of researcher needs. An investigation conducted with librarians would be also very helpful to have both perspectives. The establishment of a data repository at UFPR shows that part of the scientific community is already aware of the importance of open science. That is evidence of the opportunity to provide services that will support all the research cycle and put the library in a strategic position at the university.

There is an emergence of new specialities and, to respond to this, there are two important actions to take. First, Library and Information Science Schools should consider urgently how best to address the present opportunities and challenges of the advance of academic librarianship. Second, librarians should be aware of their new role, and seek qualification to develop skills, to be prepared to provide research support services at academic libraries. Universities are in their essence places that promote innovation and knowledge creation. Libraries should seek for partnership through the university and gather efforts to promote research at the university.

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KEY TERMS AND DEFINITIONS

Bibliographic Search Support: A research support service that embraces the search for a subject or author in databases and other information sources.

Class on Research Support: A research support service that consists in offering workshops and classes on research methods in partnership with faculty.

Data Repository: Information systems responsible for the preservation, integrity, and dissemination of scientific research data. Through data repositories, the researcher can manage, store, share and search for data sets.

Open Science: The international movement that promotes the openness of scientific research data, publications, software codes, methodologies. It embraces other important concepts such as open access, open-source, open innovation, citizen science, open education resources, etc. Open science focuses on openness, collaboration, transparency, and knowledge transformation.

Research Support Service: Academic library services focused on supporting all the research processes at universities. Bibliometric, research data management and digital scholarship are some examples.

Research Tools: Software or app used through the research process. Some examples are reference manager, network, and content analysis software, etc.

Scientific Research Data: Data produced and registered during the research cycle. They are the evidence a researcher needs to validate the research.

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Chapter 9
Becoming Trusted Research Partners Through InfoExpress at The University of Toronto:
(Re)Connecting Researchers to the Library

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EXECUTIVE SUMMARY

This case study discusses the importance of building initial trust in the relationship between researcher and academic library. Primary coverage serves the experience of two small humanities-based colleges serving approximately 125 faculty members within a larger university campus by providing the personal document delivery service of InfoExpress. The trust built through this initial research support service creates avenues for further support from the library and the wider university library system. As every relationship has challenges, the ones occurring here are opportunities to improve the relationship in favour of the researcher and library. If the researcher is unaware of what support the library provides, establishing a personal relationship will immediately provide productive research time and create an opportunity for future support through additional personalized services. The researcher, their research, and their library benefit by this trusted partnership.

INTRODUCTION

In the 1992 animated Disney movie *Aladdin,* the title character Aladdin, newly introduced as Prince Ali of the fictitious land Ababwa, offers the Princess Jasmine a magic carpet ride. The Princess is understandably reluctant as she just met Prince Ali. Stretching his hand out to her, Prince Ali asks her if she

DOI: 10.4018/978-1-7998-4546-1.ch009

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trusts him. At first, she is shocked by his bold question. After he asks for the second time, the Princess recognizes him as the boy thief Aladdin from the market whom she met earlier, and who had posed her the same question to save them both from trouble. Having recognized him, she agrees to go on the ride.

So much like this scene in life, trust must be built, established, and maintained. When providing research support it is no different. Research support services offered by academic libraries work best in an environment of trust: faculty and other university researchers must trust their academic library and its staff to supply them with the necessary materials to not only make their classes efficient but also their research publishable and rewarding. However, if that trust is not present, the library may experience resistance in forming a relationship with the very people the library mandates itself to support. The faculty may believe library support is limited to student research and support, not their own. The library, like Aladdin/Prince Ali, must present itself as a trustworthy partner in the research journey to success.

This case study chapter will examine how two smaller humanities-based college libraries, that are within a mixed decentralized centralized larger university, can impact academic research by providing a personalized document delivery service. The InfoExpress Service supports the goal of its three institutions by providing excellence in research and teaching. InfoExpress is a document delivery service that is designed to assist with the research and writing process for tenured and non-tenured faculty, sessional instructors, as well as graduate students, providing them with the materials and items they need to begin, continue, and finish their academic and professional work. In order for this service to be successful, there must be a long-term trusted commitment on the part of the library and researchers to see each other as partners in their workflow. The initial anxiety over trust is expected, and the library research support staff must work diligently to make the service work efficiently from the beginning, becoming – to continue the Aladdin metaphor – like the Genie of the Lamp. The staff must produce requested material quickly and accurately from the very beginning to build the relationship. Like the Genie, who is bound to the Lamp, the staff are bound by university library policies, college policies, and copyright laws, thus requiring them to balance the requests and actual results.

This case study chapter will draw its information from two InfoExpress Services; one is well established and the second is relatively newer. Both offer the same core service and similar extended research support within their respective libraries. The literature review focuses on faculty-library relationship as it pertains to document delivery services, which will support this examination on how smaller humanities-based libraries can impact academic research. Background on the organizational structure will provide an understanding of the mixed decentralized-centralized system in which the two colleges operate. In order to examine the variables of this question, a discussion on the issues, controversies, and problems will be followed by a full description of the service. The section on recommendations and solutions discusses how smaller libraries can utilize this service to develop trusted relationships with their faculty to impact university research. The chapter concludes with future directions for the service.

LITERATURE REVIEW

When examining the literature for research support services in academic libraries, it is best to narrow the range of topics; literature examining the intersection of relationship, trust, and research is of primary importance. One challenge in conducting such a literature review is where personalization is lacking: the description of faculty relationship with their academic library, where the library is seen as a trustworthy research partner rather than a service provider, is missing. While there is literature that discusses how a

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specific library or department employs the service there is limited reference to personalization and thus the literature is unclear on how that impacts the relationship between faculty and the library staff who provide it. As the literature has a gap in this regard, faculty's trust is presumed rather than earned: multiple studies collected positive feedback from faculty but do not analyze the comments as the beginnings of trust or a partnership between faculty and their associated library (Bladek, 2014; King & Pendleton, 2009; Kung & Chambers, 2019; Lee & Baron, 2008; Walker, 2012; Yang, Hahn, & Thornton, 2012). The trust built by these services is not being evaluated nor considered as a viable component for data collection.

Breakdowns in communication and trust between library staff and the faculty are not new. In her 1981 study "Sources of Tension And Conflict between Librarians and Faculty" Mary Bigg cites one particular area that highlights the breakdown in communication: the librarian-scholar and the library-assistant. The librarian-scholars were closer to the researcher, a "natural link with the faculty – a sense that their needs were comprehensible and important to those running the library" (Biggs, 1981, p. 185).

Librarians and faculty members were once creatures of the same order, with similar educational preparation, interests, and understanding of what the library should do. Rather quickly they have evolved into quite different creatures, each insistent upon professional autonomy, stubbornly holding sometimes disparate visions of the library's mission, and communicating very little with each other. (Biggs, 1981, p. 186)

If the relationship between faculty and the library services is not one of respectful trust, then the service will not receive the attention it may require from budgetary discussions or other means of support. Building trust between the library and the researcher is essential to the relationship: it requires reforming the understanding that library support is equal yet different to scholastic research.

It is clear the situation has both changed and worsened since Biggs released her study. In 2015, Meredith Schwartz and Jennifer Albers-Smith released a study called the "Bridging the Librarian-Faculty Gap in the Academic Library" (Schwartz & Albers-Smith, 2015). In this document there is a clear disconnect in communication and the reality of faculty research between the librarian and the faculty researcher: while faculty believe and agree that the academic librarian provides help to the student, faculty do not believe the academic librarian is sufficiently skilled in the faculty's own discipline to assist them in their research; whereas the academic librarians want inclusion in faculty meetings and commitment for library-led research instruction . Further disconnection is found where the faculty want library support for their research to be of "utmost importance" to their home library, the academic librarian does not share that value (Schwartz & Albers-Smith, 2015, p. 3). Schwartz and Albers-Smith (2015, p.7) say the faculty report higher usage of library services and communicate with the librarian far more than the librarian . The biggest disconnection is in communication with the library as a whole: for librarians, 98% say it can be improved whereas 45% faculty would concur .

Librarians were likely to blame faculty for being too busy and having no time for [consultation] meetings. One-in-five also acknowledged that faculty members are unaware of how the library could support them. A few mentioned that they rarely cross paths with faculty, especially adjunct faculty, because they do not receive on-campus offices. Faculty commonly responded that they had no need to consult with campus librarians or that they were too busy to do so (Schwartz & Albers-Smith, 2015, p. 9).

How does one partner improve communication with the other who says there is not a problem? What can bridge the disconnection? An answer some academic libraries have found is the creation of a docu-

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ment delivery service like an InfoExpress to increase both faculty usage as well as awareness of what the library and librarians can provide. The purpose of InfoExpress is not to create avenues for the return of a librarian-scholar, but to create more avenues and redefine for scholarly communication between the library and the faculty. Faculty research will most likely appear on a course reading list, and the library needs to be prepared for students inquiring about their professors' publications. The hidden factor in this increasing the trust the faculty/researcher has in their home library being able to assist. The faculty coming to rely on the library involves more depth than knowing the library is there with staff who could possibly assist: it is the secured knowledge and trust the library and its staff can and do assist that changes the communication dynamic.

In their 2012 article "Fourteen Things to Look for When Hiring New Staff in Interlibrary Loan/ Document Delivery" (Shrauger, Radnor, & Santiago, 2012), the authors initially appeared to indicate the importance of interaction and trust-building as part of the document delivery process. It described the fourteen qualities to notice when hiring someone for the document delivery department: customer service oriented, skilled with database searching and computers, able to multi-task, work independently and as part of a team, enjoy a challenge, thrive in a fast-paced environment, appreciate change, capable of engaging in physical activity, a good communicator, detail oriented, decisive yet flexible, no pattern of being absent or late, a knowledge of library systems, and would fit in well with the existing library team (Shrauger, Radnor, & Santiago, 2012). Absent from the list and descriptions is the ability to engage faculty and researchers. The document delivery service is viewed as another service provision and not a specialized tool to bridge the faculty and their academic library. This vital element appears to be neglected or at worse, presumed to pre-exist.

In a second article, "Library Express Delivery Service: The Evolution of a Campus Delivery Service at Florida State University", the authors note relationships as being important to the overall workflow:

We learned that proactive, engaging conversation with faculty members and academic department office administrators is critical. The LEDS [Library Express Delivery Service] manager spent considerable time visiting academic department offices, discussing procedures with office administrators, promoting the service, and distributing his business card. As a result of that effort, administrators and faculty members have a relationship with LEDS, which noticeably improves communication and problem solving. (Schoonover, Siriwardena & Jones, 2013, p. 209)

Though easing into the workflow is important, the relationship is not just for workflow purposes. It extends to all the library services.

A third article, "Resources – Anytime, Anywhere: Branding Library Services, A Case Study of Texas Tech's Document Delivery Department" (Litsey & Daniel, 2013), discusses heavily the desire to understand how patrons experience the service, and how to improve marketing it so as to create an emotional connection through branding. Using business marketing strategies, it was learned:

It is also up to the employees in the individual department to add value to the branding effort through the customer's Document Delivery experience. In other words, the department's employees must exude the brand. It is in this definition where [the authors] see how the academic library can fall short and where [the authors] hope to [have] success with [the] Document Delivery campaign. (Litsey & Daniel, 2013, p. 21)

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For that to be successful, there must be trust and honesty in the development of the service and in the relationship between the faculty and the library service. In this case study chapter, with the two federated colleges, one person represents the service, but the whole library provides and fulfills the requests: from the student sent to retrieve the item from another campus library to the acquisition of the item for the library collection, the InfoExpress service is not the sole responsibility of one person. No policy or procedure will develop that kind of relationship between library and faculty on its own; human involvement and interaction is of importance.

ORGANIZATION BACKGROUND

University of Toronto and Federated Colleges

The University of Toronto (U of T) is comprised of three campus locations: University of Toronto (St. George Campus), University of Toronto Mississauga, and University of Toronto Scarborough. As of 2020, U of T offers 980 programs of study and has an enrollment of over ninety thousand undergraduate and graduate students, which are supported by over twenty-one thousand faculty and staff members (University of Toronto, 2020). The St. George Campus is the main campus of the university located within the urban area of the City of Toronto and is a collegiate based system modeled after the University of Oxford and the University of Cambridge. From its seven colleges, three are independent universities with their own governing authority, the right to grant degrees and honorary degrees, and are federated within U of T. This chapter will focus on two of those colleges: the University of St. Michael's College, and the University of Trinity College.

The federated colleges provide academic programs, registral and residential services to undergraduate students enrolled at U of T and to graduate students enrolled with the respective college. As is the purpose of the college system, each federated college serves its own community of students and faculty by balancing their independent identity with the agreed upon relationship with U of T. Both colleges were founded in the mid-nineteenth century to provide a university education from a religious perspective: Roman Catholicism for St. Michael's College, Anglicanism for Trinity College. In the early 1900s, both colleges entered into a federation with the University of Toronto for its undergraduate programs; and they continue to confer its own graduate degrees within their theological faculties. Both colleges are also members within the ecumenical consortium of the Toronto School of Theology. As of 2020, both colleges support over seven thousand students within 11 academic programs/faculties. In each college, the faculty teach within the college's own undergraduate or graduate programs, and may also be cross appointed to a department at U of T.

University of Toronto Libraries and Federated College Libraries

The University of Toronto Library system (UTL) includes of over 40 locations including campus, college, faculty, and department libraries, and is a member of a consortium with 16 teaching hospitals located in the Greater Toronto Area. UTL is a mix decentralized-centralized system, which is illustrated by its shared library catalogue and operational platform, but individual governance of library policies, services, and procedure are dependent on a library's status within the system. The federated colleges administer their own libraries within this system. The collections and services of these libraries are developed to

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support the undergraduate and graduate studies of each college with an agreement to extend support to U of T departments which may be physically located on college grounds. Extensive research support, such as data management, grant applications, instructional training, open access, and scholarly communication are provided by UTL.

The John M. Kelly Library (Kelly Library) is the college library of the University of St. Michael's College, and the John W. Graham Library (Graham Library) is the college library of the University of Trinity College and Wycliffe College. Wycliffe College is an Anglican College located at the University of Toronto. The Graham Library holds the Wycliffe College theological collection and thus provides services that support the faculty and students of Wycliffe College as well.

Combined, the library collection total is nearly half a million volumes that focus largely on humanities and theological subjects. They offer support services to students and faculty by way of research consultations, personal librarians for first-year students, research and information literacy instructional services, course specific research guides, course preparation services such as course reserves and electronic reserves, and an InfoExpress service. Between the two libraries, there are nearly 30 staff members (librarians and paraprofessionals) who support the collections and provide services. Each library's mandate is to support the research and teaching activities of their respective college.

SETTING THE STAGE

Personalized Document Delivery Research Support Service in Humanities-Based College Libraries

Smaller humanities-based libraries within a larger mixed decentralized-centralized university library system are often not visible for the research support they provide to faculty due to the size and subject of the collection. It cannot be denied that university research results are highly focused on science and health related research, and that the larger libraries within a university are equipped with sufficient staffing levels and are adequately financed to provide research support on a larger scale. However, the smaller libraries also have the mandate to support teaching and research. There is a need to be creative in the approach to provide research support services, where a balance between the needs of the researcher and those of the library are met with successful results. A personalized document delivery service can begin to establish a relationship with researchers that will support their work with the library's collection. A trusted relationship with the researcher allows for the successful promotion of other research support services to the faculty member. The advantage of providing research support within a smaller setting is the development of this trusted relationship between the library and researchers. It is this trusted relationship that will see the researcher return to the smaller library for additional support and for the library to grow in services it can provide.

Issues, Controversies, Problems

How do smaller humanities-based libraries in a mixed decentralized-centralized larger university system impact faculty and graduate research? Stemming from this research question come a variety of sub-questions that can be answered by the offering of an InfoExpress Service and the initial building of trusting relationships with the researchers who use the service. The following list of questions is by

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no means exhaustive, but they can be divided into the distinct themes of collections, relationships, and operations. These themes and questions pose directional and research support challenges that are faced by smaller libraries within a larger university library system.

Collections

- How does a smaller library get researchers to utilize the resources from its collections over similar resources from the larger library?
- How does the library build collections that support researchers' current needs?

Relationships

- How can smaller libraries begin to establish a partnered relationship with faculty?
- How do other libraries within the system contribute to a personalized document delivery service?
- How does personalized document delivery promote other research support services within the university?
- How to effectively manage faculty expectations of a personalized document delivery service?

Operations

- What research support do faculty seek from smaller libraries?
- How many library staff are needed to provide this service effectively and efficiently?
- What are their roles and responsibilities of staff involved with this service?
- How can the service be promoted effectively?
- What technological resources are needed to support the service?
- What are the limitations in providing a personalized document delivery?
- What policies and procedures are needed for successful operation?
- Should the personalized document delivery service be accessible to other researchers?
- What additional support services can a personalized document delivery service provide?
- How will the success of a personalized document delivery service be measured?

In answering the main research question and thus answering several of the subsequent questions, the following case description will show how two federated college humanities-based libraries respond and provide the InfoExpress service, engaging faculty and researcher into a connected partnership of trust that benefits both parties.

CASE DESCRIPTION

InfoExpress as a Research Support Service Within the University of Toronto

The InfoExpress Service was developed to provide faculty a personalized experience within the library. Faculty submit a request for research material located within the library's collection, available within the University of Toronto Libraries, or obtainable through the Interlibrary Loan service. Items of a physical nature such as books and media are delivered to a faculty's office or collected from the InfoExpress staff member. Material which can be digitized such as journal articles or book chapters/essays are scanned and emailed as an attachment to the faculty's university email address. In return for this service, the

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library gains knowledge of the faculty member's current research which is used to support collection development.

Beyond the basic exchange of services for information, the InfoExpress Service establishes a personal relationship with faculty that earns their loyalty to the library, its services and collections, and staff. To establish this connection, the service caters to each faculty member's individual fulfillment request. This can mean that material is only delivered/collected on specific days during specific times; material is only obtained from specific sources or locations; and/or material that is digitized is done so to the preferences of the faculty member, such as orientation, enlargement, and/or editing. This is the initial step to building faculty trust. Fulfilling requested material that matches the specifics indicated demonstrates to the faculty member how their work is respected by the library. In return, it is hoped they will respect how the service and library operate.

The InfoExpress Service directly impacts how faculty undertake research because it saves them an extensive amount of time. By providing the requested material, InfoExpress saves the faculty member time in searching for the location of the items on campus and then traveling to individual libraries to collect the material. If the available material is not found within the library stacks, the faculty member is informed that InfoExpress will continue to search for the item, thus preventing faculty from losing precious research time searching for material that is lost or mis-shelved. The InfoExpress Service respects the limited amount of time faculty have for their research, especially for those who must balance their time between research, teaching, and service commitments to the university. When InfoExpress provides material which faculty know is not easily obtainable, such as unlocated items, incomplete/inaccurate citations, specialized material held at international institutions, or not held within any library, it demonstrates the library's respect for faculty members' research and their time, and strengthens the trust faculty place in the library to support their work. The extra effort to secure hard to obtain resources will result in faculty entrusting the library to provide support for additional needs.

InfoExpress involvement in faculty research support extends beyond the delivery/collection of material. The knowledge of faculty's current research is used to support collection development. The gathered information is anonymized and passed to subject liaison librarians, who may choose to acquire material for the library's collection or acquire other sources within the subject scope in anticipation of faculty research needs. As well, the librarian may suggest alternate sources or databases to the faculty member based on the requested material. The research history and relationship a subject liaison librarian has with a faculty member will make identifying individual faculty based on their research obvious within the reports. This unprompted research support demonstrates the library's commitment to a faculty member's individual research and strengthens the relationship of the subject liaison librarian as their research partner. The liaison librarian may also engage and promote additional research support services offered by the library or available from UTL, such as, developing effective research strategies, introducing alternative reference management tools, providing support for research promotion, and/or identifying open access publishing opportunities.

The InfoExpress Service has been adopted by four libraries at UTL; the Bora Laskin Law Library, the University of Toronto Scarborough Library, the University of St. Michael's College Library and the University of Trinity College Library. Three other libraries within UTL have developed a shared Scan and Deliver Service for document delivery, but their service parameters do not mirror those of the InfoExpress Service. This case description will focus on the two federated college libraries of the John M. Kelly Library and the John W. Graham Library. These two InfoExpress Services have a similar operating structure and the libraries share the same relationship within the University of Toronto.

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InfoExpress at the Kelly and Graham Libraries

Together, the InfoExpress Services at both the Kelly and the Graham Libraries support roughly 125 faculty members. Faculty eligibility to access the service is defined by their physical connection to the college, as in, if they have office space on the college campus grounds, they are permitted to use the service. The service is also extended to visiting scholars, college fellows, senior administration staff, and anyone else with a distinguished connection to the college. Initially, the InfoExpress Service is promoted from the top-down, but once established it becomes a one-to-one connection. Both libraries initially promote the InfoExpress service with presentations to faculty committees by the Chief Librarians, subject liaison librarians, and/or librarians who are responsible for the service. After the launch, the staff member responsible for the service's operations will visit individual program/department meetings to allow faculty to ask questions or clarify the limitations of the service. This is followed up by one-on-one conversations either in person or via email. Both libraries prepared a webpage where information regarding the service could be referenced, and both prepared a physical brochure that was handed out after a presentation and can be given out to faculty who inquire about the service while in the library (see Appendix I for an example of brochure content). Over time, faculty who use the service are the primary promoter. They discuss its merits to other faculty members who have not yet used the service; brag about it to associates in other departments within and beyond the university; personally recommend it to new faculty within their department; and publicly acknowledge its support in their publications.

Operation of the service is similar at both libraries. Requested material that is available within the University of Toronto Libraries system (UTL) is provided within three business days but is usually available within 24 hours or less. Material that is being used by another library patron will be obtained once it has returned or it may be suggested for collection acquisition. Either method will result in the faculty member obtaining the next available copy. When Interlibrary Loan requests cannot be fulfilled, the library will purchase a copy for the collection or the InfoExpress staff member will contact the author directly to obtain a copy. If the material does not match the collection development policy of the library, then an acquisition request is sent to the most appropriate UTL library.

Most of the material is requested via a dedicated email account, but in person or telephone requests and submitted physical lists are not uncommon. The preference to use an email exchange over an online submission form is the distinctive feature of the service. It is for the benefit of the faculty member that contacting the service with as many requests as desired by way of a single communication method reduces time and effort to utilizing the service and increases the efficiency of faculty research time. Unlike an online form, each requested item does not need to be entered individually. A dedicated email account allows for other library staff to provide support when the assigned InfoExpress staff person is unavailable or when additional assistance is required during peak periods. All requests and collected data are entered into an electronic program to monitor each request's progress and then analyzed later for reporting purposes; Kelly Library uses Microsoft Access and Graham Library uses Microsoft Excel (see Appendix II for an example of collected data). The only other technological needs are a scanner which can scan documents as large as 11" x 17" at 300 dpi or higher and a software license for a program that can edit portable document format. It is recommended to scan at a minimum of 300 dpi if using optical character recognition within the document.

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John M. Kelly Library, University of St. Michael's College

The Kelly Library has one paraprofessional InfoExpress Liaison and three other paraprofessionals who support the service. The Head of Public Services is the librarian assigned to the service, and the service sends usage reports to four subject liaison librarians. The current service has access to one student library clerk whose primary responsibility is to collect and/or digitize material. The Kelly InfoExpress Service promotes the service to faculty by sending personal emails before the start of each term which is July, November, and April. It promotes the service to new graduate students each September during their individual department/faculty orientation and then sends a personal email in April reminding students the service is available to them during the summer when they are researching away from campus. The line chart in Figure 1 presents the activity of Kelly InfoExpress since its inception in 2007. The total amount of requests per year is dependent on the research activity of its users. Variables to this include the number of faculty on research leave, those preparing for the creation of new courses, and visiting researchers on campus. When the service began there was only one InfoExpress service operating at the University of Toronto, thus its first few years at the Kelly Library was a slow growth but over its 12 years of operation, it continues to increase the number of unique users it supports per year.

Figure 1. Kelly InfoExpress total annual requests and unique users (Data source: John M. Kelly Library)

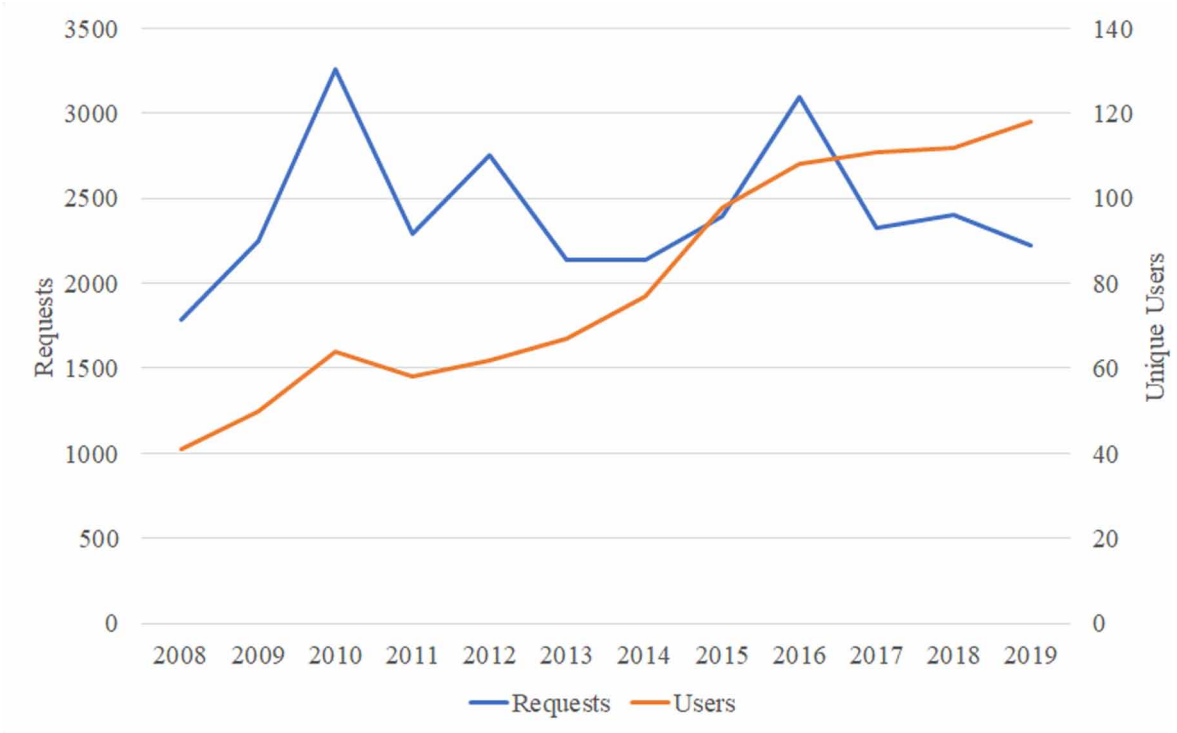

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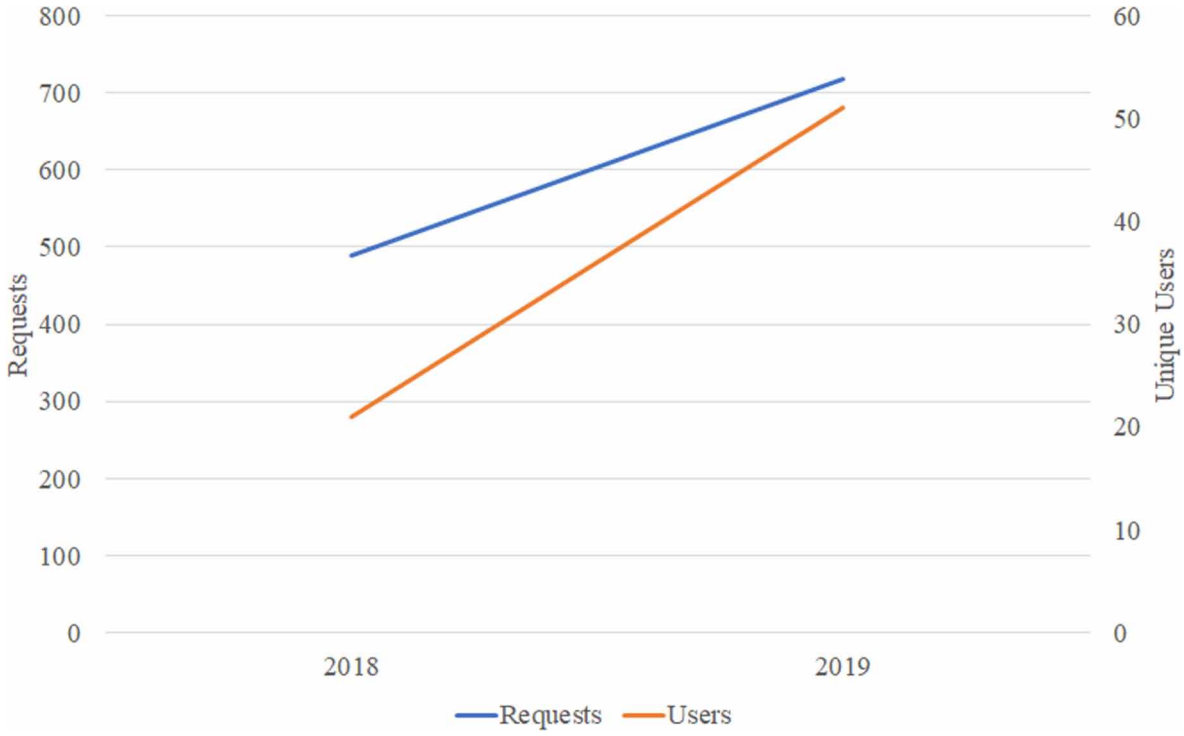
Figure 2. Graham InfoExpress total annual requests and unique users (Data source: John W. Graham Library)



John W. Graham Library, University of Trinity College

The InfoExpress Service offered at the Graham Library began in January 2018. It serves the faculties at Trinity College and Wycliffe College; whose primary research areas are theology and international relations. As a result, the Graham Library has a collection mandate to collect in these areas as well as to provide research support through reference, subject liaison, and other localized library assistance. The Graham Library has one paraprofessional InfoExpress Coordinator with one other paraprofessional who is cross-trained for continuation of the service during absences. The Instructional and Reader Services Librarian is assigned to the service and receives the service's reports. There are 24 student assistants who support the service at the Graham Library through the retrieval of items. Promotional materials are provided once a year in April to all faculty and graduate students. The line chart in Figure 2 presents the activity of the Graham InfoExpress since its inception in 2018. As with Kelly InfoExpress, the total amount of requests per year is dependent on the research activity of its users; thus, it has the same variables affecting its numbers. The InfoExpress service at the Graham Library is the newest InfoExpress at U of T. It has the advantage of attracting users who are aware of the service benefits from their colleagues at other colleges. Thus, in its second year of operation Graham InfoExpress had a 142% increase in unique users.

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RECOMMENDATIONS AND SOLUTIONS

A main campus library collection can easily surpass those of the smaller libraries, but the smaller library is in a unique position to respond adequately to the challenges made by its associated researchers. There are always advantages and disadvantages of a smaller library providing research support services within a larger institution. By acknowledging the variables of its situation, the smaller library can provide research assistance in manners that the larger campus library simply cannot.

From the above bi-college situations, some recommendations and solutions to the variables can be made and addressed; and some remain ongoing due to the structures in which the research support service functions. For example, the general management and organizational structure are both fixed variables. The federated colleges comply with policies and procedures as outlined by the University of Toronto as well as those from the University of Toronto Libraries System, as well as their own where permitted as part of the federated agreement. The other variables, however, allow for opportunities that can benefit the relationship between the researcher and their academic library. Some variables that influence how a research support service functions in this environment are easily identifiable, and the ones of note are: collection promotion and currency, staffing, localization of service, and promotion of existing university research support services. Similar to the questions above, the recommendations and solutions will address the themes of collections, relationships, and operations.

Collections

Collection Promotion and Currency

The smaller the academic library, the more concentrated and specialized its collection. If a library is associated with a specific department or faculty, it will focus its collection in the area of research that department or faculty is known for, as well as the items necessary to support the courses taught in that department. If the library is too generalized for specific research fields, the research being conducted by said department or faculty may be stifled or prolonged due to the limitations of the home library collection; frustrated, the researcher may look elsewhere for avenues and inspiration. However, if the library actively engages the researcher in locating the required materials, the library has the opportunity to learn what current research is being conducted; thus it has the opportunity to both promote and expand its collection, tailoring it to the needs of the research being conducted at that moment by those it is mandated to serve. By doing so, the library continues to be relevant in the academic lives of both the professor and the student, both current and future. The one-hundred percent stacked column charts in Figure 3 & Figure 4 presents the percentage of InfoExpress requests fulfilled by the Kelly and Graham Libraries' own collections. On average a quarter to one-third of requests for physical material available within UTL can be fulfilled by the college library's own collection.

