ISSUES IN THE MULTILINGUAL INFORMATION PROCESSING OF SPOKEN POLITICAL AND JOURNALISTIC TEXTS

CHRISTINA K. ALEXANDRIS

Issues in the Multilingual Information Processing of Spoken Political and Journalistic Texts

Issues in the Multilingual Information Processing of Spoken Political and Journalistic Texts

By

Christina K. Alexandris

Cambridge
Scholars
Publishing

Issues in the Multilingual Information Processing of Spoken Political and Journalistic Texts

By Christina K. Alexandris

This book first published 2020

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

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

ISBN (10): 1-5275-4510-5
ISBN (13): 978-1-5275-4510-6

TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION: THE DOMAIN OF SPOKEN JOURNALISTIC TEXTS AND THEIR CHALLENGES

1.1 Introduction: Information Understanding, Information Transfer and Cognitive Bias in Spoken Journalistic Texts

Spoken political and journalistic texts are a commonly occurring spoken text type in the Media, available to recipients of almost any kind, ranging from a local community to the international public. Beyond television networks and broadcast news, spoken political and journalistic texts are accessible and retrievable with multimedia applications, viewed on a personal computer (PC), a mobile phone or on other devices.

In addition to their ubiquity, spoken political and journalistic texts constitute a significant source of empirical data both for human behaviour and for linguistic phenomena, especially for spoken language.

However, with some exceptions, spoken political and journalistic texts are usually underrepresented both in linguistic data for translational and analysis purposes and in Natural Language Processing (NLP) applications.

As text types, spoken political and journalistic texts pose challenges for their evaluation, processing and translation due to a set of typical, distinctive characteristics. Spoken political and journalistic texts are usually rich in socio-linguistic and socio-cultural elements. Additionally, the content of most spoken political and journalistic texts is often not domain-specific but may encompass several domains. Furthermore, with spoken political and journalistic texts there is always the possibility of different types of target audiences – including the international community. These features of spoken political and journalistic texts may often create complications with respect to the correct understanding of their information content or the correct transfer/ translation of their information content to a different audience.

An additional feature of spoken political and journalistic texts is the existence of complex and implied information often containing indications of the Speaker's attitude and intentions. This information is not always perceived or correctly understood by the recipients, particularly if an international public is concerned. This type of information is also not easily detectible by most Opinion Mining applications. Furthermore, information content and its perception by the recipients is often related to Cognitive Bias.

Additionally, the relation of the spoken information content to prosodic and paralinguistic features is a distinctive element of spoken political and journalistic texts which needs to be integrated in any evaluation, translation or other processing tasks performed, either by a human or by a Natural Language Processing (NLP) application.

Here, we focus on the basic, typical, characteristic and most commonly occurring issues and problems in the evaluation, processing and transfer of information content of spoken political and journalistic texts and present the main task types, general characteristics and basic factors to be taken into consideration for strategies targeting the resolution of the problems and the management of the issues concerned.

Finally, the signalization and visualization of information that is mostly not uttered constitutes a typical issue that can pose challenges to applications processing spoken journalistic texts. We present strategies and solutions such as the visualization of the degree of neutrality of a written or spoken journalistic text with the use of percentages; the visualization of Speaker behaviour, Speaker intentions and Cognitive Bias with the use of graphs; and the visualization of information content of paralinguistic features with the use of messages.

All proposed strategies implemented and presented are based on the Gricean Cooperative Principle (Grice, 1975) for the speech acts involved. The Gricean Cooperative Principle (Grice, 1975) serves as a general theoretical framework at the pragmatic level: parameters may vary according to the natural languages and cultural features involved, especially if non-European languages are concerned. We focus on English as an international language and related or comparable issues and linguistic phenomena in other languages.

Proposed approaches and strategies are presented taking into account the "grey zones" – undefined boundaries between individual-specific, language-specific and socio-cultural-specific parameters of spoken political and journalistic texts.

The proposed approaches and strategies intend to address the following issues concerning the processing of these texts:

- How to indicate and formulate the factor concerning the possibility of different types of domains and/or target audiences of the spoken journalistic text and how to integrate this factor for analysis and processing purposes.
- How to indicate and formulate the factor of speaker attitude and speaker intentions and how to integrate this factor for analysis and processing purposes.
- How to indicate and formulate the factor of prosodic and paralinguistic information and how to integrate this factor for analysis and processing purposes.

1.2 Challenges of Processing Spoken Journalistic Texts

The challenges of spoken political and journalistic texts concern three main task types performed either by humans or by NLP applications, namely (1) evaluation, (2) processing and (3) transfer of information.