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Figure 3. Kelly Library collection usage by its InfoExpress Service (Data source: John M. Kelly Library

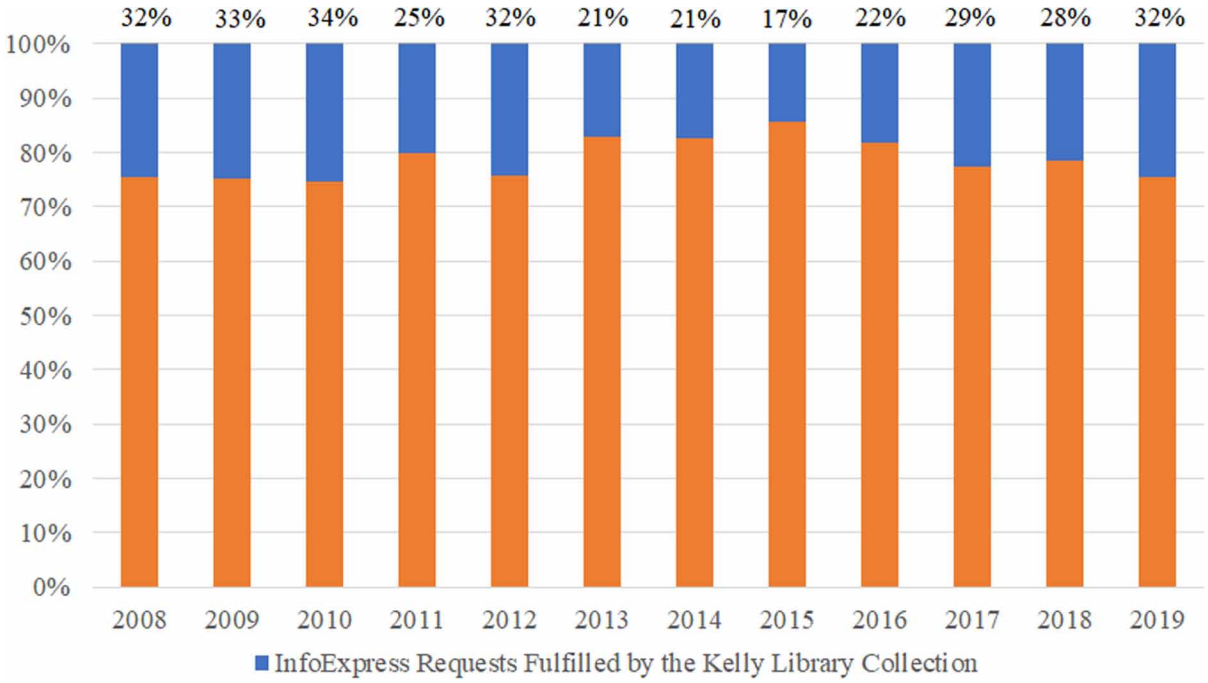
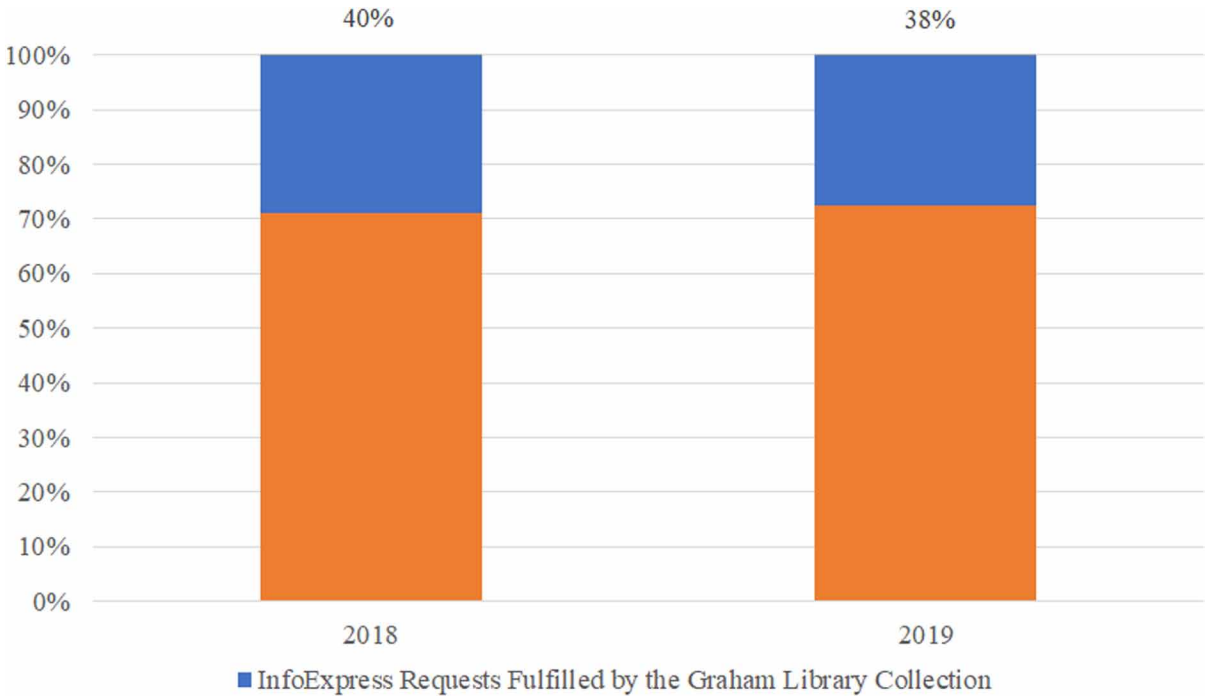


Figure 4. Graham Library collection usage by its InfoExpress Service (Data source John W. Graham Library)



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In the Toronto School of Theology Libraries Committee (2020) survey, responding faculty from St. Michael's College, Trinity College, and Wycliffe College agreed that their home library provides "good" and "excellent" access to resources for their "denominational tradition", and that the InfoExpress Service plays a part in how they access the collection: "The new service through which library book requests are provided by the Graham library: delivery, pick-up, etc. It has revolutionized [my] use of hardcopy library resources" (p. 9). It is worth noting again the length of time each service has been operating. The Kelly InfoExpress service is firmly established and is part of the faculty culture at the University of St. Michael's College; whereas the Graham InfoExpress service has yet to be seen as a full partner in research with most of the faculty, thus those faculty members that are using the service are beginning to modify their research habits that include the InfoExpress service. Much like the exponential increase in users for the Graham Library from year one to two, it is expected that the usage of the home collection will increase as non-Graham Library material requests are used to influence the collection's development.

The smaller library is also at a disadvantage for the same reasons as its advantages, not only for its size, staffing, and collection but also in the number of research support services it can provide. Due to the specialization of its collection, a smaller library will have specific subject liaison and mandates. It will not have the budget to acquire every item an associated researcher wants. It will not have more specialized staff in areas such as language or cultural influences, but it may have connections through the larger university library system to do so. For instance, while a smaller humanities-based library may have a large collection in Eastern Orthodox Christianity, it may not have those resources in a language other than English. For the faculty member, the InfoExpress serves as a connection to the university's full collection, as one St. Michael's College faculty member remarked in the survey of the Toronto School of Theology Libraries Committee (2020), "Because I benefit from Kelly InfoExpress, I must admit that I always get the material I request but I'm not sure it's always from our holdings" (p. 3). Therefore, each area of disadvantage creates the opportunity for the smaller libraries to collaborate with the larger university library system.

Relationships

The most obvious advantages of a smaller academic library providing research support services are due to its size. Fewer staff working for a smaller contingency of associated faculty and graduate researchers means there are opportunities to know each person directly: an academic research support community is built. It enables faster completion of requests due to fewer persons being involved and the document delivery service becomes a preferred method of starting the research journey. Questions and suggestions for collection promotion and development come more readily which in turn enables the researcher to engage in their research and writing with less interruption. The smaller library becomes a trusted place to begin the research journey, and a place for promotion of published research amongst other faculty and students. The pie charts in Figure 5 & Figure 6 present the percentage of users from the total eligible faculty for the Kelly and Graham InfoExpress Services for 2020. Since faculty eligibility varies per year due to the comings and goings of academic personnel, this percentage only represents those faculty members which meet the primary criteria for the service, in that they have an office on campus and their status at the university is ongoing and not considered limited or temporary, thus no exceptions or extensions were applied. As of 2020, over three-quarters of eligible faculty for Kelly InfoExpress and nearly half of the eligible faculty for Graham InfoExpress have used the service at one point.

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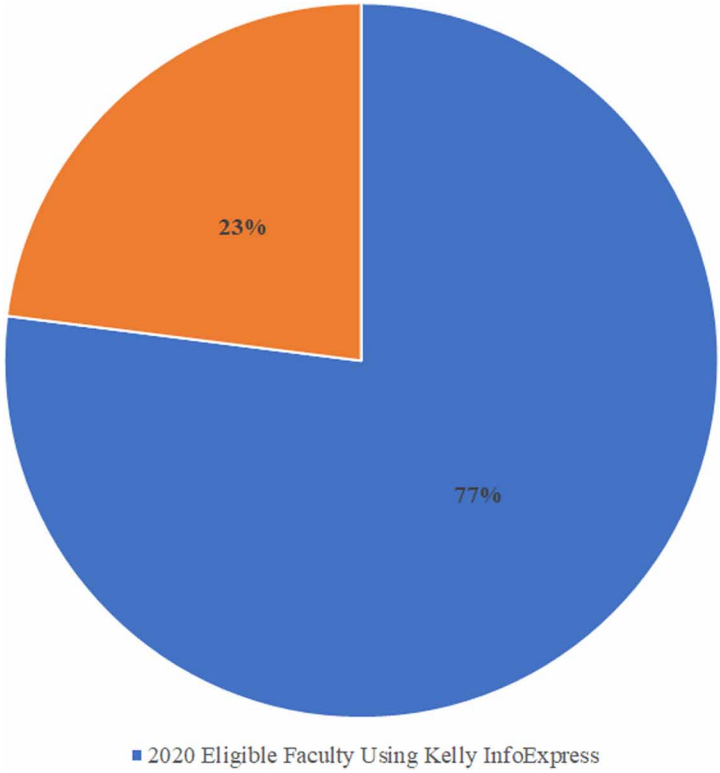
Figure 5. 2020 Eligible faculty use of the Kelly InfoExpress Service (Data source: John M. Kelly Library)



Localization of Service and Promotion of University Research Support Services

An InfoExpress service is neither a localized service nor does it work in isolation within the library. Restricting it to only those resources housed within its host library defeats the purpose of item retrieval. InfoExpress works best in an environment of collaboration amongst other library staff as well as research support services. Other more localized services that would work in tandem with an InfoExpress service as well as benefit a smaller humanities-based library are a copyright specialist, electronic reserves and course reserves, and instructional and/or subject liaison librarians. Each of these additional services can be housed within the smaller library and be limited by the scope of course variety and depth. Because of the relational aspect between the researcher and the InfoExpress service, the researcher is brought into greater awareness of the localized services their home library provides and it provides the opportunity for the promotion of additional services beyond the home library. The opportunities for collaboration grow exponentially depending on what the researcher needs, such as interlibrary loan when the item is not available on campus, digitization of other campus libraries rare book or special collections, guidance on supplying their research to the institutional repository, and informing them on the latest resources available to promote their published research. An InfoExpress service becomes the gateway to more research support than what the smaller home library can provide.

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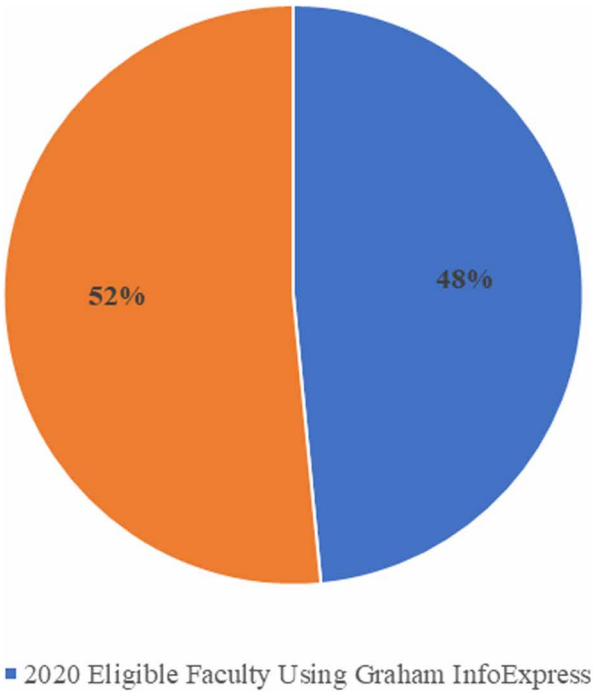
Figure 6. 2020 Eligible faculty use of the Graham InfoExpress Service (Data source: John W. Graham Library)



University of Toronto Library Partnerships

Providing a personalized service in a large decentralized library system provides several challenges but also offers great opportunities for collaboration. The federated college libraries have the capacity to build strong relationships with their community due to the size in population it serves. There is the ability to be flexible with internal policies and procedures which is more difficult with larger libraries at the University of Toronto that serve larger populations. By its operating regulations, the InfoExpress Service respects the policies and procedures from other libraries within the system. Since this service is only available in a small number of libraries at the university, it is understandable there would be some misunderstandings of how the service operates and if the policies from each individual library are being observed. If the existing InfoExpress Services can communicate and work more frequently with each other, it is recommended they begin to develop a common voice that can be heard at system wide committee meetings.

The trusted relationships the InfoExpress Service has developed should be utilized to their fullest extent when connecting faculty to additional research support services offered by UTL. The Scholarly Communications and Copyright Office (SCCO), and the university's research repository service of T-Space are research support services available to all faculty and graduate students at U of T. The InfoExpress staff members need to be knowledgeable of copyright compliance in order to meet the legal obligations of providing a document delivery service, however, it is beyond their mandate to review faculty's author contracts from publishers and/or obtain permissions of copyrighted material to be included in forthcoming faculty publications. T-Space is another research support service that assists faculty in complying

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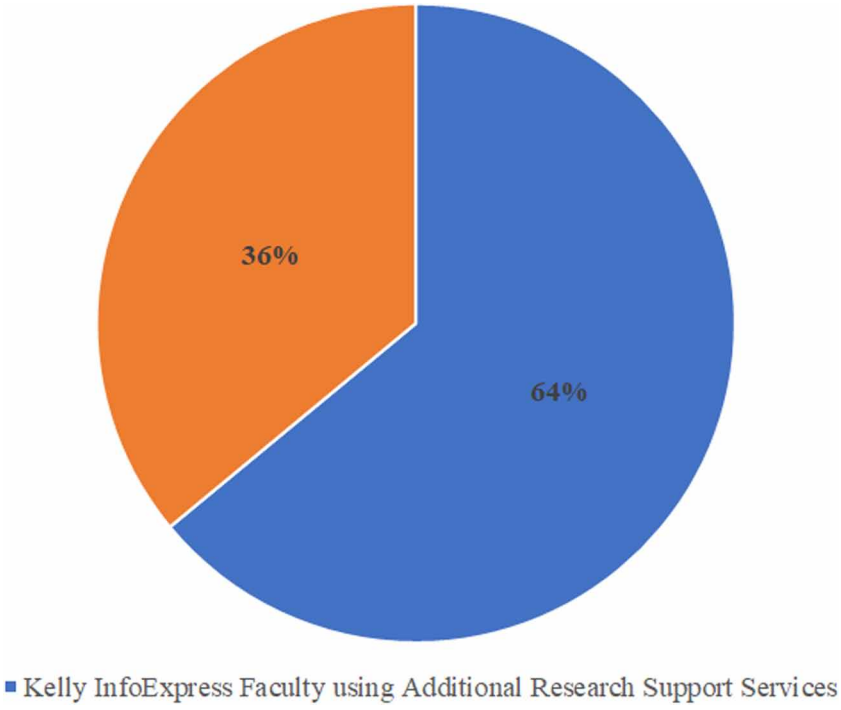
with the government of Canada research grant funding requirements. It is the pre-established relationship between faculty and the library that leads faculty to seek additional research support beyond what is provided from their home libraries. This trusted relationship supports promotion of research support services offered by U of T of which the faculty may be unaware. The services offered by SCCO and T-Space are vital to the research lifecycle of academic faculty. InfoExpress recognizes the importance of these services and promotes their activities to faculty when the situation warrants a hand-over. It is recommended that InfoExpress staff promote these two areas to faculty through regularly scheduled emails or on a one-to-one basis. There is a limited amount of staff time and working closely with an individual faculty member can take a considerable amount of it. The strong relationship established when faculty utilize the library enables a larger portion of the population to be reached at a personal level.

Figure 7. 2020 Kelly InfoExpress faculty users utilizing additional research support services (Data source: John M. Kelly Library)



The pie charts in Figure 7 and Figure 8 present the percentage of faculty users of the Kelly and Graham InfoExpress Services for 2020 who are also taking advantage of other research support services offered by the library system. At the Kelly Library, nearly two-thirds of faculty users of the InfoExpress Service are utilizing additional support services; whereas at the Graham Library, over four-fifths of faculty are users of the additional research support services, such as electronic reserves, copyright guidance, and institutional repository contributions. The recent introduction of the Graham InfoExpress has impacted faculty usage of additional research support services from its home library and that from UTL, as the Toronto School of Theology Libraries Committee (2020) survey indicates an "excellent" rating of 94%

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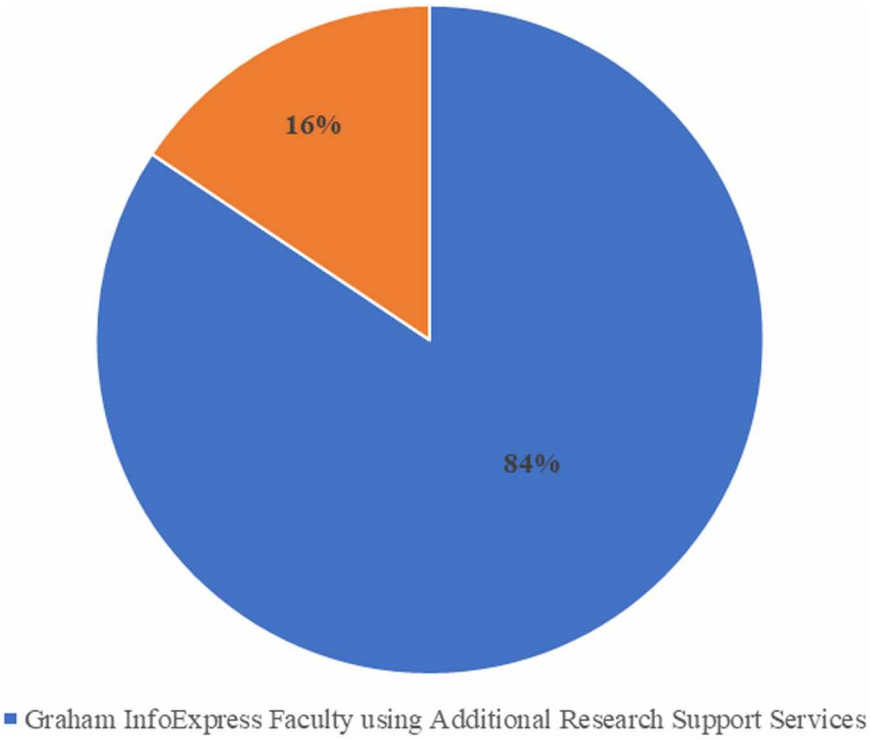
for the services offered. Thus, the InfoExpress Service is a launching point for libraries to promote the additional services available to researchers within the institution's library.

Figure 8. 2020 Graham InfoExpress faculty users utilizing additional research support services (Data source: John W. Graham Library)



Managing Faculty Relationships

A seemingly innocuous request can push the policy boundaries within which the InfoExpress Service operates. The Kelly and Graham Libraries operate within the policies of UTL, but they also operate within their own policies and procedures; some are transferable due to similarities between campus libraries while others are not. A library offering InfoExpress can be liberal with its own policies but not with others'. For instance, while InfoExpress Services can handle renewals as requested, it cannot exceed the prescribed renewal limit or override fines from the other UTL libraries. By a problematic extension, faculty may come to believe that their experience with InfoExpress is campus-wide rather than a localized service. Clear communication with faculty about the status of their library accounts indicating their library relationship via InfoExpress is unique only to the library providing the service is the remedy. This, and others like it, are opportunities for InfoExpress to reinforce its limits on what it can provide: it does not reduce the validity of the request made but creates opportunity for communication and clarity. There may still be confusion from time to time, clarity on policy of use is necessary, but offers an opportunity for ongoing open communication.

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InfoExpress by design is a personalized service, but there is risk of it becoming too personalized. In their appreciation, faculty may first use the service to the exclusion of the library catalogue use and no longer browse the library stacks for research sources. The library then has the responsibility to attract faculty back to the library through events and forums, as well as promoting other library services. Exhibitions, book launches, writing, research, and grant workshops, and new faculty book displays are examples that have been successful.

There is also potential that faculty will see the InfoExpress Coordinator or Liaison as their research assistant and will work with that person to acquire their materials to the exclusion of other members of the library staff – student, paraprofessional, or librarian. This also extends to technical support for faculty who prefer not to embrace the technology available to modern academics. To respect the trusted relationship, the faculty's preference must be handled with great care: introduction to other people and services at the same library or available on campus may lead to a sense of betrayal if the new experience is not similarly positive. Overtime, the trusted relationship turns into mutual understanding of needs, thus faculty become accustomed to someone knowing and interpreting their needs without extensive communication. However, what the faculty member may want can only be handled by another person within the library system. As the InfoExpress Service functions, inquiries can be moved along on behalf of the faculty member, but that may be as far as the service can extend. Again, it is vital to keep communication about the service's limitations clear, otherwise faculty may perceive the service as unreliable or its promises as unfulfilled.

While there are no limitations on the number of requests a researcher can make to an InfoExpress Service, there are limitations on what an InfoExpress Service can do; financial and personnel being two of the most obvious. These and the other limitations experienced provide moments of creativity and discovery for solutions where once there were obstacles. The challenges of providing the service are outweighed by the benefits to the library and to the researcher. The working goal for an InfoExpress Service is to make 'yes' happen, because the more 'no' is said to the researcher they will find an alternative to the library.

Operations

InfoExpress Staffing

Finding adequate library staff capable of both research and promotion is vital to supporting the research at an academic library regardless of size. For the smaller library, the advantage is a more direct ratio of support. For instance, if a large campus library has a ratio of 1 library staff member to 250 researchers, those researchers are not going to experience a direct working relationship with the library; the assistance given will not be personalized and not have a lot of influence on employment ratios or increasing the number of assistants. A smaller library, with a ratio of 1 library staff member to 10 researchers, stands a far better chance of knowing what each researcher is working on and can create opportunities for direction and collaboration with other library staff. A smaller library can work with more researchers in more specialized fields with more personal attention to details. It is also important to note that this is a proactive service, and it is necessary for personnel to constantly engage with researchers they encounter to continually promote the service. Otherwise, it will not be at the forefront of their mind when they are researching.

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The challenges of running the InfoExpress Service come from its success and the resulting demand from its patrons. This service focuses heavily on providing a personalized experience which can be difficult to provide within a large university such as the University of Toronto. The peak periods of the service are largely predictable because they revolve around faculty schedules. For InfoExpress, the spring and early summer are service planning time; mid-summer to early autumn are focused on preparing first term courses and supporting faculty and graduate students who are researching away from the university; mid-autumn to early winter are spent preparing second term courses; and during the early part of the calendar year faculty prepare for summer research leave. Throughout the academic year, September to August, non-InfoExpress staff are engaged with regular duties which also peak at the start of each term. It is during these overlapping peak times that services to faculty require additional staff support. The most appreciated characteristics of the InfoExpress Service are its speed and efficiency. Providing additional staff and student assistants will ease the stress of managing the volume of requests submitted during peak periods. It is also during these busy times that the email submission format may become difficult to manage. The increased volume of requests per email, which each need to be manually entered into the electronic monitoring program, may lead to lost requests due to human error. A single request form would eliminate this but may lead to service usage deterioration by the faculty, because it is asking faculty to exert additional time and effort in order to use a service that is intended to reduce these factors when researching for resources.

Defining Roles and Responsibilities

The relationship between faculty and the library is as important as the relationship between library staff and the InfoExpress Service. There are times when the role of InfoExpress overlaps with course reserves, electronic reserves, and, perhaps with greater objection, the work of a subject liaison or reference librarian. Stressing how InfoExpress is an additional service for research and reference is a way of defining the role and responsibility. This is especially important with graduate students who are looking for items to use in both their thesis writing and their course work. Some libraries employ staff to assist with course work research as well as locating resources for longer research; InfoExpress overlaps both. Subject liaison librarians may initially perceive InfoExpress as crossing into their defined roles and responsibilities, but they may also find it allows them to provide precise research assistance with students and faculty who utilize the service.

Overlapping research support also occurs with acquisition requests. Faculty members may request resources unavailable from the library system or Interlibrary Loan. These requests for purchase are sent to subject liaison librarians. However, if the material falls within the library's collection development policy it will receive approval for purchase. This need for approval adds an additional step which can delay fulfilling the request for faculty. For requested material that is beyond the collection development policy it is necessary for subject liaison librarians to make the acquisition decision. For all other material, it would be prudent to provide the InfoExpress Service with the responsibility of purchasing the requested material, thus eliminating potential wait times when fulfilling the request. In the end, it is a matter of finding the correct balance between the parameters of the service and those of other library services.

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Expansion of InfoExpress

The purpose of an academic library is to provide research support to all students and faculty. This support is exemplified through research consultations, information literacy education, and access to scholarly resources. Expanding InfoExpress's digitization service to graduate students ensures an ease of access available to all who engage in academic scholarship. The graduate students located on the colleges' campus are either enrolled in single or multi-year master programs or are doctoral students. The majority of students complete their thesis or dissertation away from campus, thus physically separating them from the libraries that serve them. By extending InfoExpress's digitization service the library continues to provide graduate students with a connection to the material they require for their research. The service does not currently retrieve physical material or handle Interlibrary Loan for graduate students; however, it will provide physical loans from the college's collection directly to students who are completing their studies at a distance. The financial costs of sending and returning the material are placed with the student. The University of Toronto is a member of the Canadian University Reciprocal Borrowing Agreement, which permits students to return library material to a participating institution within Canada who then sends it to the home institution at no cost. The InfoExpress Service is available to visiting scholars who match the criteria of campus faculty, in that they must have an office on campus. These researchers have a limited amount of time to access the university's collections, thus by design the InfoExpress Service is available to maximize their research intake while at the university.

The expansion of research support to classroom preparation further intensifies the trusted relationship of faculty with their academic library. The material faculty request from InfoExpress is used for their research and teaching; the two are often synonymous and the desire to use the supplied digitized material within their courses was the foremost request expressed by faculty. The 2012 amendments to the Copyright Act of Canada provided the opportunity for InfoExpress to expand to classroom preparation support. The modifications to the Act, in particular the inclusion of for the purpose of education within the *Fair Dealing* exceptions, permitted digital reproductions of short-excerpts or reproductions of material for which the copyright owner receives royalties or provides permission for the work to be communicated by telecommunication to students enrolled in the course (Copyright Act, Revised Statutes of Canada 1985, c. C-42). Telecommunication of the digital material is made possible through the university's learning management system which provides the reproductions to students only enrolled in the course identified by their university electronic access credentials.

The InfoExpress Service has a robust digitalization and item retrieval process in place. The nature of document delivery requires library staff to be knowledgeable on the essentials of copyright legislation as it pertains to libraries providing reproduction services to patrons, thus the expansion to an electronic reserve service does not place a strain on the existing InfoExpress Service and is a natural evolution. The promotion of the e-Reserve Service comes from the established trusted relationship forged by InfoExpress, and the growth of the now entitled Syllabus Service comes from faculty promoting the service to each other. These two services, along with the legacy service of Course Reserves/Short Term Loan, further supports faculty engagement with the library and its collection by providing them various services at a single point of contact. Having access to numerous syllabi allows the library to develop services and collections. The subject liaison librarians analyze syllabi for collection development, offer instructional sessions, and/or propose collaborative opportunities with faculty. These support services are established responsibilities for subject liaison librarians, but also having access to course syllabi allows them to propose tailored support to the faculty member. The InfoExpress Service shifts the viewpoint

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of the faculty as it pertains to obtaining digitized material for course readings from one of frustration and isolation to one of a trusted partnership between faculty and its academic library.

FUTURE RESEARCH SUPPORT DIRECTIONS

As the mentioned metaphor in the opening introductory paragraph describes, Aladdin needs the Genie to help him accomplish his goals and to work with him to solve the crises. In research support, the need for partnerships is becoming more defined in certain perimeters. The future of providing research support services will be more specialized as open data and access to electronic and digitized resources continues to increase. Researchers will have and have always had a plethora of services and support available to them, but what is becoming increasingly more vital is specialists in the research subject area. The librarian-as-research-assistant is returning as an important constant: they have always been research assistants, but now they are required to provide stability in the research journey. As university budgets for humanities-based research are diminishing, so too is access to paid graduate student assistance. Research assistance from the humanities-based libraries will be in greater need of specialist assistance. As stated in the literature review, the librarians were at one point seen as researchers themselves, gradually becoming seen more as an assistance to those beginning their research careers rather than being in the midst of those same careers: the future research support direction is a reconnection and a renewed understanding of the librarian as researcher.

CONCLUSION

Smaller humanities-based libraries in a mixed decentralized-centralized larger university system impact faculty and graduate research by forming trusted relationships that allow the library to build collections based on current research and provides support throughout the research process. The personal document delivery service of InfoExpress offered by the John M. Kelly Library and the John W. Graham Library at the University of Toronto are changing faculty solitary research practices in favour of a trusted research relationship with their academic library. Faculty adjust to seeing library services beyond the support available to their students and they see the library as their research partner. They personally know who is supporting their research and trust the people providing the service and have come to depend on the staff to start their research in the right direction. The process of establishing this trusted relationship requires an individual approach that demonstrates the library's commitment to supporting faculty's research output. Any future direction the InfoExpress Service takes will be not only to increase the productivity of faculty research but also improve the libraries' stature as an academic partner.

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KEY TERMS AND DEFINITIONS

Centralized System: One organizational body determines policies and procedures for many elements.

Decentralized-Centralized System: One organizational body determines policies and procedures for many elements, but there is allowance for situational and provisional use.

Federated College: An affiliated school or affiliated college that functions independently, but also has an agreement with another institution that may have some level of control or influence over its academic policies, standards or programs.

Front of House: Common Circulation desk, most common place for public service and interaction.

InfoExpress: A document delivery and item retrieval service provided to researchers to ease research difficulties and allow for more focused writing.

InfoExpress Coordinator: A person who coordinates the InfoExpress Service by responding to requests and delivering materials; similar in function to InfoExpress Liaison.

Paraprofessional: A person who has been assigned a professional task but who is not licensed to practice as a fully qualified professional.

Relationship (Professional): An ongoing interaction between two or more person maintained within a set of established boundaries or limits.

Research Repository Service: The storage of research work to both share and keep what has been produced by the research community at an academic institution

Research Support: Services libraries provide to researchers to increase their focus and writing. This may extend to course support.

Subject Liaison Librarian: A librarian who has been assigned to an academic department based on their experience and knowledge in that area.

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APPENDIX

InfoExpress Service Brochure Content

(Source: John M. Kelly Library and John W. Graham Library)

Description of Service:
InfoExpress is the Library's personal document delivery service for faculty members. The InfoExpress Service retrieves books, articles, and other materials from the Library, other University of Toronto libraries, and Interlibrary Loan. Items are delivered to and picked up from faculty offices. It is geared towards meeting research needs, especially the immediate; we aim to fill requests within three business days.

How do I submit a request?
You can request items by email, telephone or in person. Please include as much bibliographic citation material as possible. You will receive a confirmation email to acknowledge your request.

How long does it take to receive a requested item?
We try to deliver requested items to you within three business days. If an item cannot be delivered within that time, we will notify you by e-mail and continually update you on our efforts to retrieve the item. We do not place a limit on the number of items you can request. When you send a large list of items to retrieve, we will deliver the materials to you as soon as we receive them, rather than waiting to gather all of them.

May I request items on a rush basis?
If you have an emergency request, we will try to provide you with the item as soon as possible. Please indicate the date and time you need the item in your request.

Will InfoExpress go to other libraries to retrieve materials for me?
Absolutely! We will retrieve items from other libraries on the campus, and Interlibrary Loan.

In which format - paper or electronic - will I receive article requests?
All items will be sent as PDF files unless you request otherwise. Optical Character Recognition (OCR) will be active in each article to enable word or phrase searching.

How are items delivered to me?
If we have a delivery for you, we will send you an email to arrange a time for the InfoExpress staff to make the delivery to your office, or you can pick up the item from the Library. Please note: books cannot be left with anyone other than the intended recipient.

Can Kelly InfoExpress help me if I want a book chapter copied?
Yes! Please bring the request to the InfoExpress staff and indicate what you would like to have scanned. The copies you request will be emailed within three business days.

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May my student research assistant use InfoExpress on my behalf?
InfoExpress is a personal service intended for faculty members with offices on campus. Research assistants may not forward requests to InfoExpress on your behalf, nor pick up completed requests.

How do I return borrowed books and Interlibrary Loan materials that InfoExpress delivers to me?
You can contact InfoExpress to arrange for a pickup, or you can return the items to the Library. Please return Interlibrary Loan items to InfoExpress staff directly.

Is there anything InfoExpress cannot do for me?
InfoExpress can only make copies of copyrighted materials within the limits of copyright legislation. This situation arises most often when you ask us to copy an extensive amount of material from a source. If one of your requests raises a copyright concern, we will contact you to work out a satisfactory solution. We cannot supply you with a document that is intended for another user.

Can I recommend a book through InfoExpress?
Absolutely! If the material you request is not available at any of the campus libraries, and you believe that the material would be an asset to the Library, an order will be submitted as a rush purchase request.

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Table 1. Example of InfoExpress fields. (Source: John M. Kelly Library and John W. Graham Library)

Field Name	Description
Request Number	Sequential number starting from firsts day of statistical year
Library Card	Unique Library ID Number
Requester	Patron Name
Title	Title of item request or article/essay title
Author	Author/editor of item or author of article/essay
Source Title	Title of journal or book which contains the article/essay
Publisher	Source Publisher
Year of Publication	Year of publication and volume and page number for journal articles
Call Number	Library call number
Format of Material	Choose most appropriate from drop-down list: Article; Book; Chapter; eBook; Journal; Media; Microform; Pages; Report; Thesis
Item ID	Library unique item ID or ISBN/ISSN
Holding Location	Location of material on campus
Request Date	Date the request was started
Status	Current status of request
Retriever	Name of person who collected/scanned item
Ready?	Is the item ready to be delivered to the requester?
Delivery Location	Where does the item need to go?
Supply Date	Date of delivery or email
Loan Period	Duration of loan based on holding library's policies
Due Date	Return date of item
Return Date	When item was returned to library or interlibrary loan
Cost	Any costs paid to fulfill the request
Payment Date	Date of payment for item, if required
ILL Number	Interlibrary Loan request number
e-Reserves	Is this request an e-reading for a course
Non-Holding Request Number	Sequential number for items not available at the Library but elsewhere on campus

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Section 3
Asia

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Chapter 10
Researcher Unbound and National University of Singapore (NUS) Libraries' Evolving Role in Supporting University Research: Going Beyond Service

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EXECUTIVE SUMMARY

As a discipline-neutral entity, knowledge exchange, and nexus of the university, the National University of Singapore (NUS) Libraries is the ideal conduit for bringing together faculties and departments to facilitate cross-disciplinary education and research. This case study gives a detailed walkthrough on the creation and design of the Research Skills Framework (RSF), which forms the backbone for all information literacy programmes (ILPs), specifically the flagship Researcher Unbound (RU) programme and RU Symposium, and shares challenges faced and future improvement plans. The exploration, design, and continual improvement of the programme ensured that NUS Libraries provides relevant and timely research support and enhances the digital information literacy skills of the NUS community. This programme continues to be a work in progress drawn from participants' feedback, attendance, experience, and insights from seven semestral runs and cumulative total of 172 workshop sessions.

DOI: 10.4018/978-1-7998-4546-1.ch010

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BACKGROUND

The National University of Singapore (NUS) is the nation's oldest higher education institution. From a modest medical school with just 23 students in 1905, NUS has become a global high-ranking university with a key mission — to educate, inspire and transform through transformative education and multi-disciplinary research[1]. NUS is home to 17 faculties and 29 research institutes where approximately 41,000 students, 2,500 faculty, and 4,100 researchers learn and work, and where multidisciplinary research finds innovative solutions for local and global emerging problems.

Supporting NUS' educational philosophy[2] to nurture students to become well-rounded individuals with questioning minds, who possess resourceful and enterprising spirit in public and private life, and cutting-edge research, NUS Libraries aligns its strategic goals and objectives to achieve these outcomes:

- Facilitate student success,
- Advance teaching excellence,
- Increase research visibility & impact,
- Enhance organizational excellence, and
- Create value for the world.

NUS Libraries has been transforming library services and spaces rapidly since 2017 to support the university's mission more effectively and closely. However, the key role of NUS Libraries remains unchanged, that is, to connect people to collections, people to people, and people to spaces to generate ideas and new knowledge through the following:

- Collections: Curate, procure and provide access to print and electronic resources through various entry points, based on research, teaching and learning needs.
- Services: Facilitate research and learning through easy access to required information.
- Education: Design and conduct Information Literacy Programmes (ILPs) and workshops for students and staff, including online learning.

This chapter aims to provide a case study on how NUS Libraries provides research support to the university's community, with a focus on its flagship programme Researcher Unbound. The chapter will detail the evolution and development of the programme, adapting to the needs of the users, and explains the rationale for the implementation of a workshop series to provide instruction, awareness and knowledge to the members of the university.

With eight physical libraries supported by 146 staff, the library has a print collection of over 2.9 million books and journals, and a mega digital library consisting of more than 930,000 e-books, almost 100,000 e-journal and e-newspaper subscriptions, and 700 databases. The library also has specialised rare collections, such as the Singapore/Malaysia Collection, which comprises publications and grey literature written about or in Singapore, Malaysia and Association of Southeast Asian Nations (ASEAN). It also hosts several in-house databases to support research, e.g. PERIND, which indexes journal articles and books about Singapore, Malaysia and ASEAN that are not indexed elsewhere; ScholarBank, the university's institutional repository; and the Biodiversity Library of Southeast Asia, an open access digitised collection of Southeast Asian biodiversity literature.

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To stay relevant and meet the evolving needs of the students and staff, in particular early-career researchers, NUS Libraries continuously re-organises the four clusters comprising 63 library professionals and executives. Two clusters that work tightly together, Educational Services & Learning Innovation (ESLI) and the Collections & Research Services (CRS) largely provide education and research services while the other two clusters, Library Information Technology & Technical Services and Administrative Services form the integral backbone to ensure programmes are implemented smoothly. Also, the library provides state-of-the-art technology and innovation services and facilities to support research and teaching, these include:

- The Digital Scholarship Lab provides workstations with high-end processing power, large touchscreen televisions, graphics editing and statistical software. Librarians also provide collaborations and consultations for researchers and students to apply digital tools to their research projects. In the two years since its formation, librarians have collaborated with more than a dozen researchers and departments on projects.
- The Technology Enhanced Learning (TEL) - Imaginarium that houses augmented reality (AR), virtual reality (VR) and mixed-reality technology, as well as 3D scanning and printing. Some collaborations include designing and building two complementary AR and VR apps as crime scene simulations with the Department of Biological Sciences. This collaboration helped enhance students' learning by creating an immersive experience, whilst resolving the logistical requirements of setting up a physical reconstruction of a crime scene.

There are two teams of librarians that focus on faculty and research collaborations and consultations. These teams comprise the Digital Scholarly Communications (DSC, part of CRS, known then as Scholarly Communications) and ESLI librarians.

DSC's primary role is to partner and support NUS faculties and researchers in their scholarly communication endeavours. The team supports research and publishing practices across disciplines, ranging from digital scholarship, publishing, open access, research data management, managing the institutional repository and research impact measurement. DSC librarians are involved in one or more of the following domains:

- Digital Scholarship: Use the Digital Scholarship portal[3] and the Digital Scholarship Lab to work with researchers to enhance teaching and research using digital tools and methods.
- Research Data Management: Offer data management planning and digital object identifier (DOI) minting services to the NUS community, as well as collaborate with other stakeholders to conduct talks and workshops on data cleaning, processing and research data management best practices to staff and students.
- Publishing and Outreach: Liaise with publishers and internal stakeholders to provide publishing workshops on academic writing, journal selection and evaluation, publication ethics, research visibility, open access and others.
- Institutional Repository (ScholarBank): Established in 2010 jointly by NUS Libraries and NUS IT, it serves to collect, archive, preserve and showcase the research output of NUS to the world. Also, collaborate with other teams to facilitate auto-harvesting of publications and metadata into the institutional repository.

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- Research Impact Measurement: Provide citation analysis, benchmarking assistance and conduct hands-on workshops to faculty, researchers and administrators on the usage of different citation databases.

ESLI consists of resource librarians who focus on imparting teaching and learning skills, and library resources suitable for research to the university community. There are five Resource Teams that cater to the ILPs, workshops, research consultancy, resource curation and engagement needs of each faculty, i.e. Engineering and Computer Science; Humanities, Arts and Social Sciences (including Architecture and Building, Business, Chinese and Japanese Studies, and Music); Law; Medical and Science. Some broad categories of the customised ILPs and workshops include:

- ILPs for individual university modules where students are introduced to library resources and tools suitable for their research, and advanced searching techniques to enhance their search skills;
- Workshops for PhD students where they learn;
- Workshops for all staff and students in using reference management services such as EndNote and Zotero.

With an increase in the number and range of workshops and classes conducted by librarians, it became necessary to consolidate the sessions, and implement measures to maintain consistent quality of delivery and content. The Researcher Unbound (RU) workshops were born out of this necessity and incorporate contributions from both DSC and ESLI librarians to provide a platform where the NUS community is able to discover, and learn resources and skills relevant to their research specialisations.

INTRODUCTION TO RESEARCHER UNBOUND

Researcher Unbound (RU) is the NUS Libraries' flagship programme to help grow research capabilities of the university's early-career researchers and graduate students. RU is anchored upon the Research Skills Framework (RSF) developed by NUS Libraries in January 2018, through a study of global trends and key research skills models, including the ACRL Framework for Information Literacy for Higher Education, SCONUL Seven Pillars of Information Literacy and the Researcher Skills Development framework at the University of Adelaide and Monash University. Underpinned by this holistic framework, RU aims to address the researcher's needs at every stage of the research process, and equip them with a virtuous cycle from ideation through organising and analysing data, to research communication, and measuring research impact.

RU workshops currently average almost 30 sessions every semester, and are known across the NUS community for sharing a wide range of topics, skills and tools with researchers, students and even administrators. Its user-centric design is based on adapting to learner needs, allowing participants to select workshops that suit them. As a discipline-neutral entity in the heart of campus, NUS Libraries is the ideal conduit for multidisciplinary and interdisciplinary research and learning, by bringing together communities from different faculties and departments. RU serves as the public face and brand of the library's collections and services that support research in NUS, by showcasing resources and expertise available to the NUS community for their research and study. Some instances of these resources and expertise include:

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- Reference management software workshops enable researchers to save time on organising their references and formatting their papers;
- Publisher talks to provide advice on how to write academic publications; and
- Database workshops conducted by librarians help researchers to improve discovery of new knowledge, raise their researcher profiles through tools such as ORCID, and assess their research impact and visibility by leveraging on academic metrics such as the *h*-index and Field-Weighted Citation Impact (FWCI).

The following sections will detail the RSF as the scaffold that defines Researcher Unbound, the RU programme, and the RU Symposium that brought together NUS and external communities to share their insights on the current trends in research and pedagogy.

DEVELOPMENT OF THE RESEARCHER UNBOUND FRAMEWORK

Much exploration conducted by the library eventually led to the library senior management's decision to create a framework to provide a holistic overview and structure for governance of RU. This new framework would serve as a communication and marketing tool, while providing guidance to librarians when designing ILPs and workshops. This section will cover the inception of the Research Skills Framework (RSF) in August 2016 and its evolution over time.

Prior Frameworks

The Learning Journey for PhD Students (Figure 1) was the first framework developed by the Business resource librarians in August 2016 to guide the planning of the inaugural RU targeted mainly at the Business PhD students. This framework was tied chronologically to the NUS Business School PhD Programmes in order to provide the students with the skills and resources concurrent with their course of study.

Based on the feedback of the pilot run, in January 2017 the Learning Services division designed the Research Cycle (Figure 2) comprising 4 stages to guide participants in selecting workshops that suited their respective research needs: 1. Literature Search, 2. Reference Management, 3. Writing, Publishing & Intellectual Property, and 4. Research Impact.

In April 2017, the DSC team created the Research Life Cycle (Figure 3) to organise library research support services to cater to different researcher needs throughout the research lifecycle. The five stages in the research lifecycle were Plan and Conduct, Publish Research, Enhance Visibility, Archive and Preserve, and Measure Impact. These five stages were governed by the overarching principle of Research Ethics and Compliance, which entails conforming to institutional, funders' and/or publishers' requirements in areas such as self-archiving and sharing of associated research data.

Concurrently, ESLI librarians (known then as Learning Services) developed the "Research SKILLS by NUS Libraries" (Figure 4) framework for creating online guides to support self-directed learning and complement ongoing efforts of librarians imparting research skills. Five verbs in reference to Bloom's Taxonomy were selected: Discover, Search, Evaluate, Cite and Write. Unlike the Research Cycle framework, there is no sequence assigned, as the learning is non-linear and students can select the topics based on their levels of understanding and competency in each area. Bright and attractive colors with

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clear icons were used to engage users' attention. The leaf motif was also used to symbolise growth in learning new skills.

Figure 1. Learning Journey for PhD Students (August 2016) (Source: NUS Libraries, 2016)

Research Skills Framework

In 2017, NUS Libraries embarked on a transformation plan with its vision to become an activity hub for limitless discovery, exchange of ideas, knowledge creation, scholarly engagement, communication, and innovation National University of Singapore Libraries, 2017), in response to the foregoing trends and information needs of NUS's four user personas — a tenure-track faculty member, a PhD candidate, a fourth-year and a second-year undergraduate student.

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Figure 2. Research Cycle (January 2017) (Source: NUS Libraries, 2017)

In line with the library's new strategic direction of facilitating the creation of new knowledge by building partnerships to enhance research, the University Librarian made RU the library's flagship programme that adopts a learner-centred approach to enhance researchers' capabilities and skills, using the internally developed Research Skills Framework (RSF) (Figure 5).

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Figure 3. Research Life Cycle (April 2017) (Source: NUS Libraries. 2017)

In July 2017, a newly appointed Researcher Unbound Coordinator (referred to as the coordinator from here on) began the search for a holistic framework for RU. After a comprehensive study of global trends, references were narrowed down to six key research skill outlines and models adopted by higher education institutions in Australia, Ireland, UK, and USA (Association of College and Research Libraries, 2015; Irish Universities Association, 2008; Society of College, National & University Libraries Working Group on Information Literacy, 2011; University College Dublin, 2010, p. 3; Vitae, 2010; Willison and O'Regan, 2008). Similarities, differences and applications between these models were compared to identify featured skills and how they were categorized. Recent higher education and library

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trend reports (Adams Becker et al., 2017) and comprehensive survey results on the research needs of graduate students (Bussell, Hagman, & Guder, 2017) were consulted to verify that skills identified were relevant and up-to-date. Coupled with new envisaged roles of academic libraries in niche areas such as digital literacy (Jisc, 2019), and scholarly communication (Carpenter, Graybill, Offord & Piorun, 2011; Saunders, 2015), opportunities for addressing research skill gaps became apparent.

Figure 4. Research SKILLS by NUS Libraries (August 2017) (Source: NUS Libraries, 2017)

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Figure 5. Research Skills Framework (January 2018) (Source: NUS Libraries, 2018, n.d.-b)

Using the summarized featured skills and categories, the coordinator established key research skill domains that were customized for the emerging and future research needs of NUS, and submitted the RSF proposal to library senior management. The RSF would serve as a 'canopy' for the programmes offered for comprehensive holistic skill-based learning, in order to develop the research capabilities of the NUS community, in particular graduate students and researchers. Moreover, the RSF has a user-centric design and adopts a learner-centred approach using a "grow and learn" concept that allows staff and students to select programmes that suit their individual research and learning needs.

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Upon approval of the RSF, the library's Communications Team designed the framework into a logo for RU. While the seven skill domains (Figure 5) were meant to be easy to remember and identify with, there was still a need for a clear description of each skill domain, and crafting of learning outcomes that would benefit researchers. These skill domains would form the basis for planning and implementing the RU programme, with different learning outcomes aimed to address challenges faced by staff and students. Discussions were made with library senior management, DSC and key ESLI librarians to finalise the RSF descriptors, incorporating the latest trends in digital scholarship and humanities. The RSF remains a "living" document, as it will evolve with the latest research and technology trends (Appendix for the latest version of RSF descriptors). The RSF also ensures that staff and students gain the necessary research skills at every stage of the scholarly communication process, and can apply these skills across disciplines and fields of work. While the seven skill domains might not be acquired sequentially, they are all related and can build upon one another.

Incorporation of the RSF into RU planning was done in phases. The coordinator conducted an internal sharing in November 2017 to introduce the RSF and marketing taglines[4], while engaging librarians to start planning for the next run. An overview and analysis of RU workshops and learning outcomes relating to one or more of the skill domains were provided for two semestral runs (February to April, and August to November 2017). Feedback and suggestions received from participants also pointed the way for future collaborations with other NUS departments. The next section provides details on the implementation and evolution of the RU programme.

EVOLUTION OF RESEARCHER UNBOUND

The idea for constructing a structured series of workshops to support research was born out of a Service Design course held in April 2016, where the Business resource librarians identified an under-served user segment – Business PhD students. To address the unmet needs of these students, the librarians gathered feedback from the students and conducted extensive interviews with the PhD coordinators of each Business School department to better understand the curriculum and structure. The in-depth interviews uncovered that students are expected to be proficient in research methods and processes, as well as reading, critiquing and writing skills, but were left to acquire these skills themselves.

To gain insights on the specific research needs of the Business PhD students, the resource librarians applied the ethnographic study technique learnt from the Service Design course. PhD students recorded their learning journeys and experiences during their Summer Papers as individual experience maps[5]. The resource librarians then followed with interviews to understand the students' experience maps, and observe firsthand how the students searched for information. To encourage participation in this ethnographic study, each participant was given exclusive use of a library discussion room for three months.

The study and interviews revealed challenges that the PhD students faced in writing, presenting and critiquing their papers. First, they were unaware of library academic databases and used Google Scholar primarily to search for scholarly information, often encountering paywalls. They did not possess information searching skills, and many were unaware of their postgraduate career progressions. They also struggled with learning new software and tools for their assignments and research. These students usually sought help from their seniors, supervisors and faculty. The librarians observed that students used the search term 'decent papers' on the Internet instead of using scholarly criteria such as 'authoritative' or 'highly-cited'. Most of the students indicated that they did not attend library workshops as they were

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already required to attend numerous workshops and seminars in their disciplines. However, they would be more inclined to sign up for library workshops with clearly defined learning outcomes, such as 'retrieving key research papers', instead of broad outcomes such as 'learning effective search techniques'. In addition, the previous semester's library workshops received low attendance due to students' perception of the workshops as irrelevant and unnecessary. Conversely, students who did attend the workshops wished they had learned about library resources and searching skills earlier.

A proposal for workshops to address the specific needs of Business PhD students was submitted to the Business School's Vice Dean of Research. Upon approval, the resource librarians began working with the Business PhD Office to first address scheduling and students' attendance issues. Workshops were then planned to accommodate the schedules and assignment deadlines of the PhD students.

The RU pilot run was held in August 2016. In addition to the targeted Business PhD students, these workshops were open to everyone in NUS. Despite plans for one workshop a month for the entire semester, only three workshops were actually conducted: Get Insights for Your Research Topic (Dissertations), Locating Materials for Psychological Research, and Career Planning for Postgraduates. The resource librarians were unable to find instructors for non-library topics such as English language proficiency, writing and presentation skills, and the statistical software R.

Figure 6. Type of Participants and Actual Attendance Rate in Semester 1 of the 2016/17 Academic Year (Data source: NUS Libraries, 2016)

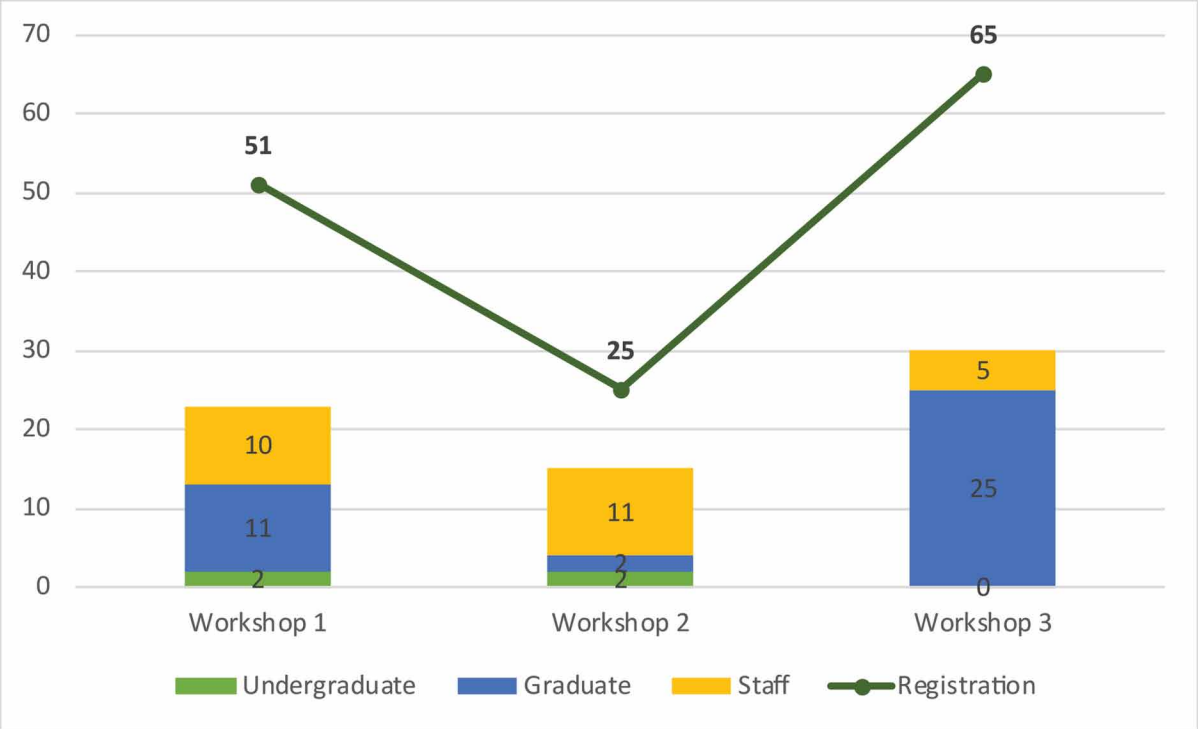

Figure 6 shows the actual participation rate compared to the number who registered; about 45% to 60% of registered participants actually turned up for each workshop. Although more graduate students

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attended the workshops compared to undergraduates and staff, only a handful of the graduate students were from Business; instead more were from non-Business faculties and departments - Arts and Social Sciences, Public Policy, Design and Environment, Engineering, Computing, Science, Law, Medicine, University Scholars Programme, the Centre for Future-ready Graduates and the Centre for Development of Teaching and Learning. Although only 16 participants submitted feedback, they all rated the workshops either Excellent or Good. Through conversations with the staff participants, the librarians discovered that administrative staff also needed information searching skills and research process knowledge, as it would improve working relationships with staff and students through a better understanding of the challenges faced by them.

Laying the Foundation

Based on the skillset needs that arose from various user types gathered from the RU pilot run, library senior management decided to pitch RU to the entire NUS community. RU came under the purview of the then Learning Services division during semester 2 of the 2016/2017 academic year. Publicity and marketing plans were made with the library's Communications Team, which included designing the logo (Figure 7), publicity materials and announcements. As a green initiative, the RU publicity material doubled as postcards that could be mailed across the world. Wide-scale publicity announcements were launched using all communication channels throughout the university; these included posters, LCD screens, LINUS (the NUS Libraries blog), library portal, RU website, social media, e-flyers through email, IVLE/LumiNUS (NUS learning management system), and the university intranet's "Message of the day".

Figure 7. Logo of Researcher Unbound (Source: NUS Libraries, 2017, n.d.-a)

Workshop topics curated from both within and outside the library that fit into the four stages of the Research Cycle (Figure 2) were planned:

1. Literature Search: Psychology, Engineering and Chinese Studies; and Databases – Market research, Chemistry, Standards.
2. Reference Management: EndNote and Mendeley.

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3. Writing, Publishing & Intellectual Property: Patents, Publishers talk on Scientific Communication, Use of iThenticate (CIT's Plagiarism Prevention tool).
4. Research Impact: Bibliometrics and Publisher talks.

A total of 15 workshops with 19 sessions were conducted, with 16 speakers, including 4 non-librarians. This run of RU garnered 405 participants, 625 registrations and 23 walk-ins. The outreach of RU was better this time as more than half the participants were graduate students and researchers. Of the 248 feedback responses received, 87.9% of the participants rated the workshops Good or Excellent, which exceeded the library's service target of 80%. The more successful workshops covered database searching (including market research), publishing and scientific communication; these workshops had 80% to 100% attendance and 100% feedback ratings of Good or Excellent.

Qualitative feedback gathered from participants reflected the positive impact the workshops had on their research work. The key skills they obtained from the workshops included enhanced information searching, conducting and organising research, as well as hands-on experience of information sources such as databases. Participants also affirmed that RU workshops were able to fill their research knowledge gaps and improve their research skills, as evident in their comments:

- "It has helped me to realize the importance, identify and search for information pertaining to a technology, its applications and company of interest. This ability is essential and very much sought after, in both industry and academia…This RU workshop fills this long-needed gap."
- "It gave me insight about how to conduct market research and how [to] use of different databases to supplement the primary research."
- "Helpful in increasing my knowledge to do proper search and to surface helpful resources that I require for my thesis project."
- "Patent search for my PhD works. Introduce me to very important tools for patent analysis"

The expanded number and broadened range of sessions were made possible with the appointment of a coordinator who combined existing library workshops with external workshops. The consolidated efforts of the RU team (described in Solutions and Recommendations section) in managing all logistic, administrative and marketing matters allowed librarians to focus on developing workshop content, leading to more effective and engaging delivery.

Leaps and Bounds

Further improvements in the RU programme have been carried out every semester since its official launch in 2016. These improvements are based on participant feedback and conversations, workshop observations, discussions with programme owners, team brainstorming sessions, directives from library senior management, internalising the NUS Educational Philosophy, and environmental scanning. All workshops were mapped into the RSF (Figure 5) to ensure a more holistic offering. While all seven domains of the RSF were represented, the Search and Use & Cite domains tend to have more workshops as these domains are the library's specialisations.

To facilitate participants' selection of relevant workshops, thematic series were introduced for workshops in the same subject domains, such as Business Resources, Chinese & Japanese Resources, Information Search Process, Citation Managers, Digital Scholarship, Publisher's Talks and Technical Information.

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A theme would be created as a search filter on the RU website if there were three or more workshops. Although the e-flyers contained "Workshop Description", "Learning Outcomes" and "Recommended For", participants tend to sign up simply based on the workshop title. As such, workshops such as "The Hunt for Wallace's Specimens" would be categorised under the theme of Information Search Process to improve discovery. Titled after the naturalist Alfred Russel Wallace who traversed Southeast Asia, this workshop was about searching for literature on Southeast Asian biodiversity research.

The library also initiated digital scholarship workshops into RU by engaging a commercial vendor to conduct two workshops: "Encoding Text for Visualisation & Analyses Using TEI Standard" and "Creating Social Network Visualisations Using GEPHI". Popular demand on these topics led to more workshops introduced in subsequent semesters, such as data visualisation and storytelling, D3.js JavaScript, Tableau, and Stylometry with R. Simultaneously, library initiatives such as the Digital Scholarship Portal and Lab, and the Historical Maps of Singapore were also incorporated into RU.

To expand the research direction of RU, a new component of industry knowledge and experiences was added to the RU focus. To do this, possible partnerships with NUS homegrown startups and private sector companies were explored. The library also carried out due diligence with the relevant departments to ensure there were no conflicts of interests during this exploration. While NUS faculty are more than qualified to conduct similar workshops, their own priorities and commitments to the university have to be considered. Conversations with faculty also revealed that they seemed to encourage 'healthy competition' as the same topic could be discussed from different perspectives. Moreover, such collaborations with external parties could lead to possible research opportunities with NUS professors and researchers.

To ensure educational value and transparency for these 'industry' workshops, the coordinator made on-site observations before agreeing to the collaboration. Both parties worked closely to craft the value proposition and design content for the workshops. Some examples of these successful collaborations include "From Research Idea to Startup" and "User-Proof Your Product via Usability Testing". Others, such as "Data-Driven Decision Making" and "Video Analytics," are still in discussion. Overall, the startups have been grateful for the opportunities given and experiences gained, and they offered to continue the collaborations should the library need them in the future.

Within NUS, the coordinator leveraged on librarians' working relationships with faculty as collaborative opportunities for new workshops. For instance, the coordinator approached a professor specialising in Engineering Leadership who was willing to introduce his students and contacts from the private sector to share their knowledge and experiences. In another instance, the coordinator also approached a Career Advisor from the Centre for Future-ready Graduates to conduct a workshop called "De-Jargoning Your Research in Resumes & Interviews", aimed at early-career researchers and graduate students, as well as postdoctoral researchers who are usually on short-term contracts and are constantly looking out for future job opportunities in the academic or private sectors.

With the NUS community recognizing RU's outreach efforts, some departments and offices have approached the library to place their existing workshops under RU. This is due to their perception of the library as a neutral space on campus that serves the entire university. Another pragmatic reason was that the departments could leverage on the library's logistic, administrative and publicity support. Some speakers have also offered to participate in RU as a gesture of appreciation for the services they received from the library. In these cases, workshops such as "Tableau: Closing the Visualisation Loop," "Scientific Illustration," and the R software series were all fully subscribed within hours of their announcements.

Lifelong learning and future-ready graduates are today's educational trends. As a leading global university, NUS is also invested in these trends in alignment with the Singapore government's focus on

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Continuing Education and Training (CET). The national approach is to revolutionise and always stay at the forefront of the knowledge industry, by equipping citizens with the means to take up new roles and responsibilities in the future. With all these in mind, in 2019 the library initiated a team to look into supporting CET, particularly NUS alumni and CET learners taking short courses in NUS. The team's objective was to understand the learning behaviour of adult learners and further extend RU to CET students in order to support NUS initiatives on lifelong learning.

Knowles' andragogy defines adult learners as "internally motivated" and "self-directed", and apply their own life experiences and knowledge to learning experiences while valuing application to the real world (Esthermsmth, 2017). Therefore as trainers, librarians acknowledge the wealth of experiences that adult learners bring to the classroom and regard them as equals in experience and knowledge. In addition to literature research, librarians held discussions with relevant NUS offices supporting CET, such as the School of Continuing and Lifelong Education (SCALE), Office of Alumni Relations (OAR), Centre for Future-ready Graduates (CFG), and also analysed the webpages of NUS faculties. The librarians also benchmarked NUS with other local higher education institutions, polytechnics and government agencies to better understand Singapore's CET landscape.

The team's findings charted the library's direction and initiatives to support CET:

- Alumni (via OAR) and CET learners (via SCALE) who wish to continue upgrading or refreshing skills beneficial to their careers as the target audience;
- Information and library-related skill-based workshops that complement instead of competing or overlapping with SCALE, polytechnic, SkillsFuture, or community centre courses;
- Transferable skills that contribute to the workplace and economy;
- Curated open source or freeware resources to be used in CET workshops to ensure they are applicable outside the NUS environment, so as to support the Open Science Movement; and
- Suitable workshop timings such as Thursday or Friday afternoons to allow participants to seek time off from their employers while considering work-life balance.

Between August 2017 and December 2019 there were 150 workshops, of which 81 were new. These workshops were attended by 4634 participants, 7658 registrations and 431 walk-ins with 49.6% turn-out rates. More than half of the participants were graduate students and researchers. 85.5% of the participants (1524 out of 1782 responses) rated the sessions Good or Excellent.

Compared with the pilot, a strong foundation enabled a quantum leap for the subsequent five semestral runs. The RSF enabled the coordinator to curate a wide range of workshops for research support, such as Python, LaTeX, Data Cleaning with Excel and OpenRefine, Scientific Illustration, Learning to Learn Better, Art of Questioning, and De-Jargoning Research Terms in Resumes & Interviews. More and stronger support, collaborations and partnerships were built between librarians, the NUS community, as well as with external organisations. The library started serving CET learners with offerings on Google tools and Fake News.

Researcher Unbound Symposium

Early-career researchers tend to work in silos and lack opportunities to mingle with fellow scholars outside of their research teams. In particular, PhD students mainly focus on their subject domains and their dissertations with less structured opportunities for acquiring field or industry relevant skill sets.

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The RU Symposium was conceived in early 2018 as the library's attempt to provide such opportunities for researchers. Modelled after the Singapore Graduate Forum on Southeast Asian Studies, the RU Symposium served to introduce skill-based content to researchers and graduate students from different disciplines and facilitate interaction and networking. The goal was twofold: address the challenges faced by early-career researchers, and promote the library as a learning hub for knowledge and skill acquisition associated with the research lifecycle.

To determine a preferred period for the event and possible topics of interest, an e-survey was created and disseminated to graduate students in January 2018. Based on feedback from 219 survey participants, there was demand for career development topics from the different disciplines. Hence, the Symposium programme was fine-tuned to include a section on "Career Planning Beyond Graduate School" and hands-on clinics on writing CVs and resumes[6]. The breakout session consisted of two parallel clinics – one for Science, Technology, Engineering and Mathematics (STEM), and another for Humanities and Social Sciences (HSS). The Symposium was scheduled for Recess Week so as not to hinder students' lessons during term time.

A Planning Committee was formed in January 2018. Tapping on personal networks and recommendations from resource librarians, the library secured the majority of speakers and panellists from both within and outside of the NUS academic community by May. Sponsorship was solicited from over 70 vendors; in all 26 vendors sponsored S$500 each (totalling S$13,000) and a variety of corporate gifts and collaterals, from which the committee prepared 300 event goodie bags. Vendors were also given opportunities to deliver talks or workshops under the RU branding.

Promotion and registration for the Symposium began in August. Besides email circulars and social media, and LCD screens at the eight libraries, the library also promoted the event via faculty and/or department graduate coordinators, NUS' Graduate Students' Society, and the Medical Postdoctoral Association. To further encourage participation and increase familiarity with library services and resources, the library created a treasure hunt entitled "Bad Droid Society", using the Actionbound app, that would take place during the Symposium.

The RU Symposium was held over two days on 25 and 26 September 2018. About 300 staff and students registered and 173 attended. A QR code event registration tool was created to facilitate quicker on-site registration. The details of this tool, which incorporates the use of different software to create a more seamless experience for the participants, will be described later.

Learnings and Insight

Continual evaluation and review of RU were conducted across semesters since the beginning, mainly through a total of 2,406 participant feedback responses, supplemented with quantitative and qualitative data such as registration and attendance details, RU website traffic, email correspondences, on-site observations and discussions with speakers. Figure 8 provides a summary of all seven RU runs. Though RU coordinators have changed hands 4 times, smooth running of RU was ensured through shared documentation and systematic handovers. This section details RU workshops offered and presents the survey data analysis, results and findings.

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Figure 8. RU Snapshot in Numbers (Data source: NUS Libraries, 2016-2019)

A total of 172 workshop sessions were held — 98 unique and 74 repeat sessions (Figure 9), which averages to 28 sessions per semester (excluding the pilot run). More workshops were offered in semesters 1 as the library's focus is on new staff and students' orientation. A total of 78 speakers comprising 35 librarians, 13 NUS non-librarians, and 30 external speakers conducted the workshops.