These challenges are related to the following general characteristics of spoken political and journalistic texts:

(i) multiple domains;
(ii) multiple (national and international) audiences;
(iii) multiple language styles (for example, standard language and mixed terminology, possibly along with idiomatic, dated or scholarly language);
(iv) implied information and connotative features; and
(v) prosodic and paralinguistic features.

- **Multiple Domains**

Factors that plays an important role, particularly when it comes to translation, machine translation and Natural Language Processing (NLP) applications are the multiple domains and the (international) public's varied levels of knowledge in respect to terminology. Spoken journalistic texts involve a broad spectrum of terms and expressions, ranging from the domains of Politics and Diplomacy (including military terminology) to domains involving specialized terminology from other professional, technical and scientific fields such as Information Technology (IT), Engineering, Chemistry and Medicine (Tassis and Iliakis, 2015).

- **The Domain of International Affairs**

For example, in the domain of International Affairs, encompassing international politics, geopolitical and military affairs, texts often contain terminology from more than one specialized domain, resulting in ambiguities and other complications in translation, Machine Translation tools and other Natural Language Processing applications. We note that accuracy is of crucial importance in Machine Translation applications – a still-evolving technology – where the impact of mistranslations does not only effect critical, "life-or-death" situations in medical and technical texts, but also has impacts in the domains of Politics and Diplomacy.

For the domains of geopolitical and military affairs, the importance of information processing, including multilingual Natural Language Processing (NLP) – especially in the domain of military applications – has been described both by researchers and military personnel, including cases where attempts "to develop policy and create new programs were often lost in translation" (West, 2009). The processing of documents in different languages may be particularly problematic in applications concerning the analysis of textual data for intelligence purposes, especially if very few or no translators are available (Noubours and Hecking, 2012). Typical Natural Language Processing applications in the domains of International Politics and Geopolitical and Military Affairs include Information Retrieval (IR), Document Classification, Information Extraction (IE), Text Mining, Opinion Mining and Machine Translation (MT) (Noubours and Hecking, 2012). However, the nature and related complexity of spoken political and journalistic texts may sometimes not allow a clear outline and a distinction between features of their content and structure. This property may create complications in the evaluation, analysis and processing, including for the above-mentioned typical Natural Language Processing applications.

- **Complex and Implied Information**

An additional factor for the analysis and processing of spoken political and journalistic texts is the existence of complex and implied information often containing indications of the Speaker's attitude and intentions, related to language-specific parameters and socio-linguistic and socio-cultural elements. Complex and implied information also concerns possible combinations of features both from the native language and from the natural language spoken, when speakers from the international community are involved. Complex and implied information is not easily managed by

most Machine Translation tools or by most Natural Language Processing (NLP) applications.

- **Prosodic and Paralinguistic Features**

Furthermore, in spoken political and journalistic texts, a connection of the information content of spoken utterances to prosodic and paralinguistic features is observed. The factor of the Prosodic and Paralinguistic Level may also be connected to language-specific parameters and socio-linguistic and socio-cultural elements.

- **Transcription and Proposed Approaches**

Transcription tools used for spoken texts and speech applications facilitate the evaluation, analysis and processing of spoken political and journalistic texts, especially in interactive applications allowing the user to make decisions concerning the spoken input.

Proposed strategies and interactive annotation approaches in combination with existing automatic processes, tools and resources may function as "stepping stones" and "safety nets" (Lewis, 2009; Lewis, 2010) for the correct and complete evaluation, processing and/or transfer of the information content of spoken political and journalistic texts while "respecting" the nature and complexity of the processed spoken input.

The proposed strategies and interactive annotation approaches are related to their integration in implemented or designed applications such as the following, among others:

- Interactive processing of terminology in journalistic texts adapted to the needs of the international public (with use of existing resources).
- Automatic evaluation of the degree of "non-neutral" elements (degree of neutrality-objectivity) in journalistic texts.
- Graphic representations of content and quality of spoken interactions (interviews, discussions).
- Visibility and "processability" of prosodic and paralinguistic information for multilingual applications.
- Connection and accessibility to the international public of online spoken journalistic texts in respect to related content of ancient or historical texts.

- **Targets of Present Analysis and Strategies**

The presented and described features of spoken political and journalistic texts and the proposed strategies and interactive annotation approaches concern the following targets:

Target 1: Visibility of information implied and/or information not uttered and visibility of Speaker intentions and attitude.