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Figure 9. Number of New and Repeat Workshops by Semester (Data source: NUS Libraries, 2016-2019)

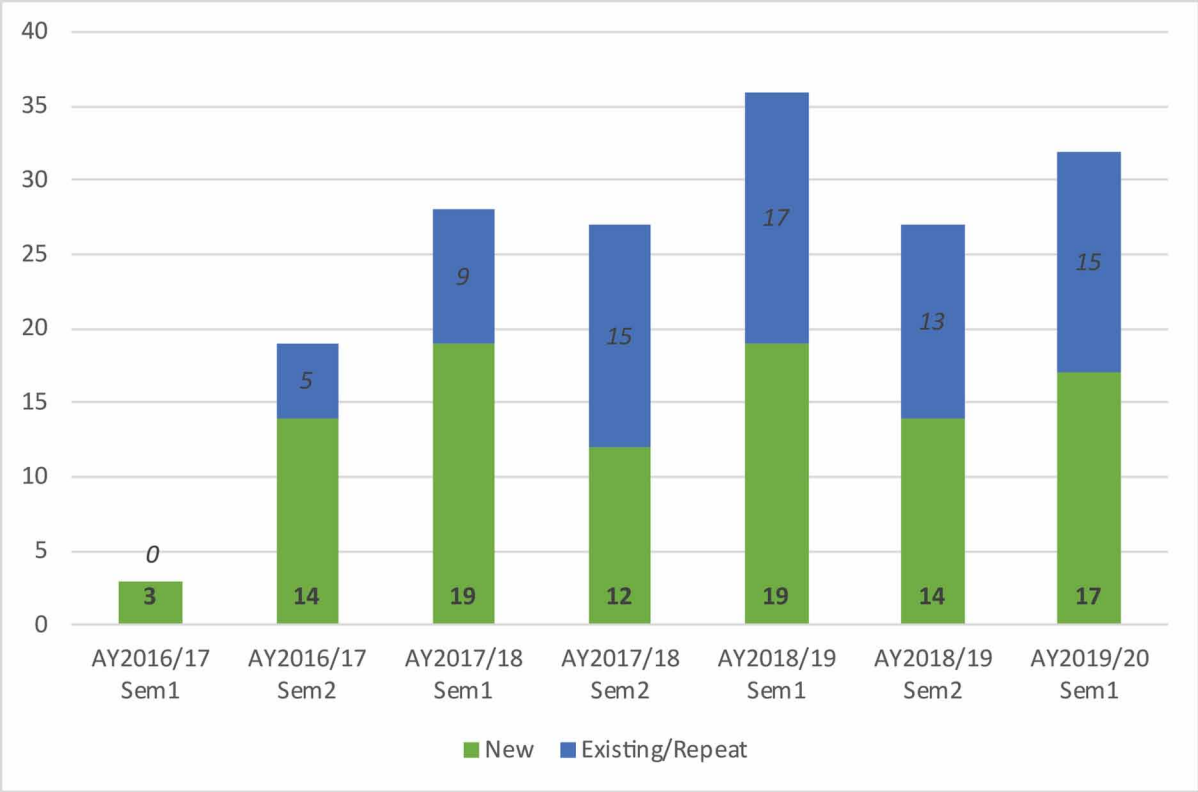

Figure 10. RSF Domains Supported (Data source: NUS Libraries, 2016-2019)

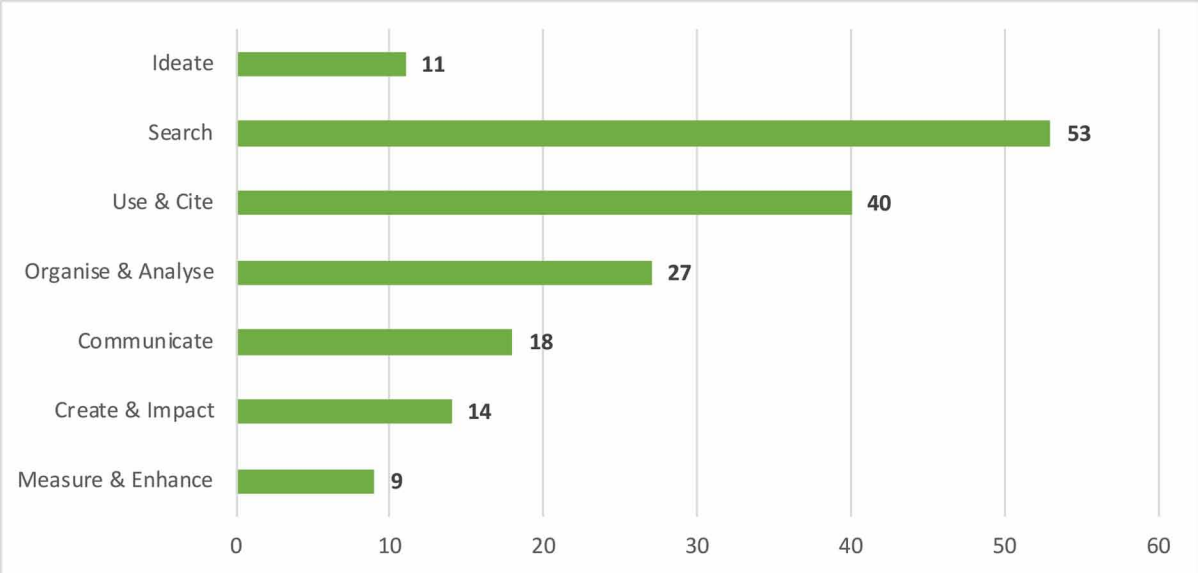

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Figure 10 maps all workshop sessions to each RSF domain. As mentioned, "Search" and "Use & Cite" were the highest in number as these domains showcased the librarians' expertise and experience. The library recently embarked on "Ideate" workshops which required librarians to understand research ideation in different disciplines. "Organise & Analyse" comprised technical workshops that introduced research tools and required the most organising and preparation time. Most publisher talks and workshops fell under "Communicate", while "Create & Impact" and "Measure & Enhance" workshops were mainly conducted by DSC librarians. While new workshops are constantly added, the overall number of sessions per semester has remained fairly constant. There are pragmatic reasons for this:

- Librarians have other job commitments which include conducting workshops outside of RU, such as module-specific ILPs. There are therefore limitations to how many RU workshops can be added to their workload; and
- Suitable venues are usually heavily booked during the semester for classes. Some workshops had to be postponed to another semester because venues were not available at time slots when the speaker could conduct.

Workshop success and popularity (Table 1 for highlights) are evaluated using 3 criteria:

1. percentage of participants who gave an overall rating of Good or Excellent;
2. online registration and on-site turnaway rate; and
3. attendance.

From a total of 2046 survey responses, 86% of the participants gave an overall rating of Good or Excellent. The coordinator's effort in being an intermediary between speakers and the audience, to curate relevant content and build audience-centric presentations, was recognised through an overall rating of 92% Good or Excellent, for semester 1 of 2019/20 academic year.

The attendance rate for RU workshops ranged from 27% to 86%, with an average rate of 50%. The three most popular workshops (with attendance rates of >80%) were "Fact Vs Fiction - How to Bust Fake News", "LaTeX 101" and "Japanese Newspaper Search - Learn With Ease". Workshops (including repeated ones in different semesters) that hit the maximum capacity during online registration within an hour of the announcement were noted for their high demand. For oversubscribed workshops, the library had to turn away walk-ins to ensure a conducive learning environment for the current participants. Non-popular workshops were dropped and useful ones analyzed for future improvements.

As shown in Figure 11, it was observed that 67% of the 5,107 RU participants were "Graduate," "Research Staff," or "Academic Staff", which proved that RU was indeed reaching the intended audience.

The growing interests in RU were registered through conversations with workshop participants, who revealed that they look out for upcoming workshops through the website and publicity emails. Frequent engagement with participants, whether face-to-face or through surveys, resulted in impactful timely workshops that support the research needs of the NUS community.

To assess the usefulness and effectiveness of each workshop, additional survey questions were added to find out how participants benefited in August 2019 (Figure 12), and gather their suggestions for improvement. 64% responded that they had learnt something new or enriched their existing skills/knowledge. The survey results proved that the library had been effective in equipping graduate students and early-career researchers with enhanced research skills. 45% suggested improvements including "more

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Table 1. Examples of Successful RU Workshops (Source: NUS Libraries, 2016-2019)

Popular Workshops by NUS Librarians
● An Introduction to Data Cleaning with Excel ● An Introduction to Data Cleaning with OpenRefine ● Navigating Through Fake News in Everyday Life ● Tips & Tricks to Google ● The Art of Questioning
Popular Workshops by NUS and External Speakers
● Creating Social Network Visualisations Using GEPHI ● De-Jargoning Your Research in Resumes & Interviews ● Encoding Text for Visualisation & Analyses Using TEI Standard ● Inside Nature – The Science of Publishing ● LaTeX 101 ● Navigating the Research Journey: Trials and Triumphs of an Early Career Researcher ● R: Powerful Graphics for Research ● Scientific Communication ● Stylometry in R: An Introduction ● Tableau: Closing the Visualisation Loop ● Visualising Singapore – Introduction to Data Storytelling ● What's Stopping Us From Performing Better Despite the Hard Work? (this was co-conducted by a librarian who is also a teaching staff in an NUS institute)
Workshop in Multiple Parts
● R Software ○ An Overview ○ Powerful Graphics for Research ○ Data Management with A Focus on Research ● Scientific Illustration ○ Theory of Design in Science & Research ○ Visual Storytelling ● The Art Of Questioning ○ Look At Your Research Topic From Multiple Perspectives ○ Look At Your Social Sciences Research Topic From Multiple Perspectives ○ Introducing the Question Formulation Technique™ ○ Question the Idea, Discover the Invention

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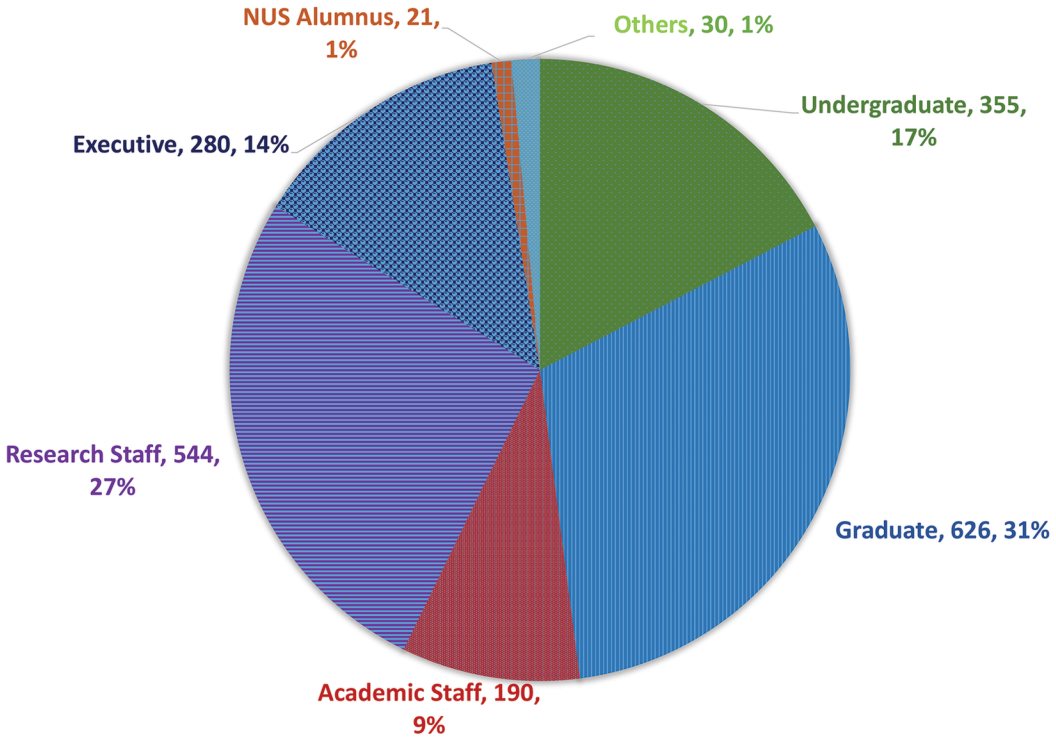
hands-on", "more examples/exercises", discipline-specific requests — "more diverse examples instead of just focusing on one discipline", speaker-specific issues such as presentation skills, and session duration.

Figure 11. Overall Type of Participants (Data source: NUS Libraries, 2016-2019)



The impact of RU extends beyond the NUS community. As of 31 December 2019, Google Analytics captured 99,953 pageviews on the RU website, of which 76,341 were unique pageviews. The RU website attracted 21,547 new visitors and 35,167 returning visitors — from 34 countries, with Malaysia, United States, Japan, Taiwan, China, Thailand, Indonesia, India, United Kingdom and the Philippines topping the list.

The Symposium was the library's first attempt to culminate an intense large-scale programme within 2 days, proving the scalability of the RSF. The programme had a broad holistic coverage of skill-based topics, from learning and ideation, research data management, publishing, to grant and resume writing. Furthermore, there was variety in the mixture of plenary lectures, breakout sessions, combined panel discussions, hands-on clinics and tours of the Digital Scholarship Lab and TEL-Imaginarium. These activities broke the monotony of the conventional conference format and allowed participants to mingle and opt for specialised programmes. Feedback was overall very positive:

- "Balanced representation…. Even when referring to a specific field, presenters were able to evoke the content relevant to a wide audience…."

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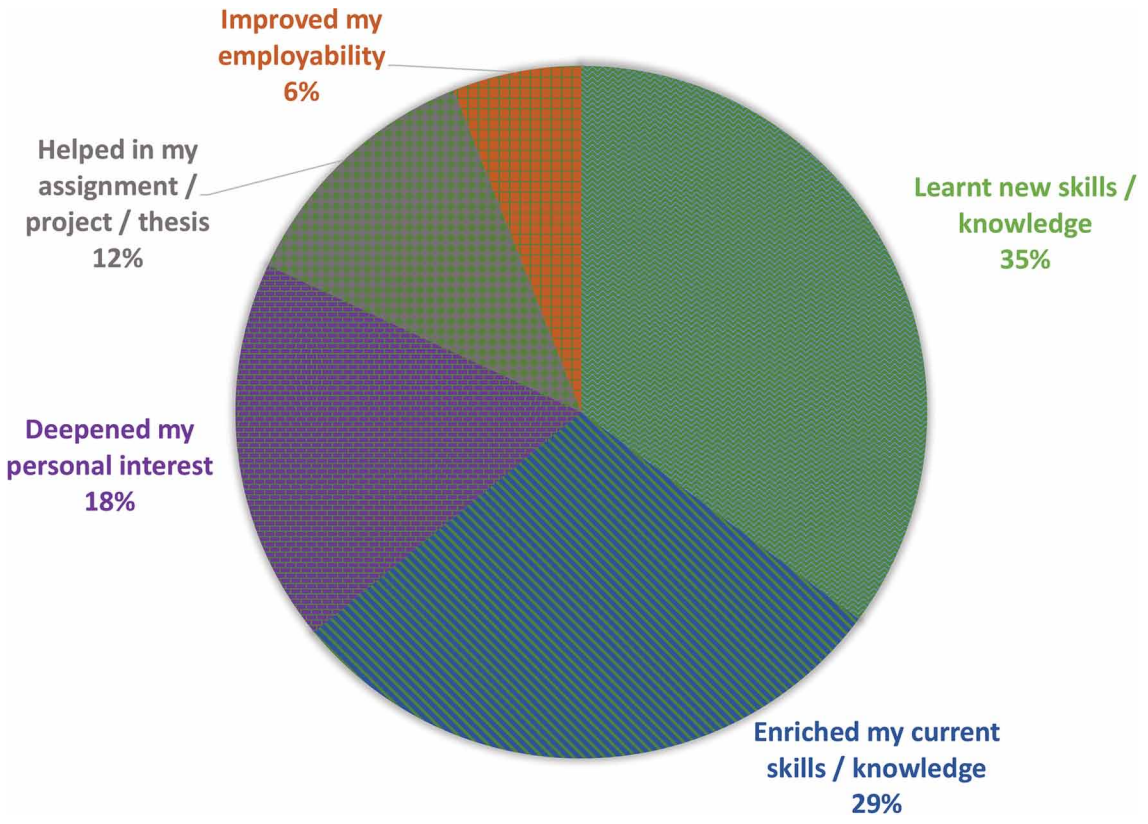
- "...sessions provide a more informed platform to discuss more greasy issues which are not often talked about…. Each session was not too long: it was possible to follow, keeping attention high. Thanks for organizing this informative and highly relevant symposium."
- "It was very well organized and things went very smoothly."

Figure 12. Benefits Gained from the Workshops in Semester 1 of the 2019/20 Academic Year (Data source: NUS Libraries, 2019)



SOLUTIONS AND RECOMMENDATIONS

RU in its seventh run increased to 32 sessions through a cumulative review every semester. The successful branding of RU is also evident from the programme's initial focus on Business PhD students to its present reach to the entire NUS community.

To gain support and buy-in from speakers, backend infrastructure to eradicate logistic, administrative and publicity hurdles is key. These are managed by the RU core team which consists of an advisor, a coordinator, support staff and the Communications Team. Each plays important roles in ensuring all workshops run smoothly with consistent standards, quality, efficiency and effectiveness, on top of their other job responsibilities.

The advisor sets the direction and objectives of the team. The coordinator looks for possible partnerships within and outside NUS, sets standard operating procedures, handles matters concerning the core

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team, and manages expectations of the participants and speakers, and also consults with the advisor on any doubts or unique situations. The support staff handle operations pre, during and post workshops, e.g. venue booking and preparation, snacks and refreshment, event publishing, basic queries from participants, on-site registration, data gathering and report preparation. The Communications team takes care of all publicity and communications, e.g. write-up, e-flyer and website design. In order to stand out from countless other workshops, courses, seminars and talks on campus, a special effort was made in creating eye-catching e-flyers, crafting attractive workshop titles, and polishing the workshop description and learning outcomes.

Postmortem meetings with the team are conducted at the end of every academic year. Everyone shares their setbacks and provides suggestions for the team to work better. Every comment counts regardless of position or seniority of the team member. Team rapport is important, and in Asian cultures, meals unite people easily. The coordinator organizes a dinner treat with the team at the end of every semester, which is not from the library budget. The coordinator plays an important role in creating a good team dynamic, from small operational issues to critical matters such as curating workshops, and ensuring they are run seamlessly to provide the unique RU experience for every participant.

Instead of investing in expensive and sophisticated Event Management solutions, the team made use of existing disparate applications to manage over 30 sessions each semester. One such zero-budget solution is the QR code event registration, which streamlined on-site registration. The solution integrates the Calendar of Events (NUS in-house platform for event registration), eSurvey (online survey platform that can generate unique URLs for each participant and capture attendance), Microsoft Excel (for generating QR Codes from the unique URLs), and Microsoft Word (for sending personalized emails with the QR codes via MailMerge). During on-site registration, the support staff use their mobile devices to scan each participants' unique QR Code. The advantage of seamless attendance-taking justifies the backend complexity of the solution. Some NUS departments even approached the library asking about this solution.

The coordinator initiated planning one year in advance based on the NUS academic calendar, which runs counter to the calendar year-based workplan. Though there was resistance initially due to the fluid nature of work commitments, this eased planning for everyone involved for semester 2, as many are away from work in November and December.

Without a marketing or business background, the coordinator needed a mindset shift when negotiating deals with potential speakers by turning the intangible into clear benefits. The library adopts the mutual benefit perspective with no charges or payments from both parties, except for a few workshops with fees or honorariums. As a cost center in the university, it would be difficult for the library to achieve its mission of providing learning and knowledge with no boundaries if the library is charged by the speakers. Moreover, all workshops in RU are free for participants. These are benefits provided when working with the library:

- Reach out to 50,000 staff and students in a globally renowned university with potential collaboration opportunities with good professors and researchers;
- Professionally designed publicity by the Communications team;
- Facilitate discussion and knowledge sharing for all subject areas as the library is discipline-neutral;
- Access to venues with different configurations and settings, ranging from 20 to 500 seats, and equipped with varied facilities, e.g. webcasting equipment, audio-visual aids, computers, and more traditionally, pen and paper; and

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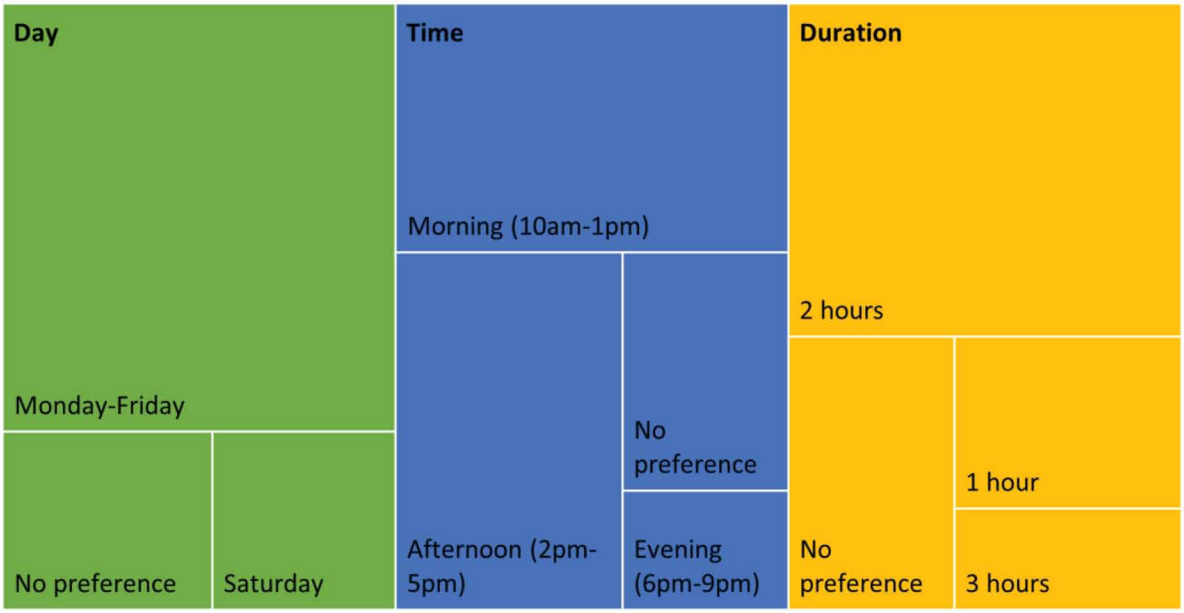
- Administrative support, e.g. sending publicity, registering participants, taking attendance and answering queries pertaining to the workshops.

In return, the library expects the speakers to deliver workshops that are beneficial to the NUS community, with educationally focused content. Products introduced in the workshop have to be subscribed by NUS or free. Topics or concepts introduced must be factual with no bias or personal agenda. The coordinator also expects speakers to have excellent delivery skills, and offer interactive sessions with Q&A, activities, hands-on experience and so forth, and to engage with the participants throughout the session, instead of the conventional one-way presentations.

Feedback showed "Lecture" and "Hands-On" were the preferred delivery modes. Though there was also some preference for non-physical sessions, RU workshops were face-to-face sessions to facilitate open and constructive discussion. As a multi-campus university and participants with tight schedules, the coordinator is mindful when scheduling. A good time to offer RU workshops is usually in the mornings (10am-1pm) from Mondays to Fridays for 2 hours (Figure 13).

Figure 13. Preferred Timings in Semester 1 of the 2019/20 Academic Year (Data source: NUS Libraries, 2019)



In realizing the large scale event of RU Symposium, besides forming the planning committee and support from the library senior management, help was required from event sponsors, 70 library staff and 2 student assistants. During the planning stage, the programme committee noticed that recent scientific meetings by local early-career researchers have evolved to become part science discussion and part career development, e.g. Duke-NUS Early Career Scientists Association's DUNES Science Symposium and NUS Mechanobiology Institute's Mechanobiology International Graduate Student Congress. Therefore, the

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Symposium served to cater to this emerging trend and the needs of early-career researchers, while bringing together faculty and graduate students from different schools and departments for open conversations.

In the future, in order to scale up and sustain research support services for the long run, these are some reflections:

- Work with the Office of Research and other stakeholders to increase engagement and collaboration;
- More structured panel discussions, with prepared questions communicated to the panel members in advance, and panel discussions concluding with a summary of different perspectives;
- Allocate more time for focused hands-on workshops or follow-up roundtable discussions around specific themes, such as research data management for particular disciplines or research instruments so as to encourage more in-depth discussions and sustained participation; and
- Provide sufficient time for Q&A segments.

It is hoped that the RU Symposium will not be just another event at the University, but the highlight event of the year, bringing post-doctoral and graduate societies together to promote inter-faculty collaborations and dialogues in emerging research.

FUTURE RESEARCH DIRECTIONS

When planning for the future, there are also questions to ask about the emerging trends in research support services and what role RU can play in these trends. Wider ranges of workshops to cater to CET learners means further collaborations with industry and other departments. While this is good, potential adverse effects must be explored, such as possibly diluting the library's presence in RU if the majority of workshops are conducted by non-librarians, or a shift in the RU branding to a less academic focus. Backed by a robust and evolving RSF, up-scaling it to different levels of skills proficiencies and depth in leading to accreditable qualifications are worth exploring. With the university's focus on translational research, what can the library do to support efforts to bring research to market? Online learning has become a recommended and even mandatory form of teaching in some situations, so more research and review must be done on how to improve the delivery and technological skills of librarians for better e-learning pedagogy. These are all aspects worth looking into for future research.

CONCLUSION

The RU brand is still evolving. With four coordinators helming in four years, RU has massively transformed since its inception, and it will likely undergo even more changes in the future. However, based on feedback and attendance rates of the RU workshops to date, it is safe to say that RU already has a positive impact on NUS researchers and students, by improving their knowledge and skills, raising awareness of resources relevant to their research, and providing a platform for cross-disciplinary interactions with both external and internal experts. RU helps to bring the value of the library to the forefront by showcasing the library's collections and services, the expertise of its librarians, and the partnerships the library has forged with researchers, publishers and industry. With the RSF as a scaffold, RU is able to help the library align itself with the research directions of the university.

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ACKNOWLEDGMENT

We thank the Researcher Unbound team (Wong Kah Wei, Shelley Wu, Devin Neo, Balbir Kaur Rani, Choy Jie Feng), Library Senior Management and NUS colleagues for their support, help and guidance in making Researcher Unbound a success.

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KEY TERMS AND DEFINITIONS

Academic Year: NUS Academic calendar, where Semester 1 is from August to December, Semester 2 from January to May the following year, and a Special Semester in June to July.

Continuing Education and Training (CET): Adult learners above 25 years old with diverse educational background and working experiences.

Digital Scholarly Communications (DSC): Team who partners and supports NUS faculties and researchers in the areas of digital scholarship, research data management, publishing and outreach, institutional repository, and research impact measurement; formerly known as Scholarly Communication unit.

Early-Career Researchers: Researchers who completed their post-doctorate less than 5 years ago.

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Education Services and Learning Innovation (ESLI): Cluster focuses on teaching and learning through workshops and consultations for students and staff. Librarians are further sub-grouped into Resource Teams (RTs) to support all the faculties in NUS.

Research Skills Frameworks (RSF): Aims to address the researcher's needs at every stage in the research process, which provides guidance to librarians and underpins all RU workshops.

Researcher Unbound (RU): A series of workshops designed to help grow the research capabilities of NUS' early-career researchers and graduate students.

Researcher Unbound Symposium: An event organized by NUS Libraries to introduce skills-based content to and facilitate interaction and networking for researchers and graduate students from different disciplines.

Resource Team (RT): Teams in ESLI focused on different disciplines, i.e. Engineering and Computer Science; Humanities, Arts and Social Sciences (including Architecture and Building, Business, Chinese and Japanese Studies, and Music); Law; Medical and Science.

ENDNOTES

1 NUS' vision and mission: https://nus.edu/2RDsRvQ

2 NUS' educational philosophy: https://nus.edu/2VoulLy

3 NUS Libraries Digital Scholarship portal: https://libds.nus.edu.sg

4 Researcher Unbound website: http://j.mp/ru_about

5 A key concept in User Experience (UX), Experience Mapping generalises the visualisation of customer journeys through products or services to accomplish specific goals. More details on the Experience Map: https://bit.ly/3c81wJY

6 RU Symposium programme: https://nus.edu/3eidmTJ

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APPENDIX

Table 2. Current Descriptors of Research Skills Framework (The most current version is available at https://nus.edu/2XyDYcY) (Source: NUS Libraries, 2019, n.d.-b)

1. **Ideate**	**Scope & frame an idea for your research** ● Articulate, define, frame ideas to demonstrate the novelty of your research or to identify gaps in research ● Apply various methods, techniques, tools and filters to critique existing research or discover emerging trends
2. **Search**	**Conduct an effective literature search to support your research** ● Plan, construct and adopt various search strategies according to the sources, scope and information needed ● Match information needs and search strategies to the appropriate search tools and databases
3. **Use & Cite**	**Evaluate & use information responsibly** ● View information from multiple perspectives and communicate information responsibly ● Apply the appropriate reference management tool or citation style to cite accurately
4. **Organise & Analyse**	**Collect, store, organise, manage & analyse information effectively** ● Apply latest tools for research collaboration and keeping current in your field of research ● Apply research methods and tools to visualise and/or analyse data
5. **Communicate**	**Publish & communicate your research effectively** ● Communicate your research output in the most appropriate method to meet the intended purpose ● Select appropriate publications, dissemination outlets and platforms from which to communicate and disseminate your research and information
6. **Create & Impact**	**Protect & commercialise your research output** ● Articulate the commercial value of your scientific discoveries and its contribution to the society ● Determine the applicability and marketability of your research output through the use of various resources
7. **Measure & Enhance**	**Measure the impact & enhance the visibility of your research** ● Use appropriate tools & techniques to measure your research impact ● Use the institutional repository to enhance the visibility and discoverability of your research

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Chapter 11
Cases on Research Support Services in Academic Libraries: Peking University Library

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EXECUTIVE SUMMARY

Peking University Library (the Library) conducts organizational restructuring in 2019, and the Collaborative Service Center (CCS) is designated as the provider of research support services, which is operated in interaction with the talent training system and the process of comprehensive reform. A string of innovations in research support services are implemented by CCS's two teams in an overall manner. This chapter introduces status of research support services in China and the Library's practices in research support services. This chapter introduces the new framework of the research support services from four aspects—service object, service provider, service content, and service strategy—and outlines its plans and visions for further efforts in this regard.

INTRODUCTION

With easier access to academic resources and more convenient academic exchanges, users are less dependent on libraries for traditional resources and services, so libraries are increasingly marginalized in universities. As a result, university libraries must identify a new focus of services, integrate into the core business of universities and increase their influence on university academic research. Research support services emerge in such a context.

With the development of information technology (IT), great changes have taken place in the environment facing university libraries in China. In January 2017, the State Council printed and issued the *Measures for the Implementation of the Overall Plan for Building World-class Universities and First-class*

DOI: 10.4018/978-1-7998-4546-1.ch011

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Disciplines (Provisional), making it a national strategy to push, a batch of high-level universities and disciplines to appear on or top the list of the world's best universities. This is the general environment facing university libraries.

In December 2017, Peking University (PKU) officially released the *Peking University Plan for First-Class University Construction (Compact Edition)*. In the overall context of the "Double First-class University" strategy, university libraries, as academic institutions that provide document information services for universities in talent training, scientific research, cultural inheritance and innovation & entrepreneurship, play an important role in providing disciplinary support. Developing into first-class libraries that can support the construction of "Double First-class" universities and provide first-class services has become an important task for university libraries at present. Users are confronting rapid development in science, technology and IT application, revolutionary changes in the way of acquiring and imparting knowledge and the teaching-learning relationship (Chen, 2018). Approaches to learning, models of teaching and research paradigms of researchers have undergone notable changes. How university libraries can support scientific research and engage in the historical process of scientific and technological progress is another crucial issue worth pondering. How university libraries can be integrated into the core business of corresponding universities and increase their influence on academic research becomes the main direction of their present and future development. Research support services are a new service product that libraries launch against this backdrop. University libraries in China have begun to pay more and more attention to research support services.

Peking University Library (the Library), as the most renowned and the largest university library in China, has explored the framework of research support services, offered such services and made positive headway since 2015. During 2016-2018, Peking University Library regularly completed and released multiple information products, including Reports on Subject Competitiveness of Peking University, Reports on Patent Competitiveness of Peking University, Reports on Research Frontiers of Peking University, and the Weiming Academic Bulletin. These reports have won recognition and praise from teacher researchers, research management and decision-making bodies of Peking University as well as from other libraries. The Library is a living organism. In response to the new changes of global, national, and local contexts,in 2019, the Library conducted a new round of business restructuring and upgrading and expanded and optimized the business in connection with research support services.

The Library includes two buildings. The Old Library Building of Peking University (the West Building) was completed in 1975, with an overall floor area of over 24,000m^2 and 2,400 seats, and with a capacity for 3.6 million books. The New Library Building (East Building) was completed in 1998. It was impeccably connected to the old one, increasing the overall floor area to as large as 53,000m^2, making Peking University Library the largest one among Asian universities, which served as a backbone for the university's effort to build the first-rate university in the world.

With the new library building and the modern possibilities of network technology, the reading environment has been further enhanced. The increased space has proven to be fruitful in the number of literature collected, in the width of open areas, in reading seats, etc. In addition to the books, the Library has also obtained a large number of local and foreign databases, eclipsing all other university libraries in China. The Library provides BBS forums for its readers, making interaction possible and using it as a means of consultation and reader training. In order to raise awareness of its collections and improve the ability of its patrons to retrieve and use its resources, the Library has organized "one-hour conferences", which is one of the readers' favourite activities.

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Currently, there is a staff force dedicated to training, they have professional competence and mastery of current librarianship. At present, the members of the Library staff have the following academic degrees: 14 PhD, 72 master's degree, 66 bachelor's degree and 78 certificates. In recent years, the Library has served over 2 million visitors per year, with over 6,000 visitors per day; over 1.8 million users visited the Library's website, with over 5,000 users per day.

The objective of this chapter is to provide valuable cases and practical experiences for the library's scientific research support service. A holistic understanding of this service can be obtained through the text. In this study, the authors present the current situation of university libraries' research support services in China and an overview of the theoretical discussion about the research support services of the Library. The authors present the case study of the Library's research support services. This paper also probes into the Library's goals, framework, evaluation of services effectiveness and future plans in respect of research support services, with a view to providing reference for research support services of university libraries and relevant theories.