Target 2: A general framework for both the correct and efficient analysis and/or processing (A) by human evaluators, analysts or translators and (B) by Natural Language Processing (NLP) applications, including Machine Translation and Data Mining (Opinion Mining/Sentiment Analysis).

Target 3: Accessibility of information content and correct information transfer for non-native Speakers and/or an international audience.

CHAPTER TWO

ISSUES IN PROCESSING SPOKEN POLITICAL AND JOURNALISTIC TEXTS

2.1 Visibility and "Processability" of all types of Information Content for Evaluation, Translation, Data Mining and Opinion Mining

The present analysis and proposed strategies may be described as a general framework with a "three level" processing approach described in the present chapter. The "three level" processing approach presented here targets the visibility of all features and respective information content of the spoken political and journalistic texts. This includes visibility of implied information and connotative features not evident at word level; information at the Prosodic and Paralinguistic Level; and information not uttered. Visibility of all information content ensures the "processability" of all information content.

Processability includes Data Mining and Opinion Mining applications that mostly rely on word groups and word sequences, including recent approaches with the use of neural networks (Arockiaraj, 2013; Shah et al., 2018). In particular, Opinion Mining applications make use of sentiment lexica (Liu, 2012), although recently neural networks have been employed in unannotated texts to improve performance (especially in low-resource languages) and to overcome errors (Hedderich and Klakow, 2018).

It should be noted that most Opinion Mining and Sentiment Analysis applications concern domains such as customer reviews and/or social media posts – even videos (Poria et al., 2017) – as illustrated in the following characteristic examples (Examples 2.1.1, 2.1.2 and 2.1.3).

Example 2.1.1

Product reviews for Sentiment Analysis and Opinion Mining (retail) (Liu, 2012):

(i)

"I bought an iPhone two days ago.
It looks very nice.
I made many calls in the past two days.
They were great."

(ii)

Posted by: John Smith Date: September 10, 2011

"(1) I bought a Canon G12 camera six months ago.
(2) I simply love it.
(3) The picture quality is amazing.
(4) The battery life is also long.
(5) However, my wife thinks it is too heavy for her."

Example 2.1.2

Movie reviews with User-generated videos (Poria et al., 2017):

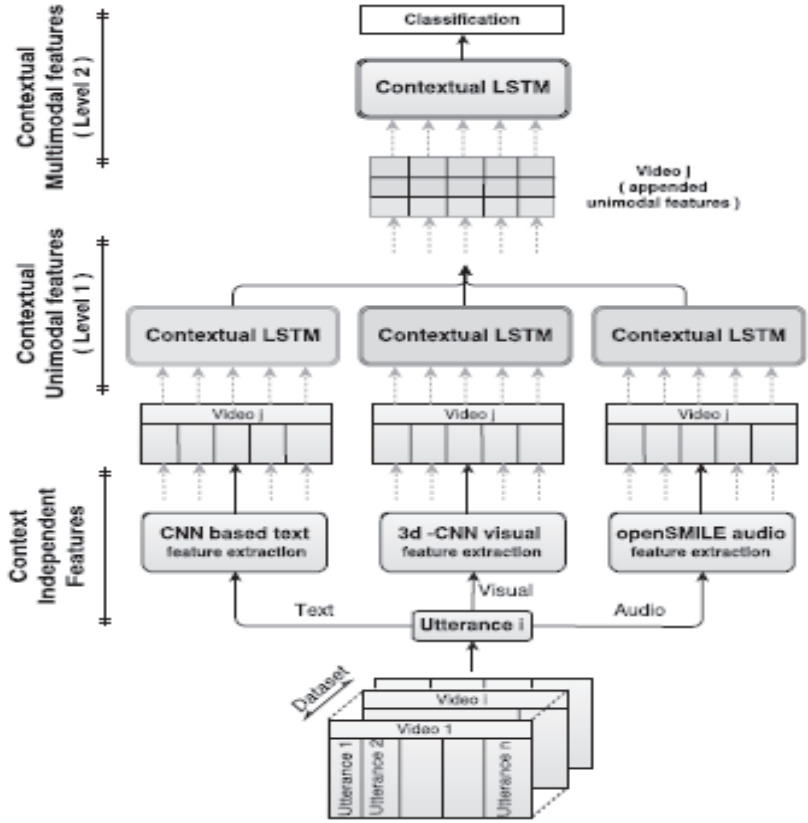
"What would have been a better name for the movie".
"And I really enjoyed it" –
"The countryside which they showed while going through Ireland was astoundingly beautiful"

Example 2.1.3

Sentiment Analysis from videos (text, audio and video):

Hierarchical architecture for extracting context-dependent multimodal utterance features (with Long Short-Term Memory (LSTM) recurrent neural networks) (Poria et al., 2017).