LITERATURE REVIEW

Beginning earlier, research-oriented university libraries in the USA, Europe and Australia are mature in providing research support services. such as Harvard Library, MIT Libraries, Stanford Libraries, Columbia University Libraries, King's College London Library and the University of Sydney Library. These university libraries provide services corresponding to different stages of the research lifecycle. The services provided include research guides, research support tools, research data management services, publication, distribution and intellectual property services (Coombs, Thomas, Rush & Martin, 2017; E & Cai, 2015; Haddow & Mamtora, 2017; Xue, Jiao, Zhang & Geng, 2016).

According to the investigation and analysis of 76 libraries of the top 100 universities listed in the QS World University Rankings in 2017, these libraries provide research support services that can be divided into seven categories: research data management, open access, scholarly publishing, research impact measurement, research guides, research consultation and research tools recommendation (Si & Zeng, 2018). According to the analysis of strategic objectives regarding research support services in 34 strategic planning documents of university libraries in America, these libraries offer support for scientific research mainly through the provision of research resources, tools and consultations, data management, publication and sharing of research results, training of researchers and other aspects (Jia, Wang & Sun, 2017; Li, Liu & Ma, 2017). University libraries in Australia deliver research support services with an emphasis in research data management, research impact measurement, research ethics training and publication of research results, with such characteristics as highlighting research evaluation services, providing subject specialists, stressing research consultations and valuing research planning and practice (Hung & Han, 2016).

University libraries in China have begun to value research support services. Firstly, such value is reflected in their philosophy. In recent years, both the Chinese government and Chinese universities themselves have given more importance to scientific research. "University libraries, as information centres of universities, should break the traditional model of services and provide university research with new services—research support services" (E., 2015, p. 83). The current research environment and research model have changed, according to Yao (2019, p.3) "library should actively pay attention to

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the demand of the scientific research personnel in the new environment,change the service means and service content,provide scientific support for the scientific research personnel services".

Chinese university libraries have carried out theoretical studies on research support services, but remain divided on the concept, connotation, framework and other fundamental issues regarding research support services. Sun, Liu and Wu (2014) summarise the appellations of research support services, including bibliometric services, intelligence analysis services, intelligence information services, scientific and technological information services, research assessment services, decision support services and research assessment services. They also define the concept of research support services emphasizing that research support assists research managers with research decision-making (e.g., research rewards, fund allocation, talent evaluation, etc.) and researchers with their scientific research (e.g., disciplinary development planning, research frontier exploration, disciplinary development trend, etc.) by offering various analysis reports on the research performance of individuals, institutions or disciplines and disciplinary development trends. Such analysis is based on bibliometrics and famous analytical databases (e.g., SCI, SSCI, ESI, Incites, Scopus, Google Scholar and CSSCI) and intelligence analysis.

E (2015) considers research support services as services provided by university libraries for researchers in different research processes such as the selection of a research project, application for project approval, project implementation and project closing according to their needs. Jiang (2019) argues that research support services are a range of supportive knowledge services offered by libraries during the cycle of research activities. These services are provided to universities, enterprises and social institutions in a wide range of areas, including topic selection, project application, publication, research publishing, research data management, research evaluation, academic exchanges, the transformation of research results, intellectual property (IP) services, research management, user training and special collections. This last definition is broader than the previous ones

The PKU Library has published a number of research outputs on the definition, core, overall framework and content system of research support services, the construction of a supporting service platform, case studies and methodology studies, among others. Xiao and Zhang (2016) introduce the definition, core, overall framework and content system of research support services and the construction of a support service platform, and by taking PKU for example, discuss theories regarding the system of research support services offered by university libraries and the construction of the system. This is the only paper systematically expounding on research support from university libraries from this point of view.

As Chinese university libraries increasingly practice research support services, it is fair to say that practice promotes theoretical development. Early in 2012, Shanghai Jiaotong University (SJTU) officially established a ubiquitous service system to support the development of universities and higher education more effectively. By upholding the principle of "proactively interacting with schools and departments, being actively integrated into disciplinary teams and flexibly embedded into research processes", the system offers services such as disciplinary information analysis, disciplinary trend analysis and dynamic tracking and evaluation (Guo & Chen, 2014).

A survey by Song and Wang (2016) indicates that Chinese university libraries have successively begun to offer decision-making support services since 2011. And as of 2016, all of the C9 universities (Tsinghua University, PKU, Zhejiang University, SJTU, Fudan University, University of Science and Technology of China (USTC), Harbin Institute of Technology (HIT), Nanjing University and Xi'an Jiaotong University (XJTU)) had launched decision-making support services.

In 2015, the Library conducted an organizational restructuring and the Research Support Center (RSC), a specialized organization for research support services, was set up. RSC offers research man-

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agement and decision-making support services to the faculty engaged in research and managers (Zhu & Bie, 2016). As of 2018, the Library completed a variety of academic competence analysis reports and research projects and built the system of research support services (Xiao & Zhang, 2016). Tang and Zhang (2019) introduce the background, framework and cases of research support services at PKU, which fall into five categories, namely disciplinary development support/discipline services, research management and decision-making support, information literacy, data services and patent information services.

Cai, Lu and Wang (2019) investigate into the research support service projects of Chinese university libraries and suggest there are 22 kinds of such projects: academic frontier express, bibliometric services, research project guidance, research data management, sci-tech novelty retrieval, academic exchange platform services, literature transmitting/review, regular tracking of research teams selecting the same research direction, task force member recommendation, potential partner or competitor identification, project application notification, key research directions, information on peer experts, thesis writing guidance, information on project application process, online submission guidance services, application form modification services, patent application guidance, graphs and charts editing, sorting of citations and other project closing materials, research resource services, project closing progress, and success rate forecast.

This literature review shows that research support services are indeed a new service area of university libraries, with the emphasis, depth and effectiveness of such services varying greatly from university to university. Although many libraries have offered research support services and have achieved good results, further theoretical research is needed.

RESEARCH SUPPORT SERVICES OF THE LIBRARY

The evolution of the research support services in the Library is represented in Figure 1. There have been great changes in user demands and in the library environment. In response to these drivers, the Library has set up a special organization, namely Research Support Services, which, with the help of cross-organizational service teams, delivers research support services. The organization has conducted in-depth theoretical research and user demand investigation before delivering the services, which laid a foundation for the framework design of research support services. A sound framework of research support services includes a range of services, service organizations and service mechanisms (procedures and norms, etc.). The framework is not fixed; it can be enhanced and improved according to the evaluation of the services and the changes in user demands and academic environment.

Peking University is a comprehensive and national key university. The campus, known as "Yan Yuan"(the garden of Yan), is situated at Haidian District in the western suburb of Beijing, with a total area of 2.743,532 square metres (or 274 hectares). Peking University is proud of its faculty, including 48 members of the Chinese Academy of Sciences (CAS), 9 members of the Chinese Academy of Engineering (CAE), and 21 members of the Third World Academy of Sciences (TWAS). The university has effectively combined research on important scientific subjects with the training of personnel with a high level of specialized knowledge and professional skill as demanded by the country's socialist modernization. It strives not only for improvements in teaching and research work but also for the promotion of interaction and mutual enhancement between the various disciplines. Thus Peking University has become a centre for teaching and research and a university of a new type, embracing diverse branches of learning such as basic and applied sciences, social sciences and the humanities, and sciences of medicine, management, and education. Its aim is to rank among the world's best universities in the future.

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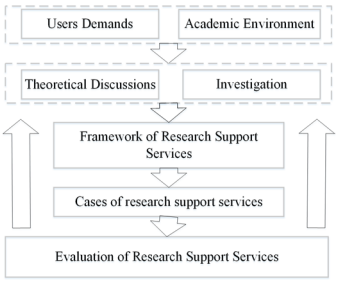
Figure 1. Research support services in PKUL



Peking University Library, as the most renowned and the largest university library in China, is the initiator of China Academic Library & Information System (CALIS) and the leader and pacemaker among China's university libraries. It mainly serves faculty and students of Peking University, but also university users in China and others. With a history of over 120 years, Peking University Library bears the mission of "Open Inclusiveness, Cultural Inheritance, Innovative Services and Harmonious Development" and occupies an unshakable position among Chinese university libraries.

Multi-Angle Theoretical Discussions for the Research Support Service Practices

Since 2015, the Library has carried out a series of theoretical discussions on research support services, mainly in the following aspects:

- Theoretical discussions and overall planning before delivering research support services. For example, Liu & Xiao (2015) suggest that in the digital age, the libraries should re-position themselves in terms of user services; become learning centres, teaching service centres, knowledge centres and cultural centres; and rebuild their user service systems. Discipline-oriented research support services are an important part of the Library's new user service system. They also put forward measures to deepen research support services:
  - The subject librarian system should be further promoted to provide more targeted support for research. This measure contains services such as research project consultation, resource retrieval and utilization training, information measurement and analysis, and information push services.
  - Embedded support services should be provided for research. This measure involves services such as research project selection consultation, literature investigation, feasibility analysis and data survey, thus providing sci-tech novelty retrieval and thesis collection, citation and certification services for the faculty in research project application, appraisal of research results, thesis quotation.
  - Intellectual Property services should be delivered. This measure involves in-depth services such as patent search, patent assessment consultation and disciplinary competitiveness analysis.
  - Research assessment services should be explored. This measure involves services such as research performance assessment and disciplinary development trend analysis.

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    - Data services should be further developed. This measure contains services such as storage, management, sharing and mining of research data.
- Survey and analysis before the launch of a specific service. For example, Li (2015) probes into how university libraries should carry out disciplinary competitiveness evaluation, which, in his opinion, it requires an understanding of big data, extensive data sources, comprehensive evaluation, homogeneous comparison with relative indicators, prospective trend analysis, visual presentation and an increase in interviews.
- The framework and implementation basis of research support services. Xiao and Zhang (2015) introduce the definition, core and basic framework of research support services and generalize the scope of research support services in university libraries. This scope includes research support services, decision-making support services, academic publishing services, intellectual property and patent information services, information literacy services, research project consultation and other services. They also draw a conclusion on platforms propping up research support services, including a business department (research support service centre), cross-departmental teams (discipline service group, information literacy group) and infrastructure (resources, platforms and tools).
- Introduction of experience in research support service practices. Li, Ai, Ma and Xiao (2016) describe how to carry out integrated analysis of disciplinary development trends and resources of promising emerging disciplines at PKU by using discipline service tools such as WoS database and CiteSpace software to support the construction of emerging disciplines. Li (2016) introduces patent service models and practices of the Library. Li et al. (2017) introduce how to identify hot discipline directions and subjects. Ma & Li (2018) introduce the Library's exploration and practice in think-tank services, including disciplinary development support services for fixed research projects and periodic research monitoring services. Ma, Li and Xiao (2018) introduce the Library's practices in the construction of the Oceanography portal based on knowledge services. According to Li, Ma, Liu, Zhang and Xiao (2018), the Library provides methods of analyzing strategic research hotspots in specific research directions, thus offering decision support services to major MOE (Ministry of Education) projects involving functional departments of PKU and providing the basis for directions of disciplinary development support, funding decisions and allocation of human resources. To this end, it makes the best of digital resources and analytical tools and conducts integrated analysis and comprehensive interpretation of numerous pertinent documents through bibliometrics, based on national strategic needs and international disciplinary frontiers. Wu, Xiao, Zhang and Liu (2018) introduce the method and system of indicators with which the Library conducts studies on the evaluation of university discipline competitiveness.
- Further improvement of the framework of research support services, difficulties in practice and how to overcome these challenges must be made. Tang and Zhang (2019) give a systematic introduction to the framework of the Library's research support services, its practices, difficulties and how it has overcome these challenges in practice since 2015.

Library Experience in Support of Industry Development

By early 2015, the Library had begun to explore research support services. The Library's research support services have been booming since 2015. As of 2018, the Library had completed multiple projects and reports on research analysis evaluation and management and decision-making support. A number of

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reports on disciplinary development assessment and disciplinary development trend analysis have been finished, accumulating a wealth of experience and addressing many problems in data accumulation and utilization, indicator system establishment, discipline mapping and the framework style and content of analysis reports. The Library has completed and released a number of information products, such as the Report on Disciplinary Competitiveness of Peking University, the Report on Patent Competitiveness of Peking University, the Report on Research Frontiers of Peking University and the Weiming Academic Bulletin, which have won recognition and praise from teaching researchers and research management and decision-making departments at PKU.

The Library also offers various forms of information literacy education to support scientific research, which has completed the construction of some special resources and discipline portals. Representative experiences are listed below.

Experience 1: research project consultation: research on Tagore

This activity came from a faculty's commission. The goal was to find as much original and research literature on Tagore as possible and then support the research project. It was achieved through extensive literature investigation. Specifically, "Tagore" was used as the search term to retrieve literature such as books, journal papers and newspapers, with the literature retrieval strategy constantly adjusted.

For example, as there were more than a dozen Chinese translations and variations[1] of Tagore, such as "太谷耳", "台莪儿", "台莪尔", "泰戈尔", "太戈爾", "太戈尔", "太谷尔", "泰果尔", "泰谷尔", "泰谷爾", "戴歌尔", "台峨尔", "泰谷兒", "太谷兒", "泰哥尔", "达噶尔". Everyone works as Tagore and therefore they were used in the search. Experience from this project is summarized as follows:

1. The Library has established special resource search methods and strategies, providing reference for future research (for instance, on "Whitman").
2. The Library has collaborated with the faculty to guarantee the success of the research project. In the search process, the Library has been integrated into the research project and deepened its understanding of the search points to ensure complete search.
3. In the delivery of research support services, the library has dug users' potential needs, expanded and deepened research support services, to increase user satisfaction and improve its influence. By deeply digging users' needs, the Library has successfully held an exhibition on this research project, which has been covered by quite a few media, increasing the influence of the Library.

Experience 2: Hotspot research and trend analysis project

This activity came from a major MOE project undertaken by PKU Office of Scientific Research. It was achieved by studying, through literature investigation and bibliometrics, the development status and trends of the "specific topics" recommended by experts based on their experience and understanding of disciplines. Specifically, a proper search strategy was determined for each hotspot recommended by experts, to completely and accurately find out all target literature on this hotspot (roughly 50,000 references).

Then, searched literature was analyzed by country, organization and personnel to obtain the rankings of such indicators like number of published papers, number of citations, number of citations per paper, citation influence and share of high-level papers (the first 20 results were included in the final report). Especially, the global performance of organizations and personnel in Mainland China in this hotspot area

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should be analyzed, and the detailed schools/departments of relevant researchers should be indicated. This allows informed decisions on which disciplines will be supported as a priority.

Finally, hotspot research trends in this research area were identified based on analysis of Essential Science Indicators (ESI) research frontiers and SciVal discipline trends and of patent research hotspots and verified on the grounds of literature review and expert interview. Experience from this project is summarized as follows:

1. The Library has established a complete set of analytical methods and processes. A specification document has been developed in terms of data sources, determination of a search strategy, selection of analysis indicators, presentation of analysis results, methods of trend analysis and the structure and format of the final report, among others.
2. Teamwork is an efficient manner of working: each project member has fully exerted his/her strengths, guaranteeing good results of the project.

Experience 3: Report on Research Frontiers of Peking University (2018)

This activity came from the Library's proactive services and reform needs. The goal was to analyze and publish the research frontiers of various disciplines at PKU, thus providing support for PKU's disciplinary development. It was achieved by extracting the research frontiers concerned by users in specific disciplines at PKU through a combination of various methods, including keyword analysis, visual analysis and outcome tracking, and then selecting and interpreting research frontiers through the expert analysis. Specifically, multiple data sources, including data on papers published recently, papers downloaded and cited, user retrieval and user attention, were utilized to extract and interpret the top 10 research frontiers in each discipline from different perspectives. Experience from this project is summarized as follows:

1. The Library has used a combination of data sources, e.g., by adding user downloads and the amount of user retrieval in the Library's discovery system, to ensure that the extracted results are prospective.
2. The Library has completed the project in collaboration with experts in different disciplines. A combination of the Library's strengths in resources and analytical methods together with experts' know-how and understanding corresponding disciplines have been brought into play.
3. The Library has acquired users' usage data in collaboration with database publishers and other departments under it.
4. The Library has proactively delivered some research support services and participated in the process of disciplinary development at PKU according to the needs.

Experience 4: Report on the Competitiveness of Peking University (2018)

This activity came from the demand for revising the Report on the Competitiveness of Peking University (2017); through user feedback and suggestions, libraries should provide dynamic traceability services for the development of various disciplines in universities. The goal was to provide reference and decision-making support for the "Double First-class" construction at PKU.

It was achieved through the use of bibliometrics. Specifically, the Library, together with PKU Office of Discipline Construction, analyzed the academic competitiveness of different disciplines at PKU by benchmarking PKU against 18 comprehensive universities at home and abroad in terms of basic research

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strength, research performance, innovation capability, international influence and school/department contribution. Experience from this project is summarized as follows:

1. The Library has established a complete indicator system for academic competitiveness, which consists of five first-level indicators, such as basic research strength, research performance, innovation capability, international influence and school/department contribution. Eleven second-level indicators, including the number of journal papers and citation influence, academic monographs frequently cited at home, research project applications, research platforms, research rewards, discipline assessment, high-impact papers, high-impact journal papers, paper funding, discipline ranking and cooperation with the country, are included.
2. The Library values user feedback and suggestions. It strives to meet personalized needs while maintaining a standard.
3. The Library values the sustainability and continuous improvement of research support services.

Experience 5: Report on Patent Competitiveness of Peking University (2018)

This activity came from the decision-making support report the Library actively attempted to complete and the demand for revising the 2016 edition. To ensure data integrity, the Library expanded data sources of the 2018 Edition by including PatSnap patent analysis management platform, Derwent Innovation (DI), China Patent Full-Text Database (CNKI Version) and China National Intellectual Property Administration (CNIPA). The analytical method increased the dimensions of analysis to 12, namely number of patents, legal status, patent hotspots, contribution degree, invalid patents, patent intensity, cited patents, patent awards, geographical distribution of patents – Chinese patents, geographical distribution of patents – overseas patents, patent cooperation and patent transfer. Experience from this project is summarized as follows:

1. The Library has worked with database publishers. For example, this project was based on Innography data, so the Library fully cooperated with Ourchem, the data agent, not only training project librarians, but also in consulting experts on the content of the report, so as to avoid obvious errors or mistakes in the project.
2. The Library values sustainability and continuous improvement of research support services.

Experience 6: Embedded support for research activities

Embedded support services for research activities come from a variety of sources. For example, embedded lecture services come from the needs of postgraduate users. The Oceanology portal, commissioned by the management level and the research level for ocean-related literature resources, was initiated by PKU Institute of Ocean Research.

The initiative of the Library is behind Sci-Tech novelty retrieval and paper collection, citation and certification services provided for the faculty in research project application, appraisal of research results and paper award application. Embedded support services for research activities features diversified in contents and forms, and flexible approaches. They can be face-to-face lectures, report certification or discipline-specific portals. Experience from this project is summarized as follows:

1. The Library has provided interdisciplinary embedded lectures in collaboration with different departments under it.

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2. The Library has provided professional software training services by cooperating with experts outside PKU.
3. The library has provided lectures on special topics by working with database publishers.

Experience 7: Report on Publication of Research Papers in Mainland China

This activity came from the needs of the MOE Department of Science and Technology. The goal of this research was to support the development of higher education in China. It was conducted through analysis of the overall trend of the number and influence of research papers published, papers published in different disciplines and comparison with corresponding disciplines in the US, papers published in top journals and comparison with the situation in universities abroad, with SCI papers during 1990-2014 as the essential data. Experience from this project is summarized as follows:

1. The Library has worked with research management departments to support higher education development in China.
2. The Library has brought into full play the advantages of each project member through teamwork.

OPTIMIZATION OF THE LIBRARY'S RESEARCH SUPPORT SERVICES

As indicated by the relevant literature, Chinese university libraries have carried out a large number of activities on research support and delivered a range of services on the grounds of their understanding of research support services and the environment. There have been some theoretical discussions, though relatively few and fragmented. Practices have also been carried out in a decentralized manner, in which case a complete and stable theoretical framework has not yet been established. Relevant services are mainly presented by case studies, without systematic, strategic positioning.

Chen (2018) discussed innovation in information services delivered by university libraries and suggested that information services were a business of an organization or platform, an integral part of higher education and, more importantly, a kind of acts that serve as an extension of a university's talent training system to solve problems for teachers, students and other users. Information services have become an important mission of university libraries. Likewise, research support services, as information services, are not only a business of a library but also an undertaking promoting higher education development and acts serving talent cultivation in universities.

Repositioning of Research Support Services

In 2019, the Library repositioned the objectives of its research support services. The goal should be operated in interaction with the talent training system and the process of a comprehensive reform of the university. The Library will establish a sound innovation mechanism and information research service system that integrates relevant departments inside and outside Peking University, and in a bid to function itself as an effective platform that helps users solve problems in learning, teaching, R&D and management and cultivate their information literacy. To achieve this new goal, the Library should adhere to the principle of user orientation and fully leverage IT applications.

It has also set up a dedicated organization—the Collaborative Service Center (CSC)—which has two offices in the West Building of the Library and is responsible for promoting and implementing research

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support services. The new CSC has inherited most of the businesses of its predecessor (RSC), spun off the data business (and incorporated it into a new department: the Data Resource Service Center) and expanded some of the businesses of its predecessor (RSC).

The Framework of Research Support Services

Information service is composed of four elements: service strategy, service object, service content and service provider. In 2019, based on a summary of its experience in research support services, the Library further clarified the framework of research support services. Collaboration between service providers has been underlined: the Library delivers services in collaboration with researchers, research managers and decision-makers, and other personnel inside and outside PKU to break new ground in research support services. Integration of the service strategy has been emphasized: the Library is actively integrated into teaching, research and talent training of various users such as researchers, teaching and research entities and relevant functional departments and into PKU's mission and the Double First-class construction. Service content has been extended: for example, information services for major research projects have been extended to serve researchers engaged in major science and technology innovation projects and in key disciplines; academic literacy courses have been offered to postgraduates and tailor-made discipline analysis reports and assessment reports have been developed for specific schools and departments.

Service Strategy

Research support services are user-oriented and active services drive collaborative innovation. Such services are integrated into scientific research during its lifecycle. By investigating user needs, the Library actively delivers research support services required by users, collects user feedback and customization needs to offer services that fit user needs more.

For example, the Report on Research Frontiers of Peking University (2018) introduces the research frontiers in 12 science & engineering disciplines at PKU. Scholars, research managers and decision-makers in Humanities and Social Sciences proposed that such reports were also required for the research frontiers in humanities & social sciences at PKU, which drove the development of reports on research frontiers in this discipline.

Service Object

Research support services are offered to different types of users, such as postgraduates, teachers, research managers and decision-makers. Teachers and postgraduates come from different schools and departments; university-wide research decision-making departments[2], such as the Office of Scientific Research, the Office of Discipline Construction and the Office of Science and Technology Development; personnel related to disciplinary development in different schools and departments.

In terms of user needs and problems to be addressed, research support services are delivered to the primary focus of scientific research, namely needs and problems to be solved throughout the research lifecycle. In terms of users' individual preferences, research support services are delivered to satisfy "individualized" research needs. The Library's research support services mainly target teachers, postgraduates, disciplinary development planners, research managers and decision-makers at PKU and MOE. They are intended to satisfy the information service needs of researchers (teachers and postgraduates) throughout

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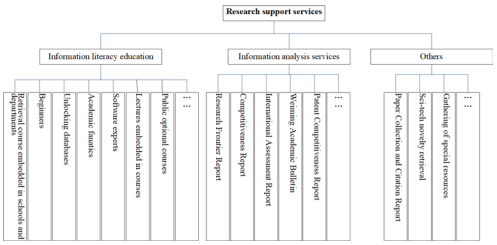
the research lifecycle, information needs of research development planning, PKU's research assessment and decision-making needs, and MOE's information needs to promote higher education development.

Service Contents

Value-added information products customized to satisfy user needs and solve their problems. Research support services can be literature services, including discipline-specific literature services, literature services for major projects, etc. They can be knowledge services, including those knowledge services of different granularities at different levels. They can also be information services, which are presented in the form of information products, or data services, research-supporting data sets converged through data mining. Services delivered at PKU are shown in Figure 2.

Figure 2. Research support service Contents in PKUL



Service Providers

Service providers include several teams including the Subject librarians mainly in charge of information literacy and research support services. The Library's research support services are organized and implemented by CSC. Job descriptions of CSC are shown in Table 1

Table 1: Collaborative Service Center Staffing

Activity	Staff	Description
Teaching coordination and information literacy education	4	To deliver full-coverage, multi-level information literacy education services oriented towards all teachers and students at PKU, take charge of courses, daily training, software and other activities in connection with information literacy education
Research coordination and information research services	6	To deliver information research services such as research coordination and information research services, and discipline trend analysis; deliver research-integrated literature services and consultation services such as database retrieving and sci-tech novelty retrieval; deliver research data services related to information research services in collaboration with the Data Service Center; take charge of research innovation and transformation of existing patent outcomes; and take charge of patent novelty retrieval, patent consultation and patent training services
Director(s) and deputy directors	3	To organize and manage the business of the two groups above

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CSC also organizes cross-departmental service teams to deliver research support services. Staffing of the teams is listed in Table 2.

Table 2 Cross-departmental teams

Teams	Staff	Description
Teaching Coordination and Information Literacy Education Team	9+12	To deliver full-coverage, multi-level information literacy education services oriented towards all teachers and students at PKU
Research Coordination and Information Research Services Team	7+13	To deliver information research services such as research coordination and information research services, and discipline trend analysis; deliver research-integrated literature services and consultation services such as database retrieving and sci-tech novelty retrieval; deliver research data services related to information research services in collaboration with the Data Service Center; take charge of research innovation and transformation of existing patent outcomes; and take charge of patent novelty retrieval, patent consultation and patent training services

The last one is the team of other personnel including researchers, research managers and decision-makers, personnel with other departments in the Library and non-PKU experts in various disciplines, who guarantee smooth delivery of research support services.

Evaluation of Service Performance

The Library values the research support services assessment collects user feedback on research support services in a planned manner and continuously improves information service products and service strategies, with a view to effectively exerting the role of research support services in the higher education system.

The Appendix contains the questionnaire survey on information literacy education and the evaluation of some information products.-The opinions and suggestions of deans on data, evaluation index system, criteria for selection of core and top journals, and analysis methods adopted in research support services of Peking University Library share common features. The library can constantly improve the Report on the Competitiveness of Peking University according to users' opinions and suggestions.

CONCLUSION AND OUTLOOK

Research support services are innovative services delivered by libraries in the new scientific research climate. They are also innovative information services delivered to researchers, research development planners, research managers and decision-makers, in a bid to support the development of disciplines in universities, research management and research development planning in universities and national higher education development strategy making. It is on the basis of such an idea and purpose that the Library's research support services are designed and implemented.

These services are delivered by a dedicated organization (CSC) to researchers in different schools and departments and research decision-makers in different functional departments at PKU, with abundant experience accumulated. Currently, all of the research-oriented university libraries should innovate their

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information services, and research support services are a good solution. By deeply digging their strengths in bibliometrics, resource sorting and analysis, indicator system research and competitive intelligence, libraries can provide strong support for disciplinary development, research management and strategic decision-making in universities, expand services, increase engagement in disciplinary development and improve their influence.

Collaboration is emphasized. Libraries should strive to establish a collaboration mechanism, build a trans-departmental, cross-unit, inter-university and multi-industry platform for win-win cooperation, and work together to deliver research support services.

Applicability is more valued. The library should provide different service contents according to the needs of varying service objects. University libraries should design content frameworks for research support services based on the characteristics of universities they serve and develop appropriate service programs. Research support services range from subject development support, research evaluation, decision support, talent assessment, information literacy, digital publishing to patent information, etc. Libraries of domestic academic universities with many dominant subjects are suggested to provide research evaluation, talent assessment, patent information and related services according to development goals and subject construction requirements of universities; libraries of small and medium-sized universities may focus on subject information literacy, academic information newsletters.

Change is underlined. The library should adjust the service strategy according to the change of environment. For example, in the case of the outbreak of COVID-19 at the beginning of 2020, the means of scientific research support services have changed: the face-to-face services have been greatly reduced, most of the services are conducted online. Information quality education is provided in the form of online and video lectures, and the communication with researchers is more dependent on the use of online tools such as email, video conference and WeChat.

Integration is stressed. Libraries should actively and seamlessly integrate research support services into the research lifecycle disciplinary development planning research management and decision-making the cause of teaching, research and talent training and university missions and the Double First-class strategy so as to promote the development of higher education.

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KEY TERMS AND DEFINITIONS

Double First-Class: In 2015, China launched the "Double First-Class Initiative" to promote the development of higher education in China. Double First-class means the world-class universities and the first-class disciplines.

First-Class Discipline: In 2015, China launched the "Double First-Class Initiative". The First-Class Discipline is the construction of first-class research-oriented disciplines.

Reports on Patent Competitiveness of Peking University: The project is a decision support report, actively completed by Peking University Library and based on potential target customer demands. Relying on Innography and other patent databases, it sums up and analyzes the number of existing patents, number of high-strength patents, patent hotspots and patent commercialization of Peking University and its directly subordinate and affiliate teaching and research institutions. The results are compared with peer universities, in order to understand Peking University's patent ownership and its competitiveness among universities and to enable the Library to develop in advantageous directions.

Reports on Research Frontiers of Peking University: This service came from the Library's proactive services and reform needs. The goal was to analyze and publish the research frontiers of various disciplines at PKU, thus providing support for PKU's disciplinary development.

Reports on Subject Competitiveness of Peking University: Co-authored by Office of Discipline Construction, the report series analyze the academic competitiveness of each subject of Peking University. It is based on subjects of Peking University and benchmarked against 18 comprehensive universities

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at home and abroad, thus providing bibliometric analysis and scientific evaluation indexes for subject development of Peking University.

Weiming Academic Bulletin: It is an information product independently edited and released by the research support centre (Collaborative Service Center now) to support scientific research. It aims to collect data from an objective perspective, show the academic achievements of Peking University, support academic research of scholars, and accompany Peking University to become a world-class university. As of December 2019, 17 issues have been published.

World-Class University: In 2015, China launched the "Double First-Class Initiative". First-Class University is the construction of first-class research-oriented universities.

ENDNOTES

1 "Taiguer", "Taiguer", "Taiguer", "Tagore", "Tagore", "Taiguer", "Taiguore", "Taiguer", "Taiguer", "Daigeer", "Tai'er", "Taiguer", "Taiguer", "Taiguer" and "Dagar".

2 According to the introduction on the website of Peking University, the Office of Scientific Research, the Office of Discipline Construction, and the Office of Science and Technology Development are research decision- making departments of Peking University. There are many other research decision-making departments at Peking University, such as the Office of Humanities and Social Sciences.

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APPENDIX

Peking University Library's "One-hour Lecture" Questionnaire Survey

Dear reader:

Good morning/afternoon! You are welcome to take the Library's "One-hour Lecture" Questionnaire Survey. The questionnaire is for the purpose of improving our services only and will not leak any of your personal information. Please be assured. Thank you for your support and cooperation!

……

Part I: Basic Information

1. Your school and department: ()
   A. School/Department of_____, Peking University B. Other university
2. Your current academic level:
   A. Undergraduate B.Postgraduate C. Doctoral student D. Other_____

Part II: About This Lecture

3. How do you think this lecture: ()

   A. It covers all of what I want to learn
   B. It covers most of what I want to learn
   C. It covers only a small part of what I want to learn
   D. It's not what I want to learn and I think the following should be included:

_____

4. What do you think of the practicability of this lecture? ()
   A. Very helpful, as it has addressed the problems I have encountered in the utilization of library resources
   B. Helpful, as it has addressed some of my problems
   C. So-so
   D. Not helpful
5. Please leave your precious advice and suggestions on this lecture:
   _____

Part III: About "One-hour Lecture"

6. What lecture topics are you most interested in? Please recommend to us:

   _____

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Section 4
Oceania

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Chapter 12
Reinventing Library Research Support Services at Griffith University

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EXECUTIVE SUMMARY

Griffith University provides advice and services to researchers around research grants, ethics and integrity, research performance, and publications and outputs. A broad-based researcher education and development program helps inform and upskill researchers and research students. From 2019, Griffith University Library has developed new services to support data-driven, data-intensive research and assist researchers through the entire research lifecycle. This chapter describes the staffing structure and the ideas underpinning a new service catalogue based around key areas, such as data management, open scholarship, and data wrangling. Methods to achieve this included a collaboratively developed knowledge base, the development of new workshops, mapping of research environments and referral pathways, and developing support for researchers for whom there is no established tool for the kinds of research they want to do. A push to establish the library as a vital and valued partner in research projects was a key driver for change.

INTRODUCTION

Since the seminal report by Megan Oakleaf (2010) on the need for academic libraries to articulate not only their value to their respective institutions but also 'their contribution to institutional mission and goals' (p. 6), librarians have been re-examining their support services for staff and students. Given the

DOI: 10.4018/978-1-7998-4546-1.ch012

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importance of research performance as one of the key criteria in the major global university ranking schemes, support for researchers has become an important focus. In some universities, libraries have succeeded in being regarded as essential to research processes (Fernández-Marcial, Costa, & González-Solar, 2016).

The following chapter examines how recent significant changes at Griffith University in both its top-level organisational structure and strategic direction have provided the Library with an opportunity to rethink its research support services. The authors have described a new service model which is currently being implemented, with particular attention given to the ways it contributes to the University's strategic research goals. They conclude with a brief discussion of important additional work which is being planned for 2020 onwards.

CONTEXT

While this chapter has been written from an Australian perspective, many of the drivers for the evolution of research support services are common across the world's developed and developing nations. Striving to be more productive and more competitive, nations seek to address the major social, economic, and environmental challenges of this century. A government's support for research and innovation helps position a nation to achieve these goals.

At the turn of this century, the Australian Government recognised that to 'create research infrastructure to enhance the national innovation system and to foster collaboration' (Australia. Department of Innovation, Industry, Science and Research, 2010, p. 7), it would be cost-effective and efficient to adopt a national approach to investing in major research facilities and the associated supporting infrastructure and networks. To this end, it created the National Collaborative Research Infrastructure Strategy (NCRIS) (Australia. Department of Innovation, Industry, Science and Research, 2010), the aim of which was to provide researchers with access to world-class resources.

Since most public research in Australia is undertaken by universities (O'Brien, 2010), these institutions were understandably eager to leverage this strategic national investment to benefit their researchers. With the advent of the data deluge, universities submitted funding bids in their own right or collaboratively with other research partners. Importantly, librarians quickly realised that they, too, could play an integral role as members of proposed project teams (Wolski, Richardson, & Rebollo, 2011).

The next section outlines the current Australian research environment.

Australian Research Environment

The main research funding body in Australia is the Australian Research Council (ARC), a Commonwealth entity within the Australian Government established as an independent body under the Australian Research Council Act 2001. The ARC advises the Government on research matters and administers the National Competitive Grants Program (NCGP), a significant component of Australia's investment in research and development.

Through Excellence in Research for Australia (ERA), the ARC is also tasked with identifying excellence in research, by benchmarking Australia's university research efforts against their international peers, creating incentives to improve the quality of research, and identifying emerging research areas and opportunities for further development. Clinical and other medical research is primarily supported

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by the National Health and Medical Research Council (NHMRC), which also administers and issues significant grant funding to Australian universities and research institutes.

The increasingly computational and data-intensive nature of modern research was identified as early as 2009 by Hey, Tansley, & Tolle (2009) who argued that there should be a new addition – data exploration – to the three existing models of scientific enquiry: empiricism (describing natural phenomena), theoretical science (based on models and generalised theories) and computational science (simulating complex phenomena):

The world of science has changed ... The techniques and technologies for such data-intensive science are so different that it is worth distinguishing data-intensive science from computational science as a new, fourth paradigm for scientific exploration (p. 15).

In data-intensive science, data is captured by instruments or generated by simulators, and the outputs are too large to be processed by humans. Data thus has first to be manipulated by statistical software and analytical tools such as data mining, visualisation, and simulation in order for researchers to make sense of it. The wide acceptance of Hey et al.'s 'fourth paradigm', data-intensive scientific model (2009) is reflected in Australian research and infrastructure funding. Over the past fifteen years, AUD $3.3 billion has been invested in NCRIS (Australia. Department of Education and Training, 2019), which established a roadmap for infrastructure support for research. More than AUD $1 billion has also been made available through co-investment from state and territory governments, universities, research facilities, and industry. The ultimate objective is to support high-quality research that will drive greater innovation in the Australian research sector and the economy more broadly.

Through NCRIS, the Government works with the research sector to drive research excellence and its application. Given the growth in importance of computer-based data gathering and data analysis in most disciplines (Boulton et al., 2012; Katz et al., 2017), developing researchers' skills in these areas is essential to meet that aspiration. Supported by NCRIS, the Australian Research Data Commons (ARDC, 2019) worked with Universities Australia and the Council of Australasian University Directors of Information Technology (CAUDIT) to run a two-day skilled research workforce summit in July 2019. The summit aimed to answer the question: "What skills will our researchers, data or software specialists and research support staff need to survive and thrive in this new world of data-enabled research?" and to come up with concrete proposals and pathways to plan for the future research workforce. This was a belated recognition by Australian universities that workforce issues are beginning to put pressure on the ability of research teams to undertake certain kinds of research.

For example, there are increasing numbers of researchers for whom there is no established tool for the kind of research they want to do. Researchers in disciplines with long-established digital tools, tools such as SPSS, Galaxy, NVivo, MATLAB, or one of the many Virtual Laboratories available to Australian researchers, can generally access online help, starter tutorials, and troubleshooting tips. But in many data-driven disciplines now, researchers need to build their own tools. As MacArthur (2009) observed more than ten years ago:

If you intend to be at the head of your field, you'll often be in a place where the right tools for the job simply don't exist yet. You need to be able to develop such tools yourself, or at least speak the right language to communicate your needs to someone who can; and speaking that language means having a good working knowledge of computation.

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Staff at Griffith University Library are investigating ways to support researchers who are embarking on this path.

Griffith University

Located in the rapidly growing corridor between Brisbane and the Gold Coast in Southeast Queensland, Griffith University is a comprehensive, research-intensive university with a strong emphasis on interdisciplinarity. Formally founded in 1971, Griffith opened its doors in 1975, introducing Australia's first degrees in environmental science and Asian studies. Currently, the University offers more than 200 degrees across five campuses to more than 50,000 students from 130 countries studying at undergraduate through to doctoral level in one of four broad academic groups: arts, education and law; business; science; and health. The University operates on a trimester schedule.

A series of prestigious rankings systems place Griffith in the top 2 percent of universities worldwide: ranking 35th in the *2019 Times Higher Education Young University Rankings* (Times Higher Education, 2019) and 37th in the *2020 QS World University Rankings Top 50 Under 50* (Quacquarelli Symonds, 2019). Griffith's strategic research investment strategy has positioned it to be a world leader in the fields of Asian politics, trade and development; climate change adaptation; criminology; drug discovery and infectious disease; health; sustainable tourism; water science; music; and the creative arts.

The mission of Griffith University is to 'engage in outstanding scholarship that makes a major contribution to society and to produce groundbreaking research. Students will be provided with an excellent education and the capacity to develop and apply knowledge to exercise influence and make meaningful life-long contributions to their communities'. In order to deliver on its mission, the University's *Griffith* (Griffith University, 2019) is structured around six interrelated core commitments: values, students, research, people, engagement, and infrastructure.Figure 1 depicts the University's current organisation structure. The University Librarian reports to the Senior Deputy Vice Chancellor.

However, at the time of writing, the University is in the process of transitioning to a new senior executive leadership team, which will not be fully in place until early 2021. The current Senior Deputy Vice Chancellor role will be replaced by a Provost, who will consolidate accountability for the student experience. A key role reporting to the Provost will be the Deputy Vice Chancellor (Education), whose core focus will be on learning and teaching strategy. As a key partner in supporting learning and teaching, the Library will report to the DVC (Education).

Another new key role established in early 2020 is that of Deputy Vice Chancellor (Research), reporting directly to the Vice Chancellor. This appointment's focus is on increasing university-wide research performance and fostering relationships with additional government, industry, and community partners. From the Library's perspective, this has provided an opportunity at a very senior level to advise on the impact on the University of important national initiatives to ensure Australia keeps abreast of global research-focused trends. Additionally, the DVC (Research) and the University Librarian have been using their bi-monthly meetings not only to develop Griffith's responses to these initiatives, as required, but also to identify strategies and resources to maximise the skills and knowledge of library staff to contribute to the University's research agenda.

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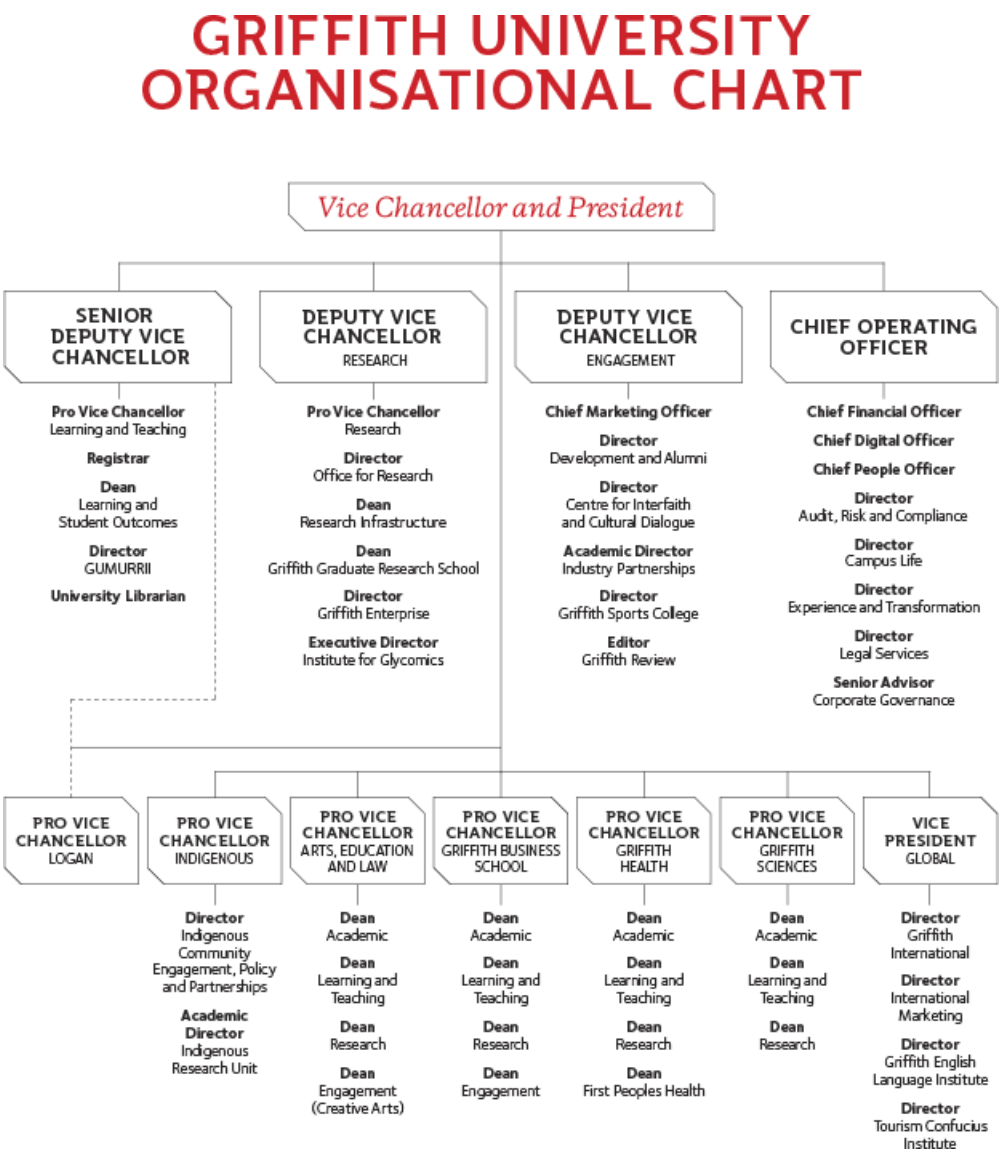
Figure 1. Griffith University organisational structure in early 2020. (Source: Griffith University)



The Library

From 2012, Griffith University's library services were offered through Information Management (IM) and Library and Learning Services (the Library), two of six Portfolio groups which comprised the then Division of Information Services (INS). In 2017, the Division was disestablished, thereby providing the Library with the opportunity to redefine itself.

A series of subsequent changes have brought all functional units into one portfolio, now known as the Library, which reports to the Senior Deputy Vice Chancellor. In 2018, additional changes established a new service model and staff profile, including a new leadership layer (Figure 2).

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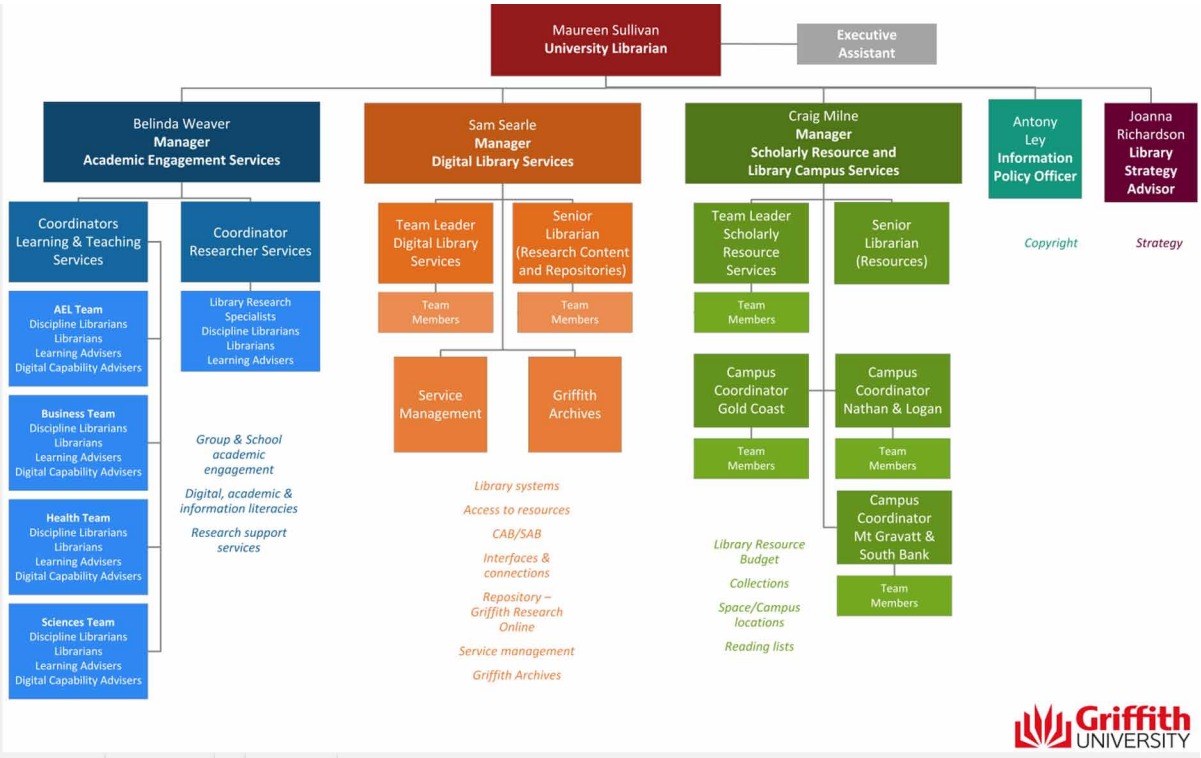
Key drivers were the need to be more responsive to the University's priorities, to facilitate the effective and flexible mobilisation of staff capability, and to facilitate more agile development and delivery of services.

The Library currently provides digital first, contemporary, expert library services to support Griffith University's students, academics and researchers in their learning, teaching and research. The Library delivers high quality, targeted, and robust library management systems, search and discovery tools, and technologies enabling resource discovery, access and use.

Griffith Library encompasses six physical libraries over five campuses and is consistently one of the busiest locations on each of its campuses. The Library also services the University's Digital Campus through a digital first development approach to its services and an e-preferred collection strategy.

Figure 2. Library organisational structure. (Source:Griffith University Library)



As Figure 2 shows, the Library is structured around three key teams:

- **Academic Engagement Services**
  - Provides generic and discipline-specific information and academic skill development expertise to support learning and teaching and research services.
- **Scholarly Resource and Library Campus Services**

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    - Ensures digital access to information resources that support outstanding scholarship and research anywhere, anytime, as well as first tier support for The Library products and services and operational management of the six campus libraries.
- **Digital Library Services**
    - Manages the portfolio of technologies and systems that underpin the Library's services.

The Library also includes the University's Information Policy Officer, the Griffith Archive Officer, a Service Management Officer, and a Library Strategy Adviser. has 119 staff, with a full-time equivalent of 105.742. Full-time staff make up 64.7% of the overall profile, with the remaining 35.3% being part-time. Library Campus Services is the largest service group (41.2% of all The Library staff), servicing all library locations on each campus, with service offerings in face-to face and digital modes (telephone, chat, email, and webform channels). Academic Engagement Services makes up 31.1% of The Library staffing, as they undertake digital and face-to-face, specialised advice and consulting services for students, academics and researchers.

The Library has benefited from the long history of the design and delivery of integrated divisional (INS) services to a dispersed multi-campus/multi-disciplinary community. For the Library, this established a broad focus on, and understanding of, issues beyond traditional library boundaries. As a result, at the heart of 'how we do things' is a commitment to end-to-end service delivery enacted through data-driven decisions, collaboration based on respect for all expertise and contributions, and an understanding of the porous boundaries both between internal Library work teams and Library delivery partners. This is increasingly regarded by Library business partners as a value-add.

RESEARCH SUPPORT SERVICES IN GRIFFITH UNIVERSITY

Griffith University supports researchers through a range of different units and sections. The key units are:

- Office for Research – delivers professional research support services with functions spanning grants, development, ethics and integrity, policy, performance and reporting
- Griffith Graduate Research School – administers Higher Degree by Research (HDR) programs, manages placements and internships, and oversees the comprehensive and broad-based Researcher Education and Development (RED) training program, in which the Library collaborates
- Griffith Enterprise – the University's dedicated unit for business and government engagements, innovations and new ventures, which connects research experts to public needs to find solutions for society
- eResearch Services – provides specialist IT support for researchers across all Griffith schools and research centres
- The Library – delivers a broad range of research support services and training to both researchers and HDR students.

Challenges

Historically, Griffith University Library had established a record within the University of offering a range of research support services for such topics as bibliographic impact, information literacy, and research

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discovery. However, in recent years, it had become readily apparent that if the Library was to continue to contribute to the University's research agenda, then it needed to reconceptualise its service offerings to address modern, data-driven research challenges.

Given the number of Griffith University units with roles in research support, there is inevitably some confusion in researchers' minds as to where to turn for advice, especially regarding issues such as data management, which can span a number of units, or identifying different units' responsibilities in supporting and training HDR students. As stated above, Library staff now need to support the increasing numbers of researchers for whom there is no established tool for the kind of research they want to do. As increasing numbers of staff and HDR students undertake data-intensive research, the importance of appropriate skills, support and training becomes more pressing.

Another emerging challenge is the creation of Griffith 'Beacon' projects, which are large, interdisciplinary projects designed to address some of humanity's grand challenges, such as the health effects of climate change. Traditionally, these projects would have been solely run by schools and research centres, but their size and complexity has fostered a more collaborative approach in which eResearch Services and Library staff can play a key role.

Reliable data on the Library's effectiveness has been scattered. Feedback on individual workshops indicates they have been favourably received by students and staff alike, and a steadily increasing uptick in consultations and workshop requests demonstrates the considerable need for Library support. However, the lack of a centralised data dashboard has hampered the Library's ability to tell this story.

In the sections which follow, the authors have outlined the approach which Griffith University Library is adopting to address the fundamental question raised by this monograph: How does a university library ensure that its research support services contribute to the parent organisation's strategic research goals? Some of the key characteristics covered include

- Library research support staffing profile, including roles
- Target users, including researcher profiles
- Service reorientation plan
- Service catalogue
- Collaboration with other University research support units

The reorganisation is still being bedded down, and it is not yet possible to measure how effective the changes have been in enhancing research outcomes. However, the development of standardised metrics and measurements forms part of the changes being implemented, so that it should be possible in the future to provide evidence of the success of the Library's service changes.

Library Research Support

The researcher support services offered by the Library are managed by Academic Engagement Services (AES), a team of forty-two staff, not all of whom work full time (the full time equivalent (FTE) is 38.38). AES is divided into two teams, which work across five physical campuses and the Digital Campus. Researchers are also supported by Library Technology Service (LTS), which manages the Griffith Research Online (GRO) repository, in which researchers can deposit openly available research outputs, and by a full time Information Policy Officer, who advises and runs training on copyright and intellectual property.

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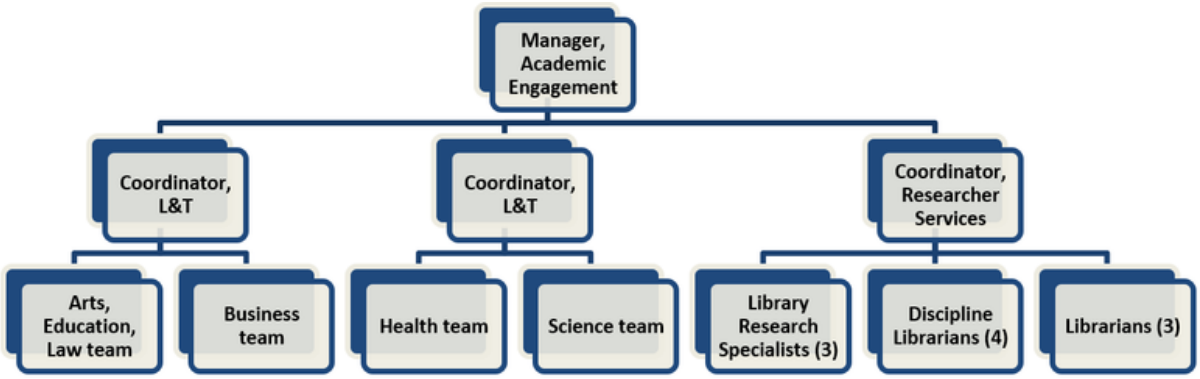
The focus of Learning and Teaching, the larger of the two AES teams, is to support undergraduate and postgraduate coursework students, manage course resources, provide academic skills, digital and information literacy training via face to face workshops and through bespoke online content, and run consultations with students.

Researcher Services is a smaller team, currently eleven people, including the team coordinator. Staff within the team have different roles, all of which complement each other. The focus of the Researcher Services team is to support academic staff in their research role, as well as HDR students enrolled in either Masters by Research or PhD programs.

The two teams are not silos. They collaborate closely across the continuum of teaching and research support needs and provide strong backing for students moving from undergraduate to postgraduate study.

The Academic Engagement Services (AES) structure was established in 2018, with the aim of creating a more responsive and agile team to foster academic engagement across both teaching and learning and researcher support (Figure 3).

Figure 3. AES structure in 2020. (Source:Griffith University Library)



The incoming Manager, Academic Engagement, who began work in November 2018, had previously worked as a community lead for The Carpentries (2020), a global non-profit organisation that teaches foundational computational skills to researchers. Before that, she was a Team Leader for the Queensland Cyber Infrastructure Foundation, a joint operator of the Queensland section of the Australian research cloud with the Research Computing Centre at The University of Queensland. The experience gained in both positions identified a growing need for researchers to develop a range of skills to enable them to work computationally and collaboratively with data. As data volumes have continued to grow in scale and complexity, this need has become more acute, especially since researchers need to comply with increasingly stringent data management and research reproducibility requirements from journal publishers and research funding bodies (Australian Research Council, National Health and Medical Research Council, & Universities Australia, 2019).

This need provided the impetus to develop and deliver research support of a different kind from that previously offered to researchers by staff in university libraries. While such libraries have traditionally supported scholarly research, and have constantly adapted their services over the years as more and more scholarly practice has moved into the digital space, the paradigm shift to data-driven research meant

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a more radical change was needed if Griffith Library was to stay relevant and provide services of real value to the University and its researchers.

As more and more research becomes data-based and data-driven, and as researchers access and use online resources such as journals in a self-service manner, the need for traditional library support or service mediation has shifted. It is obvious that the information for which researchers seek library assistance is far less in journal, conference, or patent databases – the services that librarians formerly helped them navigate – but rather in data they already have, or are about to create or acquire from a vast range of sources, such as sensors, instruments, telescopes, drones, cameras, acoustic listening devices, imaging technologies, and so on. What researchers now need is advice and skills training on how to work productively and efficiently with that data – how to manage, describe, store, combine, standardise, clean, visualise, analyse, and share it.

Given the Library's changing role in assisting researchers with resource discovery, and the ever-increasing existential threats to library jobs from increased automation, it was timely to pivot and use the skills and attributes of librarians to develop new, more relevant services that answered researchers' pressing concerns around working with data, and also contributed to the University's research mission and its strong interdisciplinary focus. The new focus on enabling data-driven research was developed in tandem with updates and extensions of the existing services around researcher profiling and impact and data management.

Increasing Complexity

While researcher support staff at Griffith have traditionally advised researchers about data management issues such as IP, licensing, the appropriate number of backup copies of data and so on, the kinds of enquiries now being fielded by the team are increasing in complexity.

For example, a Researcher Services staffer recently consulted with a researcher about a three-year funded project examining the health effects of large-scale events within a population. Data for the analysis was being acquired from a number of external sources, such as the Australian Bureau of Meteorology, a range of hospitals and health departments, and state emergency services. Some of the incoming health data was identifiable, and thus highly sensitive. The consultation was wide-ranging, covering issues such as the 'Five Safes' (Desai, Ritchie, & Welpton, 2016) protocol for managing sensitive data, the optimal data storage for this kind of data, and how to request that storage, estimating the size of the data, issues of access control, file naming and project organisation, tools for working with the data at the different stages from acquisition through to analysis and visualisation, and methods for combining and standardising data sourced from disparate datasets. Issues around the need for staff upskilling were also canvassed. The consultation required good technical knowledge as well as strong communication and problem-solving skills.

Controlling exactly who has access to what project data is another issue on which the Library is increasingly being asked for advice as projects span institutions and countries. Advice has been developed on optimal ways of structuring project data so that permissions and data restrictions can be more easily managed across large research teams.

Protocols are another area in which Griffith's research support is evolving. Where researchers outsource work to external providers for services such as genome sequencing or interview transcription, a clear need has emerged for protocols that protect the data from loss, disclosure or damage as materials are transferred back and forth between the external provider and the research team. Security protocols

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are also needed as staff move in and out of projects or leave the University for other jobs. Researcher services staff are helping researchers develop instruments for research teams, such as data compliance checklists, data induction checklists and workflows for incoming members, and data exit plans for departing staff or graduate students to ensure that no data is accidentally removed.

Reorienting Services

Traditionally, Griffith University Library staff had offered advice, support and services regarding data management, scholarly publishing, open access, and bibliometrics. They also provided advice and training to HDR students. Services were provided face-to-face and virtually by individual consultations or by bespoke training workshops tailored to students' needs. Web-based support materials, including video content, provided 24/7 support on a range of topics. However, a 2019 review of the Library indicated that Library services, though highly valued, were not well-understood by Library clients. This was a key driver for developing a service catalogue that could be a key explainer of what we do.

Because institutions have been slow to recognise the challenges presented by the data-driven nature of research, this provided an opportunity for Library staff to step in to provide advice, skills training, and support throughout the entirety of the research cycle, from data creation and acquisition to data management, publication and sharing, and its eventual curation and archiving. The Library had seized a similar opportunity when earlier assuming responsibility for data management advice and support, and when helping researchers comply with the data management and research reproducibility requirements set by journal publishers and research funding bodies.

By responding to the increasing complexities of research needs, and recognising a gap in formal training and support, Griffith Library not only developed a plan to reorient library services to support data-intensive research, but also accepted the need for library staff to build new capacity and capability in these emerging areas.

The aim of the service reorientation was to build on existing services, while also developing new services, such as data clean-up and data storytelling, to support the new data-driven research methods in which researchers increasingly work. Establishing the Library as a vital partner in research projects and demonstrating the Library's value within that space was a principal driver for change. Leveraging the interdisciplinary skill set of Researcher Services staff was a key way to demonstrate our value and usefulness to researchers.

Reorientation Plan

Before new services could be developed and delivered, agreement first had to be reached with staff on what these new services would be, who would deliver them, what deficits in staff skills, knowledge and materials might need to be addressed before services could be developed and launched, and a strategy mapped out on how best to demonstrate and communicate the eventual changes to stakeholders.

The service reorientation plan had the following components:

- Define the services to be offered (a mixture of newly developed and well-established services)
- Clarify roles and responsibilities within the Researcher Services team
- Identify knowledge and skills gaps
- Build a knowledge base

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- Upskill and train staff
- Create service support materials and training
- Deliver the service
- Communicate the changes to stakeholders

To ensure services were well-targeted, consultations were held with a range of research staff, research students, and staff such as HDR convenors about their needs, as well as with staff from other units who support researchers and offer research training at Griffith University.

Within the team, it was important to ensure that Researcher Services staff had the requisite skills and the knowledge to be able to create, deliver and support new services. Also important was ensuring that staff had sufficient confidence to take on new or unfamiliar areas of work. While the idea of developing new services was not unwelcome to staff, one immediate issue that had to be addressed was gaps in knowledge. Another was the need to address the 'impostor syndrome' some staff were experiencing at the idea of presenting themselves as 'experts' in areas where their knowledge was either quite shallow or, in some cases, non-existent. For example, some staff were unfamiliar with the terminology needed to adequately discuss and support data-driven research. Technical skills had to be updated, for example, around data clean up and weighing up the suitability of different kinds of cloud-based data storage for different research scenarios, and with new data handling protocols such as Five Safes (Desai, Ritchie, & Welpton, 2016), which provided a framework for all researchers working with potentially sensitive data.

Internally, a number of staff sessions were run to define and refine service offerings, to clarify staff roles and responsibilities, and to set expectations. Upskilling sessions around data wrangling and effective and inclusive teaching practices were also delivered. A comprehensive, collaborative knowledge base was created to equip staff with the information required to support the mixture of new and evolving services. A new service catalogue was drafted, which explains what each new or existing service is, who can access it, and how, and other relevant detail. The service catalogue is structured around key areas – data management; scholarly publishing and research impact; and open scholarship and data wrangling. Data wrangling was a new area, and the support for this service needed to be built completely from scratch. We also offer largely HDR-student-targeted services, such as working with literature and developing skills in academic writing.

Knowledge Base

Knowledge gaps were centred around research-related topics, as well as disciplinary differences and their variable impacts on research support. The Discipline Librarians generally had deeper knowledge about the discipline areas they traditionally supported than did other staff, but if Researcher Services staff across the board were to support interdisciplinary research, knowledge gaps of all kinds had to be minimised as far as possible. To address these gaps, the creation of a Knowledge Base was undertaken, with two types of document being created:

- Documents addressing a specific topic of relevance to emerging services, for example, APIs, issues around options for data storage, cybersecurity and data encryption, algorithms, web scraping
- Documents describing discipline-specific research environments, for example, data storage challenges within a discipline, research impact points of difference within a discipline.

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There were approximately fifty initial topics needing to be created in the Knowledge Base. This has now grown to around sixty and will continue to grow.

Collaboratively created documents in the Knowledge Base captured the existing knowledge about each of the designated topics from within the team, and identified where information was lacking or where deeper or more current information needed to be sourced. The iterative nature of these documents' creation meant that formerly siloed knowledge could be pooled and shared. Documents had multiple purposes: (i) to provide the team with a comprehensive and authoritative look-up service on a topic when asked by researchers for advice; (ii) to provide the basis for the new web-based, Tier 0 support that still needed to be developed as part of the service revamp; and (iii) to encourage sharing of knowledge and a more collaborative and coordinated approach across the team.

A standard format for both types of knowledge base documents has been implemented (Tables 1 and 2).

Table 1. Topical template (Source:Griffith University Library)

Body of Knowledge Template	
Definition	A brief summary of the topic, usually one to two sentences
Uses	How the topic is relevant and where it fits into a research support scenario
Examples of specific discipline methods and issues	Useful analogies for discussions with researchers
Organisations active in creating, collecting, analysing or lobbying for [this Knowledge Base topic]	Key organisations to watch for developments in the field
Web sites for further information	
Tools	Relevant tools, e.g., for data visualisation, data clean up
Griffith University stakeholders	If relevant
Research evidence that [this Knowledge Base topic] matters	Current academic journal articles and papers relating to the topic
Designated person responsible for maintenance	Staff name
Backup person for maintenance	Staff name
Tags	Categories to enable cross-Knowledge Base searching
Date created & author	Date and staff name
Date updated	
Next review date	

In addition to creating the topical Knowledge Base, Researcher Services staff also sought to map the different research environments in which HDR students and researchers operate. This was to help new and developing researchers gain a broad sense of the discipline in which they would be researching, identify the key research methods and tools, learn about the key sources of research data used in their discipline, and so on.

For each discipline supported at Griffith University, Researcher Services staff sought to map them broadly, according to six key sections:

- Research tools, such as
  - Databases relevant to the research

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Table 2. Discipline-specific research environment template (Source:Griffith University Library)

Discipline-Specific Research Environment Template	
What the discipline encompasses	Brief summary
Data sources in the discipline	Databases, data repositories, government, NGO, institutional and industry sources
Common analytical tools	Relevant tools, e.g., for data visualisation, data clean up
Support available	
Training available	
Research methods most common within the discipline	e.g., grounded theory, prototyping, species distribution modelling
Research scenarios	Recent real world examples
Relevant scholarly articles	Current academic journal articles and papers
Griffith University institutes or centres	If relevant
Designated person responsible for maintenance of [this Knowledge Base]	
Backup person for maintenance of this Knowledge Base	
Tags	Categories to enable cross-Body-of-Knowledge searching
Date created & author	Date and staff name
Date updated	
Next review date	

    - Computer programs, including writing and spreadsheeting tools
    - Analytical tools, such as R
    - Referencing tools for managing bibliographies
- Relevant data sources, such as
    - Surveys and interviews
    - Texts/corpora
    - Video/audio
    - Organisations, such as NGOs, governments, industry bodies
    - Libraries, museums and archives
- Research methods relevant to the research discipline, e.g., discourse analysis, prototyping
- Scenarios to assist researchers in developing appropriate research questions within a discipline, including sizing and scoping of projects
- Training available, both internal and external
- Support services, both internal and external.

This mapping has proved helpful to librarians who increasingly need to support interdisciplinary research. The discipline-specific mapping documents (Table 2) have helped people unfamiliar with a discipline get up to speed quite quickly on the major landmarks within it, and have also been useful in assisting with new staff induction. They have also served to democratise information across the team – all staff, including those in the Learning and Teaching team within AES, have access to the same data. Mapped environments discourage knowledge ‘hoarding’ by team members.

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Sharing this kind of data also makes it easier for people to switch roles, or to deputise for others, both of which are useful for multi-skilling and career development.

The collaborative nature of the development of the documents means that information has been captured from a range of different people's experiences, and is all the richer for it. Where information was seen to be missing, and where it needed to be sourced from elsewhere, the central capture of the information has made that deficit visible to all, and therefore identifiable as work still needing to be completed.