(Poria et al., 2017)



These domains are related to a variety of issues that analysts and developers must resolve. However, spoken political and journalistic texts pose additional challenges, as described in the present chapter. The nature and complexity of the content of spoken political and journalistic texts

renders the use of specially annotated corpora a necessity, at least as initial training and test sets for any application.

The evaluation, (machine) translation and other forms of processing of spoken journalistic texts concern the complexity of the texts in regard to the existence of multiple sub-domains involved (i) and in respect to linguistic processing (ii) (Complexity –A). The degree of complexity (the Complexity Issue – A) increases where multilingual texts from diverse languages and language families and an international public are concerned. Additional issues are processing speed (Speed – B) and availability of language resources (the Resources Issue – C). In particular, the efficient use of resources (the Resources Issue) and processing speed (the Speed issue) play an important role, especially if decision-making is involved.

2.2 Issues in Processing Spoken Journalistic Texts: Complexity, Speed and Resources

2.2.1 The Issues of Complexity and Speed

The complexity of linguistic processing in spoken political and journalistic texts (Complexity – A) includes the basic problems of (1) ambiguity resolution, (2) the ability to detect and process complex information and (3) access to related and/or implied information and connotative features. Spoken journalistic texts contain problems related to the semantics of words, such as ambiguities and polysemy; complex information from various domains (including International Affairs and Diplomacy); and implied information and connotative features contained in texts reflecting tendencies, opinions and positions taken in respect to events.

Additional issues concern the detection and processing of information that is not easily detected, often resulting in complications in applications such as Machine Translation and Data Mining (including Opinion Mining and Sentiment Analysis).

Ambiguity resolution and complex information processing are related to the multiple sub-domains that exist in spoken journalistic texts. Thus, the determination and application of domain-specific resources (terminology databases, lexica and corpora) with the ability to connect to multiple domains constitutes a basis for the efficient machine translation and processing of spoken political and journalistic texts.

Furthermore, the need for successful analysis and processing, a basic requirement in all types of applications, is coupled with the factor of urgency and the need to make an immediate decision, a common case in many types of (written and) spoken political and journalistic texts. Thus,

processing speed (Speed – B) constitutes another basic issue for processing texts involving typical domains of journalistic texts such as International Politics and Geopolitical and Military Affairs.

2.2.2 Using Available Resources

The access and effective use of resources (Resources – C) is an additional issue in the translation, Machine Translation and other forms of processing spoken journalistic texts. Bilingual and multilingual resources such as Parallel Corpora play a key role in the processing concerned. Typical examples of Parallel Corpora are the EuroParl corpus (European Parliament Proceedings Parallel Corpus, http://statmt.org/europarl/) and the United Nations Parallel Corpus (https://conferences.unite.un.org/uncorpus). An example of an open, freely available online parallel corpus is OPUS (http://opus.nlpl.eu/), providing aligned texts in multiple languages and connected to corpora including less widely spoken languages such as SETIMES2, a parallel corpus of news articles in the Balkan languages (http://opus.nlpl.eu/SETIMES2.php). The UM-Corpus (UM-Corpus: A Large English-Chinese Parallel Corpus http://nlp2ct.cis.umac.mo/um-corpus/) is an example of a domain-specific parallel corpus for the domains "Education", "Science", "Laws", "Thesis", "Microblog", "News", "Spoken" and "Subtitles".

In the strategies presented in the following chapters, readily available resources save time and reduce the cost of developing new corpora and multiple databases. The use of resources (Resources – C) in processing spoken journalistic texts concerns the combination of domain-specific/sublanguage-specific terminology and existing or specially constructed resources such as translations, texts, ontologies and other types of databases.

Specifically, in addition to corpora, the strategies may also include lexical databases such as WordNet (https://wordnet.princeton.edu/), multilingual databases such as the Universal Networking Language (UNL) (http://www.undl.org/), constructed monolingual or multilingual ontologies (e.g. OWL, Loaiza et al., 2014) or even monolingual lexica or corpora of languages from diverse language families such as Chinese or Arabic. Less spoken (local) languages may be processed in combination with "assistive" translations in a third language, with an option for further improvement and "fine-tuning" of translations.

These resources contribute to the processing of monolingual or multilingual journalistic texts for an international or national audience.