While all the topical and disciplinary documents have been created as standalone documents, housed centrally within a Microsoft Teams file structure, a project is underway to convert the data contained within them into a structured format so that the material can be housed on SharePoint and become searchable through document metadata. The categorisation of items by multiple tags is designed to link relevant information together for retrieval purposes.

Staffing and Roles

Researcher Services' key stakeholders at Griffith University include Academic Groups, research institutes and centres, and HDR candidates. Griffith is currently divided into four key academic groups:

- Arts, Education and Law (AEL)
- Business
- Health
- Science

Advice and services are tailored to the needs of these four Academic Groups and to the many research centres and institutes linked with those Groups at the University. All librarian roles within Researcher Services support Digital Science's Symplectic Elements (housing research publications) and Discovery (the researcher profile service locally badged as Griffith Experts) services, and all topical advice is informed by disciplinary differences and knowledge.

The four Discipline Librarians based in the Researcher Services team have each been assigned primary responsibility for a specific academic group so that communication and outreach are consistent and well-managed. They work closely with their Discipline Librarian counterparts within the Learning and Teaching team, whose four teams are based around the same academic groups. This ensures more consistent service right across the board. The Researcher Services Discipline Librarians lead the outreach and communication work with the academic groups, and play a key role in supporting and upskilling HDR students and supporting researchers.

The librarians within the team focus on service delivery, managing and triaging requests submitted through the online enquiry system, running consultations, teaching workshops, and providing support for Griffith's Symplectic Elements and Discovery services. They support the work of the Discipline Librarians and the Library Research Specialists as required and play a key role in onward referral across a range of topics such as researcher profiles, research metrics, and data handling issues.

The three Library Research Specialists (LRSs) have distinct areas of operation, with one focusing on developing expertise in data management, another on scholarly publishing and research metrics, and the third working in the emerging support area of data wrangling and open scholarship. These unique roles were established to support the reorientation of the service focus and are required to develop the deep

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knowledge required to stay on top of changing needs and emerging trends in their areas of specialisation (see Table 3).

Table 3. Library research specialist roles (Source:Griffith University Library)

Data Management	Data Wrangling and Open Scholarship	Scholarly Publishing and Research Metrics
The LRS for data management has been at the forefront of developing the various data compliance and data exit instruments and checklists requested by research teams, creating advice about the management and storage of all kinds of data, and what adherence to the Five Safes framework for sensitive data would entail, and building expertise in the REDCap software used for acquiring and managing clinical trials data.	The LRS for data wrangling has developed and delivered new workshops on fixing messy, missing and inconsistent data and on acquiring and merging data from a range of publicly available sources. An existing data storytelling workshop now has an extra focus on freely available tools to visualise data. This role is also developing advocacy and training materials and practical advice around open scholarship.	The LRS for the scholarly publishing and research metrics specialisation delivers and supports traditional services and advice in this area and also focuses on helping create and disseminate stories of the beneficial societal impacts Griffith research has. This impact may take the form of new policies or protocols, legislative changes, improvements in health and the environment and other useful outcomes.

The success of this approach, i.e. of 'specialist' leads coupled with professionally engaged and upskilled library staff providing in-demand services, can be seen in the growing inclusion and integration of what would once have been seen as 'library-only' training into university-wide offerings, and ever-increasing cooperation and collaboration between the Library and other units at Griffith who all support research and researchers in different ways.

The Library Research Specialist roles are relatively new, and thus are still evolving. Given the Discipline Librarians' focus on building up knowledge and experience within their subject areas, the Library Research Specialist roles were created to provide leadership in the topical, more future-facing aspects of researcher support, such as evolving funder and journal policies on data management and reproducible research, the growing use of computational methods in research, the need for data-driven research support, and so on.

The aim was to build a warp/weft support structure to ensure that all services are well-grounded and fit for purpose.

- **The Warp:** Discipline Librarians, supported by librarians in the team, provide the disciplinary expertise to ensure all advice encompasses disciplinary differences around research impact, data management, data wrangling, and open scholarship. This advice is based on collaboratively developed, discipline-specific backgrounding documentation.
- **The Weft:** Library Research Specialists provide the topical knowledge to ensure all advice is in-depth and fit for purpose. This advice is based on collaboratively developed bodies of knowledge about a whole range of topics, issues and research-related challenges.

Services are built around three main outreach channels – web-based information (self-help information resources, which need to be constantly updated), training workshops, and advice and support, usually managed through a consultation which may be conducted face-to-face, online, or by phone. Information used in consultations is in many cases drawn from, and is certainly informed by, the evolving Researcher Services Knowledge Base. To request support, researchers, including students, generally use an enquiry

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management system, with options tailored for each client group. Queries are routed to the appropriate team by question category, that is, queries about academic writing might be routed to a learning adviser, while questions about researcher profiles go to the librarian queue, and a question about data licensing would be sent to the library research specialist queue. The system allows the query to be routed to different service units outside of AES, or to different queues within Researcher Services. Services are tiered, running numerically from 0 (self-help) to 3 (specialised level) as indicated in Table 4.

Table 4. Service tiers and their meaning (Source:Griffith University Library)

Level	Description	Support
Tier 0	Self-help and user-retrieved information	Users retrieve information and use resources in a self-service manner. Outstanding needs and enquiries not satisfied by this material can be escalated by means of an enquiry-logging system.
Tier 1	Help for known needs and guided introduction to Tier 0 support	Staff with introductory knowledge support initial enquiries and escalate more complex issues to a higher tier.
Tier 2	Targeted support and technical advice	Experienced and knowledgeable staff assess issues and identify solutions.
Tier 3	Expert or highly specialised support	Highest level of response.

Underpinning the tiered structure are our key service principles, which include a user-centred focus in the design and delivery of services, and the need for all services to be connected, integrated, and personalised, as well as fit for purpose.

Service Catalogue

Services are offered through a combination of online and face-to-face delivery. As a multi-campus university, Griffith is well set up to deliver services remotely, whether through web-based resources, training workshops, or via online meetings or consultations. However, staff at the different campuses also regularly meet in person with students or staff who need support. Currently, most training is delivered in person at least at the two largest campuses, Nathan and Gold Coast, and some training is delivered at all five.

Researcher Services are described in a service catalogue. We are currently promoting six, with two more to be included once the appropriate web support materials for them have been finalised.

The initial six services are:

- **Working with data**
  - This new, broader service updates and extends the existing support which was largely based around data management. It now offers support across the entirety of the research data lifecycle, from the creation, acquisition and storage of data through to publication and archiving, providing clarity about licensing, data sharing and reuse, and other data-related issues. This service incorporates the data wrangling and data clean-up training the team developed during 2019. It also includes data storytelling and tools for visualisation. Staff are being trained in how to conduct a much wider-ranging data interview than before – one that goes beyond

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issues around storage, back-up options and re-use to further probe desired data use workflows, the optimal co-location of data and tools, methods for remote collaboration over data, especially sensitive data, so as to help researchers tailor a solution that meets their unique needs. Plans are being developed to make the newly created data wrangling lesson materials openly available to other libraries, most likely through a GitHub repository.

- **Researcher metrics**
  - This provides advice and support for a range of research metrics services, such as Clarivate Analytics' tool InCites, and also covers the use of altmetrics and social media for research promotion.
- **Researcher profiles**
  - This provides advice and support for the Griffith Experts profiling service (based on Symplectic's Discovery tool) and for other services such as ORCiD and Google Scholar. Staff are being trained in how researchers can maximise their profile's visibility and share profile data across services such as ORCiD.
- **Scholarly publishing**
  - This provides advice and support on where to publish, the pros and cons of open access publishing, and how to avoid publishing scams and identify predatory publishers. As it covers issues such as bibliometrics and altmetrics, there is some overlap with the Researcher metrics service.
- **Open scholarship**
  - This provides advice and support on how and why to work 'in the open'. It includes advice and support on how to make publications and data 'FAIR', i.e. Findable, Accessible, Interoperable, and Reusable (Wilkinson et al., 2016).
- **Working with literature**
  - This provides advice and support on finding and managing resources for literature reviews. Advice on techniques for faster reading and processing of published research is also provided. This service is largely designed for, but is not restricted to, HDR students. Workshops for this service are taught by a combination of Researcher Services librarians and Learning Advisers from the Teaching and Learning team who, in most cases, are qualified teachers. Staff also provide advice through individual consultations.

The seventh service in development, Academic Writing, will help HDR students master the skills required to construct strong academic arguments and adequately structure their writing to suit different genres. Workshops and advice for this service are provided by Learning Advisers from the Teaching and Learning team. They also provide advice specifically targeted for the needs of HDR students through individual consultations. Staff are already performing this work – all that is lacking is the Tier 0 material for the service catalogue.

The eighth service is a guide to the research ecosystem, that is, information about the policies, organisations, facilities, support services, and training that underpin research, as this is often an area in which both HDR students and researchers alike lack up-to-date knowledge. Work is ongoing to map this.

AES staff have now presented their service catalogue via the researcher support section of Griffith Library's website. The plan is to gradually add more materials to the initial pages, including online tutorials and self-help guides, in a constantly iterative improvement process.

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The audience for Researcher Services includes all research-active academic staff and HDR students. Some of the services, such as Working with literature, and the forthcoming Academic Writing service, are geared more toward HDR students than academic staff.

The implementation in late 2019 of more rigorous enquiry management reporting and categorization should provide new evidence of the uptake of the different services.

Supporting Researchers on Different Paths

Researcher Services staff will increasingly need to support researchers developing bespoke tools to answer their research questions. The issue here is the lack of available training (except for disciplines such as computer science) to develop computational thinking as a key research literacy.

Margulieux (2017) describes computational thinking (CT) as "a set of skills related to computing but useful beyond computing. This conception originated from Wing's (2006) paper that argued CT should be as fundamental to education as reading, writing, and arithmetic". In layman's terms, computational thinking encompasses the steps required to formulate a problem and find a method to solve it, either by a person or by a computer. Because it involves discrete steps, computational thinking is sometimes referred to as algorithmic thinking.

Given the key role computational thinking plays in problem solving, it is already showing up in workforce planning as one of the most sought-after graduate attributes (Hershkovitz, Sitman, R., Israel-Fishelson, Eguíluz, Garaizar, & Guenaga et al., 2019). Researcher Services are investigating the development of an introduction to computational thinking to assist researchers starting down this path.

Researchers at Griffith University who want to master foundational computational skills can attend Software Carpentry workshops which are offered throughout the year. These locally run, volunteer-led workshops, while not explicitly teaching computational thinking, do introduce researchers to basic skills such as task automation, version control, and the rudiments of programming in R or Python. Griffith Library staff refer researchers to these workshops and also volunteer as helpers at some of the workshops. There are four certified Software Carpentry instructors within AES, two of whom are also Software Carpentry instructor trainers.

The majority of AES staff, i.e. not just those in Researcher Services, have now attended an internally run, two-day workshop to learn and practise the methods that have made Software Carpentry workshops so successful. These include collaborative learning using 'code-along' methods, the use of continuous feedback, working at the learners' pace, the use of challenges to test understanding, and many more, with the key ingredient being the creation of an inclusive and welcoming learning environment. The internal workshop was based on the materials shared in The Carpentries' Instructor Training website (The Carpentries, 2019). Staff have been encouraged to adopt these practices to make all AES workshops more interactive, inclusive, welcoming and engaging.

Building Cross-Unit Cooperation

The Researcher Services team have strong relationships with other units who support research and researchers within the University. All AES-initiated workshops designed for researchers are offered through the Researcher Education and Development program, which is coordinated by the Griffith Graduate Research School (GGRS). GGRS also created a Research Support Community of Practice (CoP) in 2019. This group meets regularly and is open to anyone whose role involves research support. This has proved

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to be an important knowledge exchange mechanism, and has created greater understanding about who does what, and how services and support across Griffith join up. Researcher Services staff are active in the CoP. The team also has strong relationships with staff in the Office for Research, which manages research grants and research development. Grants recipients are now referred to the Library for support around data management planning, and the Office refers staff to library-created guidelines on this topic. Library staff are also front-line responders to Office for Research-owned services, such as Symplectic Elements (research publications) and Discovery (researcher profiles). The Library's relationship with eResearch Services is also strong. Some material is co-taught, including Software Carpentry workshops; staff co-operate on providing support and advice at weekly drop-in sessions called Hacky Hours; both units collaboratively organise and help deliver the annual Research Bazaar three-day skill and community building events for early career researchers; and staff have regular contact and conversations regarding services, tools, plans and projects.

Within the Library, AES staff cooperate with their colleagues in the Library Technology Service (LTS), who manage the Griffith Research Online repository (GRO), which makes available open access versions of published works. In 2020, staff in LTS and AES plan to collaborate more closely to raise the profile of existing deposited works and to advocate for and provide resources to support researchers interested in open scholarship and data curation.

FUTURE RESEARCH DIRECTIONS

In 2020, Researcher Services will partner with a range of schools to deliver introductory research training to incoming HDR students, so that they can be highly productive researchers from the start. Training will cover a broad range of skills and tools. This will be a rolling pilot program that will be delivered in stages and continuously evaluated as the cohort moves through their HDR candidatures. The aim is to assess whether targeted training at point of need adds value to the HDR process.

During this year, staff in Researcher Services will also support researchers working on 'Beacon' projects – these are flagship projects that seek to address very large interdisciplinary research challenges in a coordinated way. Library input will be documented and assessed to extract learnings from these projects that can feed into upskilling and service improvement.

Greater emphasis is also being put on outreach to new grant awardees so that good research and data management practices can be implemented from the outset and skill gaps in the research team identified early, and to ensure that suitable arrangements are made before work commences to ensure the long-term sustainability and potential operationalisation of project data, so that projects do not become 'orphaned' when funding runs out.

Additionally, a data working group has been established within AES to centralise and analyse disparate data, such as workshop requests, training feedback, research support-related data from the Library's enquiry management system, and data from library drop-in sessions and attendance at Hacky Hours. The aim is to ensure that all services are aligned to need and are evidence-based. The group is also developing a data handling protocol, which can be repurposed as a customisable instrument for dissemination to researchers.

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CONCLUSION

A university's aspirations to increase both its research activity and impact rely not only on the outputs of its researchers but also on the quality of the research support provided by a range of key service elements within the organisation. It is here that the library can make a valuable contribution. In recognising this challenge, Griffith University Library has embarked on a major reconceptualisation and restructure of its research support services, in alignment with the University's strategic research goals.

The changes to researcher support at the Library are still in the process of being fully implemented, so it is not yet possible to fully gauge the success or otherwise of the changes made, or to evaluate their effect on the University's research performance. Work is still ongoing to equip the team with the skills they need to support data-driven research and meet future needs. The changes to service this year have been implemented to ensure that Griffith University Library has a fit-for-purpose team, which is well-positioned to partner with researchers in the grand interdisciplinary research challenges they face.

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KEY TERMS AND DEFINITIONS

Data-Intensive Scientific Model: In this model, data is captured by instruments or generated by simulators, and as the outputs are too large to be processed by humans, they require software tools to make sense of them.

Discipline Librarians: Senior librarians who support and liaise with specific academic disciplinary groups.

Five Safes: A framework that requires data management decisions to be based on appropriate use against five key criteria: projects, people, settings, data, and outputs.

Fourth Paradigm: A theory that data exploration represents a new scientific paradigm, above and beyond the existing scientific models of empiricism, theoretical science, and computational science.

Library Research Specialist: A senior librarian who leads a discrete area of research support (e.g., data management, bibliometrics, and research impact).

Portfolio: An arrangement of services within a specific grouping.

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Chapter 13
Beyond the Crossroads: Transforming Research Support Services at Te Herenga Waka Library

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EXECUTIVE SUMMARY

The key strategic goal for research at Te Herenga Waka - Victoria University of Wellington is to create a culture of ambitious research for transformative impact. To support this goal, a library restructure and investment in library teams supporting research has enabled a detailed understanding of the university's research output and how to increase its visibility. New working relationships and clearly defined research initiatives have demonstrated the diverse value of the library. New services and tools are outlined that help create value for schools, academics, and postgraduates; benchmark university performance; develop tailored services; enhance research profiles; and foster collaboration. Challenges and opportunities remain, including developing a university policy to support open access (OA) research and a new OA research repository to aid the promotion of, and access to, university research. The library continues to change perceptions of its services and works collaboratively to enhance individual and university research reputations.

DOI: 10.4018/978-1-7998-4546-1.ch013

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INTRODUCTION

This chapter follows the implementation of a comprehensive library research service at Te Herenga Waka - Victoria University of Wellington (Te Herenga Waka) from the perspective of a work in progress. It covers a developing understanding of the needs of our users, the role of the Library in supporting the research lifecycle, a maturing strategic vision, and further reorganisation within the Library to meet the present challenges. By strengthening its research services, the Library has closely aligned itself with Te Herenga Waka's strategy and particularly the strategic research goal that seeks to deliver "ambitious research and transformative impact" (Te Herenga Waka, 2019).

This chapter builds on a 2018 article, written by (with others) two of this chapter's authors. The article 'Research Support at the Crossroads: Capability, Capacity, and Collaboration' was published in *New Review of Academic Librarianship* (Lang, Wilson, Wilson & Kirkpatrick, 2018). It described research support at that point at Te Herenga Waka Library as being at a crossroads, with the implementation of an ambitious research support strategy and the Library deepening its engagement with research issues, such as those relating to bibliometrics and research impact.

This chapter explores how the Library at Te Herenga Waka has navigated 'beyond the crossroads.' It describes a further restructure conducted since the 2018 article, the changing context in terms of Te Herenga Waka's strategic direction, and how the Library's services have developed in response. In addition, it addresses the emerging needs of users, and the initiatives that the new structure has enabled the Library to align with, and contribute to, the University's research goals.

BACKGROUND AND CONTEXT

Founded in 1897 in Aotearoa New Zealand, Te Herenga Waka's vision is "to be a world-leading capital city university and one of the great global-civic universities" with a shared purpose of "research, teaching, and engagement that transforms lives" (Te Herenga Waka, 2019, p. 5). One of eight public universities in New Zealand, Te Herenga Waka offers both undergraduate and postgraduate degrees and in 2018 had a full-time equivalent student population of approximately 17,500 and over 1000 teaching and research staff of which approximately 46% are international academics (Victoria University of Wellington, 2018; QS, 2020).

Universities are maturing in their view of how their research engages the outside world and considering impact beyond citations and scholarly recognition. Professor Wendy Larner, University Provost, in her address as the Royal Society Te Apārangi President, discussed the current highly individualised research model as being outdated in today's world where deep interpersonal relationships, co-designing of research and tackling the grand challenges were at the fore (Larner, 2019). This perspective is also reflected in Te Herenga Waka's recently refreshed Strategic Plan 2020-2024 as shown in Figure 1, particularly the following two of the five key strategies: Ambitious research for transformative impact; Engagement that deepens relevance, impact, and reputation (Te Herenga Waka, 2019).

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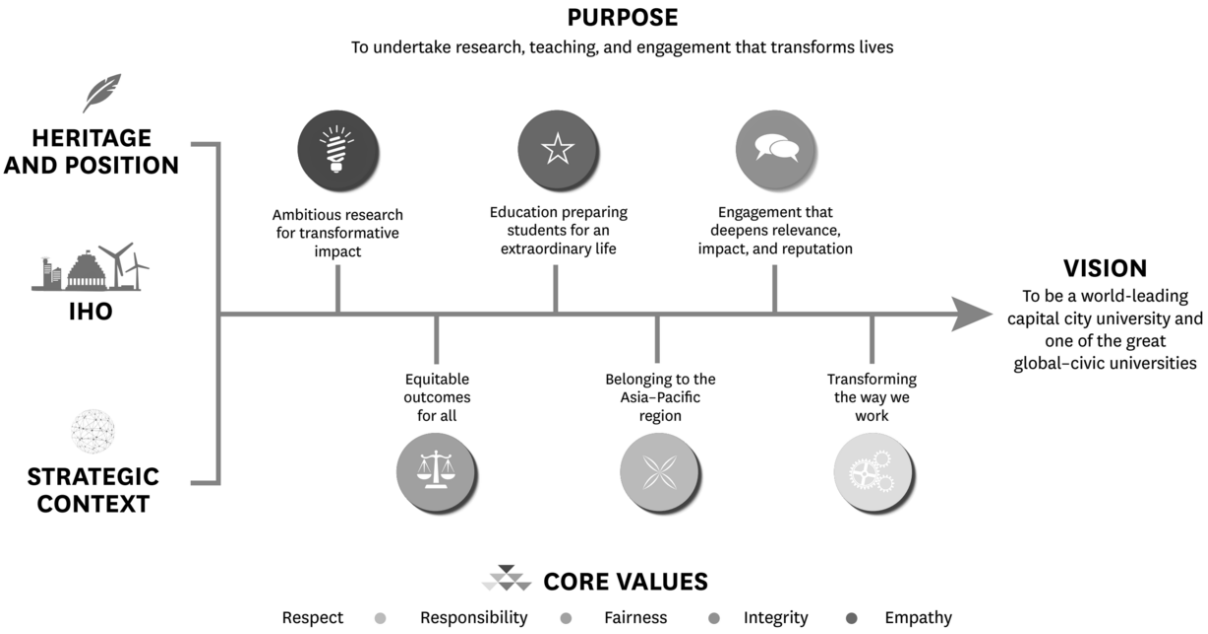
Figure 1: Te Herenga Waka Strategic Plan (Source: © 2019, Te Herenga Waka. Used with permission.)



Te Herenga Waka's research strategic direction is led by the Vice-Provost for Research, reporting to the Provost. The past ten years has seen a greater focus and a more explicit institutional ambition for research at Te Herenga Waka, partly in response to government initiatives and funding mechanisms which incentivised increasing research intensity. There has also been greater investment in research leadership and infrastructure. Service units, including the Library, that support research have scaled up, with both growth in and a greater focus on research. Ten years ago, Te Herenga Waka's strategic objective for research was to achieve 'a dramatic improvement in research culture'. Through strategic hiring, higher expectations of research, and more intensive, targeted support for researchers in terms of development and funding, this objective was widely regarded as having been successfully achieved when Te Herenga Waka ranked first for average research quality in 2012 in the Performance Based Research Fund (PBRF) – a result that it repeated in 2018.

The PBRF is New Zealand's national research evaluation exercise similar to the Research Excellence Framework (REF) in the UK and Excellence in Research in Australia (ERA) exercises. Every six years, each academic staff member prepares a portfolio describing their research activity. Portfolios are assessed by peer review panels and assigned quality categories of A (internationally active with research ranking among the best of its kind), B (nationally active with very strong research well recognised by other researchers), C (locally active with some publishing activity), or R (research inactive). The PBRF fund is divided among tertiary institutions based in part on the outcomes of this assessment, with As attracting the highest amount of funding and Rs attracting no funding. In 2018, Te Herenga Waka repeated its first ranking with the highest proportion of As and Bs, although by a narrower margin compared to 2012 as shown in Figure 2, as other universities closed the gap (Tertiary Education Commission, 2019a, 2019b).

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Figure 2. PBRF Results (Source: © 2020, Te Herenga Waka. Used with permission.)

2012 PBRF Results

University	A (%)	B (%)	C (%)	CNE (%)	Total funded FTE	% A and B
Victoria University of Wellington	17.39%	52.92%	20.35%	9.33%	641.54	70.32%
University of Auckland	18.55%	40.85%	26.03%	14.57%	1556.05	59.40%
University of Otago	15.37%	43.15%	24.91%	16.57%	1168.24	58.52%
University of Canterbury	13.10%	43.71%	26.30%	16.90%	617.26	56.81%
University of Waikato	8.79%	45.59%	35.52%	10.10%	440.63	54.37%
Massey University	10.30%	37.20%	39.05%	13.45%	918.62	47.50%
Lincoln University	10.45%	29.70%	54.22%	5.63%	174.1	40.15%
Auckland University of Technology	4.46%	30.76%	42.61%	23.85%	429.47	35.22%
Unitec New Zealand	1.39%	20.74%	65.41%	13.33%	114.77	22.13%

Source data: Tertiary Education Commission (2013): https://www.tec.govt.nz/assets/Reports/4508da9deb/PBRF-QE-2012-Final-Report.pdf

2018 PBRF Results

University	A (%)	B (%)	C (%)	CNE (%)	Total funded FTE	% A and B
Victoria University of Wellington	20.00%	57.75%	29.55%	12.67%	691.85	66.21%
University of Auckland	22.40%	42.06%	19.68%	15.86%	1744.17	64.46%
University of Waikato	14.06%	47.39%	27.08%	11.46%	428.47	61.45%
University of Canterbury	17.70%	42.98%	20.81%	18.51%	596.46	60.68%
University of Otago	16.84%	40.93%	25.61%	16.62%	1357.65	57.77%
Lincoln University	12.46%	42.32%	32.43%	12.79%	176.53	54.78%
Massey University	12.92%	41.36%	36.97%	8.75%	1014.59	54.28%
Auckland University of Technology	6.89%	36.51%	38.49%	18.11%	689.23	43.40%

Source data: Tertiary Education Commission (2019): https://www.tec.govt.nz/assets/Publications-and-others/PBRF-2018/fd3f65348a/Improving-Research-Quality-The-results-of-the-PBRF-2018-Quality-Evaluation-12-09-2019.pdf

The University Librarian reports to the Provost, aligning the Library to the university's strategic priorities, alongside the key academic functions of research, learning, and teaching. This clearly aligns the Library with the key functions of the University. Although the research strategy is primarily implemented by the Research Office, the Library team works closely with them in a long-established relationship. It is in this context that the Library has progressively developed its capacity and capability to deliver strategically relevant research support services.

The Library currently has 101 staff members as shown in Figure 3. There are two Associate Directors reporting to the University Librarian responsible for the following directorates: Library Client Services and Collection Access; and Library Academic and Research Services. It is the latter group that is largely responsible for the library research support services. In addition to the directorates the Manager Business Services, Manager Planning and Quality, and Manager Information and Records Management also report directly to the University Librarian. The Library consists of four physical libraries and has an extensive online presence, with a digital first policy concerning its collections.

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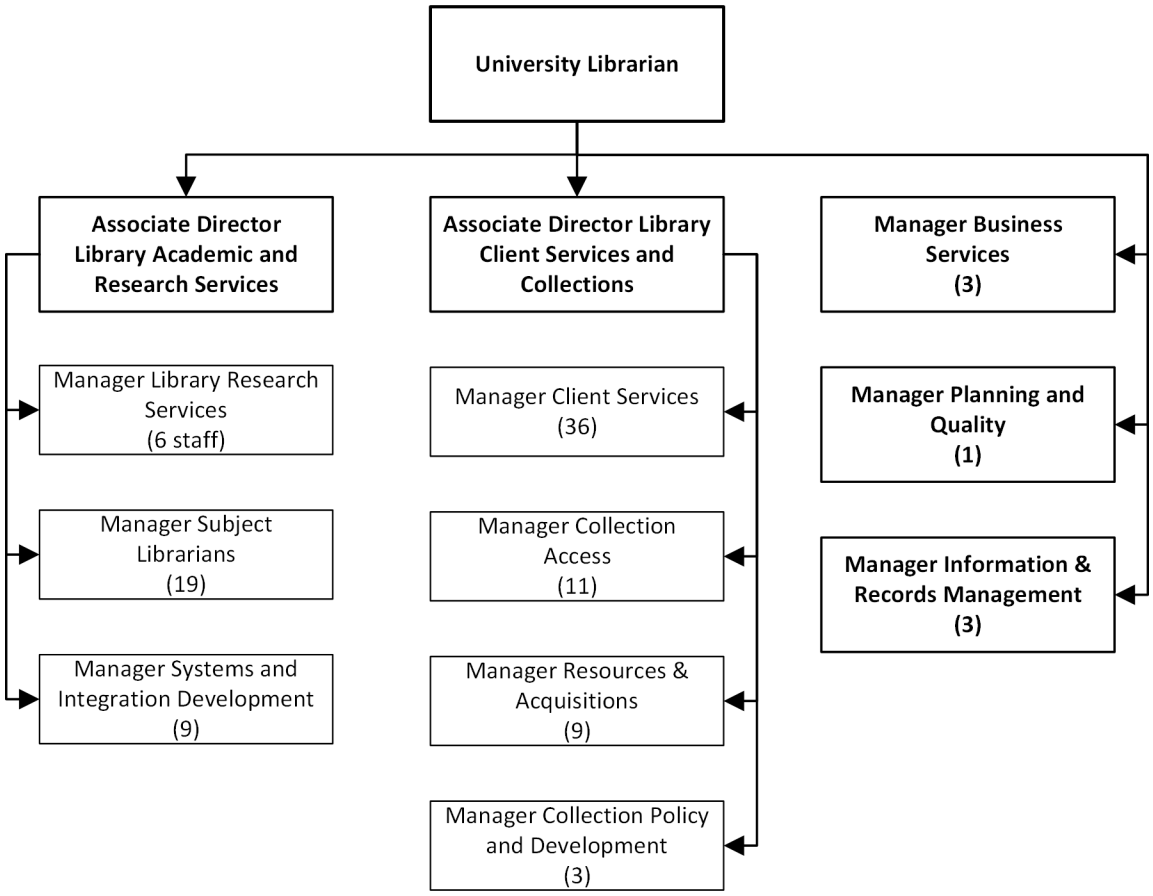
Figure 3. Library Organisational Chart (Data source: Te Herenga Waka, 2020. Used with permission.)



The Library's vision is to provide "world class services and resources supporting quality learning, teaching and research" (Victoria University of Wellington Library, 2017b). Strategic priorities and goals to achieve this vision are grouped under the following areas: enable student success; enable research success; as a library staff member I feel valued and supported. This highlights the significance the library gives to its research support services and recognition of the need to align its services and priorities to clearly contribute to the University's goals. The following sections will expand on the library research support services and how they contribute to the University's research goals and priorities.

DEVELOPING THE LIBRARY RESEARCH SUPPORT SERVICES AT TE HERENGA WAKA

What Are the Issues and Opportunities?

The tertiary education and scholarly communications landscapes are changing, creating complexities and issues at both a local and international level:

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- **Internationalisation of tertiary education and competition in attracting students and high-quality research staff:** Attracting students and highly regarded academics and researchers remains hotly competitive both nationally and internationally. Te Herenga Waka's reputation, ranking, and research impact are major factors in this regard. With this in mind, the Library has worked with other services units to understand the University's research outputs, compare these with other institutions, and develop strategies that contribute to improving them.
- **Increasing importance of quality and measurement of research outputs:** The quality of research outputs helps determine external research funding, including that from the government. The stakes are high in terms of the quality, reach and visibility of the Te Herenga Waka's research outputs and the Library has a growing role in enhancing those. Arguably, bibliometric measures are a blunt and problematic instrument for measuring the value of published research outputs and research excellence. However, these are considered when research performance is described and compared, for example in academic promotions and career progression and external funding. They are also key in influencing global university rankings such as Quacquarelli Symonds (QS) World rankings and The Times Higher Education World University Rankings (Hicks & Wouters, 2015; Cox, Gadd, Petersohn & Sbaffi, 2019).
- **The gap between quality and citations:** At an institutional level, although Te Herenga Waka has the highest proportion of A and B ranked researchers of all New Zealand universities, the University's research is cited less than expected compared to peer universities on average, according to Scopus data. An important aspect of PBRF assessment is review of the quality of each researcher's top four nominated research outputs (NROs) by a panel of peers. It is clear that Te Herenga Waka's relatively modest citation rate is not an indication of the quality of the work produced by its researchers, but rather the degree to which it is visible, and perhaps also the publishing venue choices of researchers. This gap between research quality and reputation is of concern to the University, and the Library's role in working with other units on addressing it is discussed later in the chapter.
- **The changing scholarly publishing landscape:** Expectations around open access publishing are changing, with funding agencies increasingly expecting research outputs to be made openly available. Publishers are also reacting to the landscape shifts and moving away from conventional subscription-based models to transformative agreements. Researchers need to balance a number of sometimes competing factors in publishing including open access, quality of venue, and speed of publication.
- **Balancing traditional library services with changing needs and adapting library services accordingly:** As universities navigate the changing research landscape and shifts in scholarly communications, so too are academic libraries changing and adapting their focus and services to meet these needs and clearly align with their institutions' priorities (Deng & Dotson, 2015; Lang et al., 2018). As the library redefines its services it needs to balance these with traditional library services and roles. This can be a challenge with limited resources and managing expectations and perceptions of the role of the library.
- **Building library capacity and capability to meet research needs:** As Te Herenga Waka embarks on a more ambitious research strategy and grows in size, there is a greater need for the Library to develop and deliver services that meet these growing needs. This includes ensuring that Subject Librarians develop their understanding of issues relating to scholarly communication and metrics.

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Who Are the Users and What Are Their Needs?

As well as ensuring the Library's ongoing alignment with the wider strategic context, understanding the needs of users has been crucial to ensuring research services are relevant, aimed at the right level, and easy to engage with. In the past, this work has relied on individual academics and postgraduates contacting subject librarians, or the library in general, for guidance in these areas. With the formation of a more structured approach to research support at Te Herenga Waka, the Library has identified the various types of users of these services and considered how its interactions with them can help to proactively deliver on new strategic goals. Users tend to fall into three main categories: senior university leadership, researchers, and service units.

These user categories are not prescriptive, and users can be identified in more than one group depending on their current task or role. These categories help to situate the level of support, training and services that they will likely require and allows for the Library to triage research queries across teams.

- **Senior university leadership:** need to access and interpret information, often drawn from analytical tools using citation information, to better explain, understand, or add value to various aspects of their work, or to better understand the university in relation to the global research landscape (Lang et al., 2018). These users are usually not interested in reviewing their personal publication performance. Rather, their strategic focus is at an institutional or discipline level – how Te Herenga Waka measures up against other organisations, understanding strengths and weakness, and identifying potential collaborations or opportunities. Some users in this category may be confident in using the tools themselves, but not on a regular basis, and require minor support in understanding new features and metrics definitions. Most of these users, however, are removed from the tools, and time-pressured. They bring specific queries or concerns to the Library to respond to in the form of reports or simple metric retrieval. Typically, these users are the Vice Chancellor, Pro Vice Chancellors, Associate Deans (Research), and Heads of School.
- **Individual researchers:** need to understand and contextualise their own personal performance to support applications; benchmark within their discipline; finding publishing venues; ranking journals; creating and updating research profiles; understanding the research landscape ('hot topics' and key people in their area, etc); or accessing advice on research management and publishing issues (Open Access, preprint servers, research data management etc). They are expected to use the various tools themselves and request training and support. Few are regular users of the tools beyond tracking their own personal outputs, although they are encouraged to consider their research profiles and how they might enhance the visibility and impact of their research work to meet Te Herenga Waka's ambitious research goals. Typically, these users are academics, postgraduates, and professional staff involved in research activities.
- **Service units:** are those in non-academic units (e.g. the Library, Communications, Centre for Academic Development, Planning and Management, Research Office) who in some way support researchers at University and/or whose work contributes to delivering the research strategy. They have experience in using the analytical tools the Library is responsible for and can provide basic training and advise other users at Te Herenga Waka. They receive training on how researchers typically want to interact with the research tools and what is important in understanding the scope of content, how this represents a researcher's profile, and steps to strengthen their publishing opportunities. Typically, these users are subject librarians and professional University staff engaged

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with research support. They include a growing community of staff engaged in research analytics in some way. The Library plays a role in connecting with these people and teams, ensuring that there is a degree of coordination between them.

How Has the Library Responded to the Changing Research Priorities?

Lang et al. (2018) described major structural changes in 2011 that placed the Library in a better position to meet the research needs of the time. This led to the later formation of a new Research Support Librarian role and engaging with units across the University on issues such as research data, e-research, ORCID and researcher profiles. As Te Herenga Waka's strategic direction in relation to research matured and became more ambitious, the Library gained a greater understanding of user needs through its deepening relationships across Te Herenga Waka. The Library also recognised the need to continually review, manage and develop its services and resources (Victoria University of Wellington Library, 2017a). In 2017 – 2018 the Library underwent another restructure to enable a refocus of services and resourcing to ensure it continued to effectively support the Te Herenga Waka's learning, teaching and research priorities.

The need for the Library to strengthen support for scholarly publishing lifecycle and enhancing institutional reputation was recognised as part of the restructure. This resulted in the formation of a recalibrated directorate, Library Academic and Research Services (LARS). This included three teams: a newly created Library Research Services team along with the Subject Librarian, and System and Integration Development teams. LARS replaced the previous Library Academic Services directorate which had encompassed the following three teams: Academic Support (which included the subject librarians, special collections staff, and a single research support librarian role); Client Services; and Collection Policy and Development.

The addition of 'research' to the directorate's name and the corresponding associate director's title signalled the shift within the directorate from a more traditional collection and general client focus, to that of teams engaging more directly with research, and supporting academic teaching. In addition, the synergies of the teams in the new directorate provide a strong, cohesive and proactive approach to delivering a wide range of services that complement the work of the University community at scale and proportionate to need.

The Evolving Support Model

The Library has moved from having no dedicated positions for research support in 2011, to the establishment of a single Research Support Librarian role in 2015, to now having two Research Services librarians reporting to a Research Services Manager and a Subject Librarian team lead with a research portfolio as part of their role. This reflects the increasing importance of research support and enables a more proactive approach to supporting researchers and contributing to the University's research goals.

The Library's research support model before the 2017-2018 restructure mostly relied on Subject Librarians working with researchers in specific research areas to use tools and metrics relevant to their disciplines. This instilled a largely ad-hoc, self-help approach, meaning services were more reactive to requests instead of proactively anticipating research needs or addressing university wide initiatives.

The introduction of two dedicated Research Services Librarian roles in 2018 has allowed for greater immersion in the research ecosystem to understand emerging trends and areas of concern to our univer-

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sity community. Part of their role is the development and delivery of research skills training, including the following areas:

- increasing research visibility
- providing a consistent research profile to the world
- identifying opportunities for collaboration
- evaluating funding opportunities

While the Library did offer research training before the 2017-2018 change, the new structure, with the research services librarians having responsibility for designing and delivering the "train the trainer" programmes for subject librarians, has meant that time could be devoted to formalising the training programme for researchers that meets pressing needs and can be delivered at scale to users.

Part of the evolving support model has seen greater involvement with other units responsible for research issues, especially the Research Office. For instance, during the most recent 2018 PBRF round, the Library developed tailored sessions and online resources that directly responded to specific PBRF requirements on a school by school basis. This work highlighted the need to engage with metrics, impact, and visibility as it related to a researcher's work in each school. These sessions demonstrated the library was able to create targeted research support designed around the unique expectations and practice of each discipline. This was possible partly because of the introduction of a new research support librarian role (later to evolve into two full time research services librarian roles through the latest restructure). Anecdotal feedback from school administrators and participants indicates these contributions added value and better equipped researchers to respond to the requirements of PBRF.

Since the latest round of the PBRF, under the new structure, there have been more opportunities to provide research support at point of need and contributing to the strategic goal of ambitious research for transformative impact. An example of this work in practice was the Library acquiring an institutional license for Dimensions, an online platform giving researchers access to the full complement of information about publications, grants, intellectual property, clinical trials, policy documents, analytical tools, and access to the API to deepen the understanding of the research landscape. The research services librarians have added Dimensions to the list of analytical tools they are familiar with, and run training sessions for subject librarians, who in turn are able to introduce it to clients. So, while this tool is not exclusively in the library domain it is recognised as offering broad value to the research community and given its relevance to the wider university research activities considered a worthwhile investment.

In practice, the Library's research support model is similar to the three-tiered or triangle model of service provision implemented in other libraries, and in its use of expertise in functional research support roles alongside specific discipline expertise as best practice (Brown, Wolski & Richardson, 2015; Brown, Alvey, Danilova, Morgan & Thomas, 2018). Not all researchers will want, or need, face-to-face research support and the development of online resources, supporting their research activities, provides the ability to access relevant tools and guidance independently and at point of need. These are also helpful for directing users to Library resources as a supplement to workshops. Current usage of the research help guides indicates users typically only access these guides after a workshop or following a period where links to them have been provided in newsletters or mandated in a process. An example of the latter is the Library's Research Data Management subject guide, accessed mostly by people applying for the University Research Fund which requires comments on data management intentions and links to this guide. This supportive role of expert staff developing help guides to aid researcher's engagement with

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content and tools covered in training and demonstrations is reflected by Vinyard and Colvin (2018) in their analysis of faculty level research support initiatives.

The success of the support model is evidenced by the increase in senior university leadership and researchers approaching library staff for advice on obtaining and selecting appropriate metrics, an increase in the usage of tools and databases demonstrated during the sessions and a large number of visits to the related subject guides demonstrated in the sessions. These library research services have been well received and regularly contribute to pan-university initiatives and committees like the University Research Committee. The University is increasingly recognising the role the Library can, and does, play in contributing to its overall research goals and priorities.

What Library Staff are Involved in Research Support?

Forming the Research Services Team

The new Library Research Services team consists of seven staff members: a manager; two research services librarians focussed on metrics and scholarly communications; two team members in Digital Initiatives focused on digital collections and platforms such as the institutional repository and Open Journal System; and two Special Collections library staff who manage Te Herenga Waka's unique and heritage collections. Some aspects of the work are handled independently by each team, but there is considerable crossover. For instance, Digital Initiatives has provided advice and assistance to Special Collections around digital issues, and research services librarians and Digital Initiatives work closely in several areas: open access, open journal systems, analytics, and APIs (Application Programming Interfaces).

Changes to the Subject Librarian Role

In December 2017 the Academic Support team was renamed the Subject Librarian team in the new directorate structure and consists of 20 staff: a manager; three team leaders; 15 subject librarians; and a library assistant supporting Pasifika undergraduates. The change outcome emphasised the need to focus on research support as a priority area for the team. The role of subject librarian has strong support within the academic community and the large team provides the Library with the flexibility to respond to the varied and changing research, learning and teaching needs across the University. Three team leader roles were newly established, with each having responsibility for managing a team of subject librarians across the three Wellington campuses, and to drive strategic initiatives (including research support) within the team. The special collections function and research support librarian previously within the team were transferred to Research Services. The subject librarians remain the primary contact for direct involvement with academics and postgraduate students, with services targeted to their individual needs.

Collaborating Across Teams

As the Research Services and Subject Librarian teams both have explicit research support functions in their roles there were some initial demarcation issues between roles and reporting lines during the planning, implementation and provision of services. To minimise any confusion, the priorities and key roles and responsibilities were clearly articulated and documented for the teams. The work of the two teams

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has settled within the expected key performance areas of strategic planning and service design on the part of Research Services team, and direct client support on the part of subject librarians.

Working collaboratively together, the two teams enable expertise to be disseminated widely to user groups. Research services librarians are not assigned to academic units (schools) as subject librarians are. They embody a functional, as opposed to a disciplinary role in the new structure. Their advanced specialist analytical skills are used to break down complex problems around reputation and affiliation into simpler strategies and processes. Subject librarians, with their broader brief and strong relationships in their subject areas can then implement these strategies and processes widely and effectively.

This division of labour has the research services librarians identifying issues and incorporating existing reporting resources and databases to establish clear methods to improve, monitor or evaluate these issues, which can then be actioned by the larger team of subject librarians through their networks. The model has worked for a range of initiatives such as increasing uptake of ORCID, and currently is being employed to deliver more targeted advice on strategic publishing.

This model of offering research support services is proving successful, and it is anticipated that there will be more opportunities to approach issues in this way. Similar styles of structure are seen in other library restructures, where the functional research roles have been created and scoped to support the existing disciplinary specific librarian roles (R. Brown et. al., 2015; S. Brown et. al., 2018). The model also lends itself to a 'train the trainer' activity, with research services librarians training subject librarians, who are then empowered to deliver training, advice and support across the University at scale.

Strategic Collaboration Across Te Herenga Waka

A collaborative pan-university approach is key to delivering on Te Herenga Waka's ambitious research goals. The Library has deepened its relationships both across the University, including with the Research Office, central Planning and Management Information team, and the Centre for Academic Development.

Our collaborators, the Research Office, for example, provide us with the wider research context with their own interactions with researchers in grant applications, their responsibility for the PBRF submission, and their role in managing the Te Herenga Waka's Research Information Management System as well as supporting research infrastructure. Regular meetings to discuss common queries and issues has resulted in more strategic and coordinated approaches in creating solutions and strategies. This open channel of communication has resulted in reporting that has moved beyond basic provision of set metrics to wider analysis of the best methods of displaying and highlighting issues of concern to university leaders. This has included the Library contributing to high level reporting and analysis, and guidance in the selection of metrics that align with the strategic goals of Te Herenga Waka.

There had long been an awareness of Te Herenga Waka's relatively modest performance in citations, which was partly responsible for a downward shift in its world rankings standings. Taking a university-wide approach to responding to this situation has been important and has, for example, resulted in the Research Office and research services librarians working jointly on a paper for the Vice Provost, Research, exploring possible reasons for the rate of citations. The Library, for its part, contributed its expertise on metrics, using Scopus and Web of Science to provide a picture of the Te Herenga Waka's citation performance compared to that of other similar universities. The paper was well received by the University's Senior Leadership Team and has resulted in a set of action points that the Library and Research Office will work on over time. This is proving an important and productive collaboration, leading to joined-up work aimed at boosting the visibility and impact of Te Herenga Waka's research.

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This strategic collaborative approach across the University has facilitated the effective use of the range of skills and experiences across service units and enabled a unified way of supporting the University's research initiatives, focusing on institutional outcomes rather than individual unit goals, leading to a more cohesive, joined-up approach (Lang et al., 2018; Wilson, 2017)

As well as these important cross-University relationships, the Library also actively engages in national and international networks, including a developing network of research services librarians across New Zealand Universities, and active membership of IATUL (International Association of University Libraries) Special Interest Group for Metrics and Research Impact, among others. This both ensures that the Library is aware of international issues and developments in research services, and can contribute not just to the University, but also nationally and internationally.

What Research Support Services are Offered?

In the creation of new services, awareness of the specific needs of researchers and understanding the context in which they need to use systems and tools have been important. Impact and visibility are subjective, so placing them in specific contexts relevant to Te Herenga Waka's priorities is key to aligning our services and support and can be described as follows:

- **Impact:** as it relates to metrics and datasets utilised in ranking systems, but also with the openness to incorporate various types of non-traditional metrics and measures.
- **Visibility:** as it relates to the ability for wider audiences to easily discover and access our researchers work and create opportunities for collaboration.

Strategic Publishing Support

Publication support has quickly become a significant area of growth for the Library, especially since decisions around the publishing venue has a strong link to the impact of research and so central to Te Herenga Waka's strategic plan. The selection of journals and the publication venues to attract a wider audience, and that are recognized as sources of quality research is therefore critical to this plan. Responses from Te Herenga Waka's Ithaka survey (2018) indicated that researchers were not aware of any group across the University that offered advice on determining where to publish a given work to maximise its impact, indicating a need for more clearly defined services and support in this area. As well as a need to better promote Library research services, it was evident there was a gap in the support offered in relation to strategic publishing and the Library was well positioned to respond to this unmet demand. This has resulted in strategic publishing support being an important and well-received Library service.

Quality of publication venue over quantity of research produced is prevailing. However, identifying optimal journals, and assessing their relative versus perceived quality, is a challenge especially to early career academics and postgraduates. Smaller local publishers do not always have wide international audiences, and sometimes lack practices that lead to greater visibility (for instance, use of dois). The research service librarians were tasked with identifying the current state of publication practices across Te Herenga Waka to better understand the unique challenges. This resulted in a review of the previous 10 years of non-Scopus indexed journal articles for the subject librarians to engage with, using their subject and school expertise, and to provide feedback on the trends, prominent titles and other issues of note. This review helped inform the subject librarians about the publishing habits of their schools

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which some had not previously been involved with, while also allowing the Research Services team to compile lists of potentially impactful journals which are not indexed, assess the quality of these journals and consider their likelihood as the "best venue" for our researchers.

This area is not without some controversy. The notion of ranking and assigning a quality level to journals is not objective and has led to interesting discussions on how the Library might define impactful journals. However, the focus on university rankings is a driver of this initiative which currently only captures publications indexed in the Scopus database. The process has now moved from awareness and discussion of publishing trends, to supporting those quality journals to pursue and hopefully obtain indexing in Scopus (with the option of pursuing indexing in the Directory of Open Access Journals, and the Web of Science as appropriate). The Library contacts publishers with advice on requirements, best practice, and guidance for the journals themselves to achieve the level of visibility and impact that the researchers attribute to them. To date, this approach has had some success with additional publications now being indexed by Scopus.

There is an existing sentiment that librarians know and comprehend publishers while academics know and comprehend journal content. This dichotomy has been widely felt by library staff and can be challenging if they feel they are not suited or scholastically equipped to advise academics on where best to publish. To some extent, this has been addressed by research services librarians' creating workshops, aimed at both subject librarians and researchers, on tools to identify and evaluate relevant journals. These have been successful in both empowering the subject librarians and providing a new level of support to academics and postgraduates that they had typically not received much guidance on before.

Collaborative Reporting

The Library has been involved in providing regular metrics to groups across Te Herenga Waka over the past few years. Recently the Research Services team has worked closely with pan-university groups to deliver reports that incorporates their expertise in relevant metrics and unpacking the trends and findings. This involvement has provided several benefits. The Library better understands the metrics of interest to users and can offer new measures and solutions for reporting based on our in-depth knowledge of the databases and analytical tools. The strategic use of the bibliometric databases and analytical tools has allowed the Library to provide tailored benchmarking, collaboration analysis, and forecasting, consequently helping inform the unique research strengths within the University as well as potential areas for future focus and development.

Tracking Research Visibility and Impact

While this is not a new area for the Library in relation to providing support and advice to academics, a more active approach has been taken given its alignment with Te Herenga Waka's strategic priorities. Having the University acknowledge and embed the importance of the visibility and impact of its research outputs, has resulted in a greater interest in the tools and those seeking advice on how to best ensure their research is meeting these objectives. There has been an increased demand for, and interest in, tracking social engagement with research; setting up regular reports to provide ongoing tracking; and creating and maintaining academic profiles to ensure work is attributed to the correct academic. Additionally, this work allows for better reporting outcomes when using those profiles. Some examples of these new initiatives have been:

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- **The ORCID process:** run by the subject librarians, which saw every academic being advised and encouraged to create and use ORCID. The awareness and engagement from this process has seen some researchers also spending more time on their profiles within other platforms such as Scopus IDs, Research IDs, Google Scholar, etc. This initiative saw a 30.42% increase in sign-up by academic staff and a 15.4% increase by PhD students.
- **The Communications team:** has shown a renewed interest in using Altmetric based reporting for awareness and tracking of social engagement with each schools' research. It has become clear that these tools will become embedded in their regular reporting and tracking for schools to gain insight into key media sources and outlets that respond to their research.

Open Access and Institutional Repositories

Perhaps the most important collaboration between the Research Office and the Library since the restructure, and one with strong potential for increasing the visibility and reach of Te Herenga Waka's research, has been working together on the implementation of a new open access institutional repository (IR). This project also involves the third team in the Library Academic and Research Services Directorate (Systems and Integration) and will involve subject librarians during the rollout phase.

During 2018, the University Librarian and Associate Director, Research Services in the Research Office worked together on a draft Open Access Policy which was well received by the University Research Committee. The draft policy mandated green open access for journal articles and conference papers. Besides the public access benefits of making our research openly available, this will give a boost to the visibility and potential impact of University research.

It became clear that before the policy could be put in place, the infrastructure had to be available to enable researchers to easily self-deposit their materials into the University repository. The Library and Research Office worked together on a set of high-level requirements that a new IR would need to offer. Key aspects were:

- ease of deposit
- modern interface and excellent indexing
- out-of-the-box integration with the Te Herenga Waka's key research information system Symplectic Elements (a Digital Science product the most important feature of which is harvesting publication details from major data sources)
- no need for extensive modification or building.

Integration with Elements is a critical requirement, as Elements remains the single source of truth on research outputs produced by University researchers. Deposit via Elements means that metadata is supplied to the IR through a crosswalk – there is no need to re-create metadata when depositing. This is important for retaining a single source of truth, but also ensures that the process is easy for academic staff to engage with. Elements has been extremely well received by academic staff since its implementation and is used for a range of purposes including PBRF, so is a system academic staff often use. Adding deposit of papers as a function in Elements is the most likely way of making deposit into the repository a simple everyday activity in an already familiar system.

The project team looked at a range of applications which might meet the high-level requirements and finally selected Figshare as the most suitable system. It is relatively easy to implement, required no

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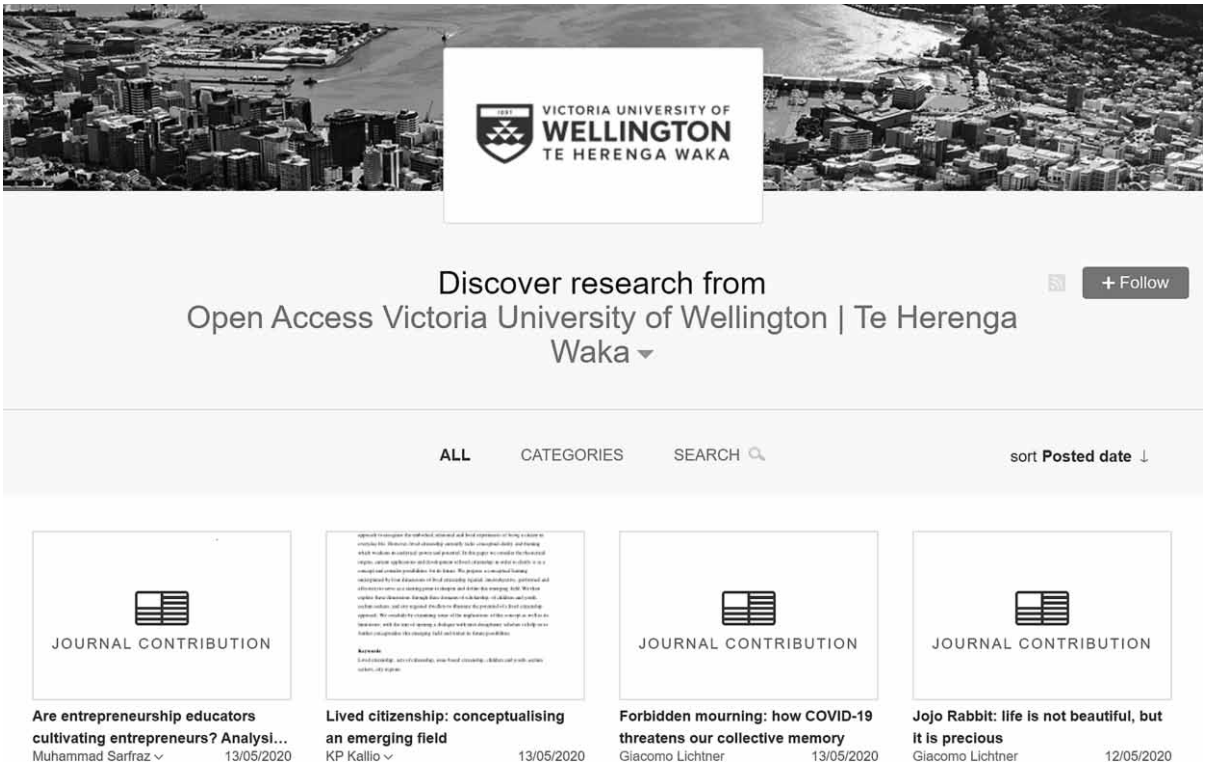
building work, can boost the visibility of our research, mint dois, and has been successfully implemented as an institutional repository at a range of institutions comparable to the University.

Library Research Services, the Library Systems and Integration Development team, and the Research Office have worked together on the implementation, which will 'go live' in 2020 as shown in Figure 4, in conjunction with Elements' Discovery module, which streams data from Elements onto profile pages. The Research Office manages Elements, the Library manages Figshare, and the two teams have worked together building crosswalks and designing workflows. Following rollout, Figshare management will likely become a key function of the Library Research Services team, and the now well-established 'train the trainer' relationship between research services librarians and subject librarians will be key to rolling out the repository across Te Herenga Waka.

Figure 4. Te Herenga Waka Open Access Repository (Source: Te Herenga Waka, 2020. Used with permission.)



Subject librarians will also be involved in working with academic staff to proactively deposit high-value papers into Figshare. This will involve using data from the available data sources to identify papers which are not yet open access, but could be, and which are likely to attract attention. Subject librarians will simultaneously develop a working understanding and awareness of open access issues, ensuring that the repository adds value from the outset. This activity will also provide subject librarians with a clearer understanding of a researcher's output, in turn strengthening the support and advice they can give.

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Capability and Capacity Building for Research Support Services

The Library has made steady progress over several years in strengthening capability and capacity to deliver research services. While the 2017-2018 restructure is the latest and most significant development, there had already been developments in this direction.

In 2015, the Library created a Research Support Librarian role. A key responsibility of this role was to build the capability of Library staff so that they were equipped to effectively support Te Herenga Waka's research activities (Lang et al., 2018; Wilson, 2017). The Library put considerable effort into identifying the needs of Te Herenga Waka's researchers and the corresponding skills and knowledge needed by subject librarians, so they could actively engage in this arena, and confidently offer the expanding research support services.

This development included socialising the importance of the changing research and scholarly communication landscapes and the need to shift the focus of the subject librarian roles from traditional areas, such as collection development, to supporting and adding value across the research lifecycle, as was also the case in other universities (Auckland, 2012; Deng, 2015; Howie, 2020). At Te Herenga Waka, this included subject librarians collectively undertaking the 23 (research data) Things programme[1], as well as in-house training. This period is discussed in more detail in earlier publications (Lang et al., 2018; Wilson 2017).

However, with the latest restructure more than doubling the number of roles dedicated to research services, has meant the Library has been able to further build capability and capacity building. Research skills training for subject librarians is becoming less ad hoc and more programmatic. Subject librarians are continuingly offered skills development sessions, with the aim of being able to deliver sessions to researchers in their subject areas. One current strength is that the two research services librarians both actively publish, and also have previously been in subject librarian roles, meaning they have a good understanding of the research lifecycle and understand the perspective of subject librarians, meaning training is particularly effective (at least according to anecdotal feedback from attendees of sessions).

The research services librarians actively keep abreast of developments in the publishing and metrics landscape, partly through cultivating relationships with colleagues in other universities and with vendors such as Elsevier and Digital Science. Taking up offers of additional training opportunities from vendors has meant that both research services librarians are highly skilled users of Scival, Dimensions, and Web of Science. They have contributed to improvements in systems, such as Scival, by recommending and subsequent inclusion of a grouping of New Zealand universities. This allows Scival users to easily compare by geographic area. They are held in high regard by vendors, which is reflected in being invited to present at a SciVal event in Sydney in 2019.

There are of course challenges in building capability and capacity within the Library. The analytical tools subscribed to by the library can change and often do, with little notice. New or removed functionality adds to the complexity of capability building. Subject librarians have a range of responsibilities and research needs are only one component of the work that they do. And researchers are sometimes sceptical about the relevance and validity of metrics, some disciplines engaging with them more than others. In addition, the notion that academic research quality is a responsibility of the library, which has traditionally been considered a 'service profession', sits uneasily with some (A. Cox et. al., 2019).

However, the complexity of developments in bibliometrics and new functionalities in systems are also an advantage, so long as the Library can easily convey the important aspects of them through well designed and well delivered training. As the research landscape now contains a plethora of tools and

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metrics, being able to quantify a researcher's impact and tell their story in a way that leads to an active strategy to enhance their profile has become easier over time. After all, given that the disparity between the quality of Te Herenga Waka's research and its citations, any developments in the ability to enhance the profile of our academic staff and the institution are welcome.

We are now able to make concrete steps towards providing subject librarians with the capability and confidence to offer targeted advice to researchers based on a strong understanding of metrics and strategic publishing, and sound knowledge of the individual researcher's research trajectory.

FUTURE RESEARCH SUPPORT SERVICES DIRECTIONS

The new library structure has enabled a greater number and tailoring of services and support in the research services areas offered at Te Herenga Waka. Over two years into this new structure, initiatives and areas of focus have emerged in line with the University's and Library's strategic plans to enhance visibility and impact of research.

Looking forward, there are opportunities for enhancing our delivery model, especially given that tools have also evolved to become easier to use. For example, the subject guides have been maintained in the same format as before the restructure, largely resulting in lists of links and definitions trying to cover a wide range of topics. These will be updated to reflect the problem/solution-based model to ensure the guides help researchers to address immediate 'real-world' needs. There is also potential to create online tutorials that instruct and guide users in best practice, whether aimed at upskilling subject librarians or researchers. This allows access to guides and support to those users who are unable to attend workshops or find that method of delivery ill-suited to their own preferences and approach.

The earlier Library directorate had already addressed some gaps and issues around reputation and affiliation by improving the curation of Te Herenga Waka's institutional identity in Scopus. This entailed resolving competing variations of the name and affiliated units appearing with different Scopus institutional IDs. This will continue to be an area of focus to ensure research outputs are correctly affiliated to the institution and its researchers. As the new structure has become embedded and the working relationship with the Research Office deepened, the Library has been able to contribute more to wider initiatives.

A key focus the Library is continuing to address, along with the Research Office and others, is the disparity between research quality and reputation as measured through bibliometrics. The research services librarians have worked jointly with the Research Office on a paper exploring possible reasons for the lower than expected citation rates. The Library contributed its expertise on metrics, using Scopus and Web of Science data to provide a picture of Te Herenga Waka's citation performance compared to that of other universities. The paper was well received by the University's Senior Leadership Team and has resulted in a set of action points that the Library and Research Office will work on over time. This is proving to be an important and productive collaboration, leading to joined-up work aimed at boosting the visibility and impact of Te Herenga Waka's research over the next few years.

The Library is in a good position to further contribute to Te Herenga Waka's strategic goals for research. The research services librarians have established reputations as experts in bibliometrics and are consulted when selecting suitable metrics to use for institutional KPIs. The team is working with the university's planning and management information unit on importing groups into Scival in as automated a way as possible, meaning that Associate Deans Research, Heads of Schools, Subject Librarians and

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anybody who needs to review current research impact performance will be able to easily access up to date graphical reports for their units.

The Subject Librarian team is also well placed to contribute to the strategic objectives. This includes a further drive to encourage researchers to register for ORCID, identifying publications researchers regularly publish in that could be suitable candidates for Scopus indexing, and then approaching editors to offer support in completing applications for indexing. To date, both initiatives have had considerable success. Subject librarians are also currently helping with proactive deposit of papers into the University's open access repository, offering help and support to researchers in the first tranche of deposits. They are also well placed to have conversations with individual researchers about the new online academic profiles which stream data from Symplectic Elements to staff websites using the Symplectic Elements' Discovery module (a Research Office project which the Library has also contributed to). The common theme of these activities is enhancing online research profiles of researchers, which is likely to lead to an increase in the impact of Te Herenga Waka research.

One challenge in developing research services is that it is not always clear what services researchers need the most. Replicating research services delivered by other universities is not always successful in the local context (Daland & Walmann-Hidle, 2016). Digital humanities research is one area where the Library started to invest time and resources in developing services and capability. However, this field is still emerging within Te Herenga Waka and without strong academic demand, a decision was made to keep a watching brief rather than further develop support. Another issue influencing the design of services is a persistent lack of visibility of the impact of the Te Herenga Waka's research in some areas, notably in its influence on public policy in New Zealand or elsewhere. Metrics around this type of impact are still to mature in being reported, particularly in New Zealand.

Further work is needed in promoting our services and shifting the perspective of some pockets of researchers who while engaged in their research, do not necessarily think the Library is the place to seek support in this regard. Nonetheless, inroads have been made in shifting thinking on the value the Library contributes.

An additional challenge is that the Library is working in a complex, fast-changing, and at times, uncertain environment. This has meant that as the Library establishes priorities and begins to work through them, some of these priorities are superseded before work is complete, or new and urgent issues emerge to take priority. It is anticipated that remaining agile in order to respond to changing priorities will be important.

A final issue is the difficulty of quantifying the value of the Library's contributions to Te Herenga Waka's strategic goals for research. While there is anecdotal evidence that the Library's research services positively contribute to the universities research priorities (for instance, through positive feedback from the Vice-Chancellor and other research leaders), it remains difficult to clearly demonstrate a correlation. Traditional library measurements and usage statistics are not sufficient in determining the value of the Library contributions in relation to the University's research activities, outputs and their corresponding quality (Salisbury & Peasley, 2018). Establishing robust measurements that provide evidence of the value of the library contribution to institutional research goals remains a challenge and an area for consideration both locally and sector-wide moving forward.

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CONCLUSION

The Library has put considerable effort into identifying how its research services can evolve to be of critical strategic importance to the operation and international recognition of Te Herenga Waka. By understanding the context in which Te Herenga Waka operates and the diverse needs of its researchers the Library has identified core activities where it can contribute to university success. Located in New Zealand, the challenges faced in an increasingly internationalised and competitive market for research funding, collaborative opportunities, recruitment of staff and attractiveness for students, forces the need for active strategies to maintain and grow the reputation and relevance of Te Herenga Waka with a global perspective.

Evidence for the success of the Library's research activities and support model is demonstrated by an increase in demand for its services and expertise, from Te Herenga Waka's senior leaders, to individual researchers, who are keen to optimise the impact of their research outputs. Positioning the Library to clearly align with, and contribute to, the University's strategies and key priorities has been pivotal to its success and will continue to remain important moving forward (J. Cox, 2018). It also serves to strengthen the relevance of the Library to Te Herenga Waka as traditional roles such as custodians of physical collections are changing.

A collaborative pan-university approach and building key relationships is crucial to delivering on Te Herenga Waka's ambitious research goals. The major restructure in 2017-2018 has resulted in the Library being able to share knowledge and experience; collaborate across Te Herenga Waka; keep on top of complex issues; and design services and training which delivers influential support through the networks of subject librarians. Articulating why changes to services and priorities are necessary, and in turn building library staff capacity and capability to support research has played a necessary part in this successful service implementation. New research tools will come, go, or evolve so the learning process for all staff will be constant and require adaptability to change. While not without its challenges, the Library's approach to service delivery has enabled it to provide advice and support more broadly, systematically and responsively than the previous structure could have.

Looking to the future it is apparent that evaluating the research services offered and providing concrete evidence that the Library is making a difference to research impact and visibility will be necessary to continue the process of enhancing and tailoring these services. This will be a challenge for other libraries too, given the fast-changing environment and ensuring they continue to be valued within their institutions. With the progress made, it is clear the Library and wider University has moved passed the crossroad and is now on a defined path to developing a strong research infrastructure, providing transformative support services and tools that contribute to the ambitious research goals of Te Herenga Waka.

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KEY TERMS AND DEFINITIONS

Impact: The degree to which research outputs have been referred to or used as indicated by research metrics.

Metrics: The tools and processes used to measure the performance of university research outputs, including bibliometrics.

Open Access: The unrestricted online access to research outputs such as journal articles and books with content open to all and no access fees.

Research Outputs: Published output of research, e.g. journal articles, chapters, conference papers.

Research Support Librarians: Librarians whose roles are focussed on developing and delivering research support services

Research Support Services: A range of services aimed at supporting researchers and the institution's research strategies.

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Researchers: University staff undertaking research, including academic faculty members and post-graduate students.

Scholarly Publishing: Refers to the process of scholarly writing being created, peer reviewed, and disseminated to the scholarly community via reputable sources such as peer reviewed journals. Also known as scholarly communication.

Subject Librarians: Librarians who are focused on supporting disciplines with research, learning and teaching support.

ENDNOTE

[1] A self-directed programme developed by the Australian National Data Service –see: https://www.ands.org.au/working-with-data/skills/23-research-data-things

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