2.3 Overview of Existing Tools and Resources for Machine Translation

2.3.1 Recent Advances in Machine Translation and the Issue of Accuracy

2.3.1.1 Introduction

Targeting the increasing needs of a multilingual international public, along with the needs of industry, government, and a variety of sectors and user groups, many Machine Translation (MT) systems continue to use a combination of various machine translation approaches.

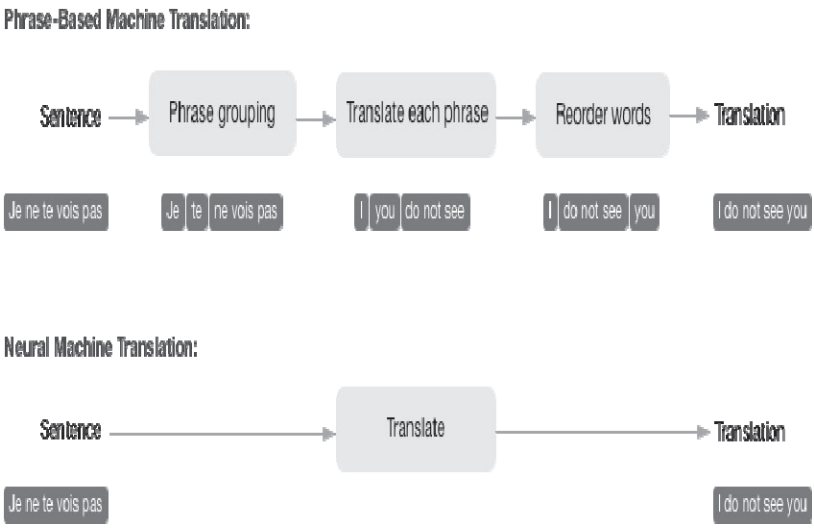
Statistical machine translation (SMT) (Koehn, 2010) has become increasingly popular compared to the original approaches of rule-based machine translation (RbMT) and even in comparison with example-based machine translation (Turcato and Popowich, 2003).

Statistical machine translation relies on pre-translated parallel corpora (Resources) on which the derived statistical probabilities are based. Although it dates back to the 1980s, rule-based machine translation, relying on hand-written grammar rules and lexica with vocabulary lists, is still used in some types of applications.

Despite recent developments, whether for the use of individual users or for industry, Machine Translation continues to vary in terms of levels of output accuracy (Burchardt et al., 2017), although in many cases better results are observed for neural machine translation (NMT) in comparison to phrase-based translation (PBNT), in terms of statistical machine translation approaches (Example 2.3.1).

Example 2.3.1

Outline of the phrase-based translation (PBNT) and the neural machine translation (NMT) processes (Zhou, Kurenkov and See, 2018)[1]



A characteristic illustration of these differences was made available to a broader public through Google press releases in 2016 concerning the performance of Google Translate.[2] However, even in the case of neural machine translation, researchers have used statistical machine translation to further improve translation results, "alleviating limitations" detected in neural machine translation processes (Wang et al., 2017).

Despite the above-presented advances, in terms of output accuracy, the performance of human translators continues to exceed all types of machine

[1] https://www.skynettoday.com/editorials/state_of_nmt
Skynet Today, July 25, 2018
Putting AI News in Perspective. Has AI surpassed humans at translation? Not even close! Neural network translation systems still have many significant issues which make them far from superior to human translators, by Sharon Zhou, Andrey Kurenkov and Abigail See

[2] https://www.theverge.com/2016/9/27/13078138/google-translate-ai-machine-learning-gnmt (by Nick Statt, September 27th, 2016)
https://www.techemergence.com/machine-translation-14-current-applications-and-services (by Radhika Madhavan, July 31st 2018)

translation, including neural machine translation (NMT) (Dietterich, 2017).

The recently launched Google Neural Machine Translation system (GNMT) (Wu et al., 2016) uses neural machine translation technology based on the use of a large neural network. Unlike other common Machine Translation procedures where the input is segmented into words and phrases as single units for translation (Jurafsky and Martin, 2008), in neural machine translation technology, the single unit for translation is considered to be an input sentence. The large neural network used predicts how likely a given sentence as a word sequence is to occur. The neural network encodes the source language words as a list of vectors. The meaning of all words read by the system so far is represented with each vector. The target language sentence is generated one word at a time, ending with the reading of the entire sentence by the system. In neural machine translation, entire sentences are modelled in a single integrated model (Cho et al., 2014).

In 2016, Facebook launched its own AI-powered translation system, which, according to press releases, marks the complete transition from phrase-based models into neural machine translation (NMT).[3] An additional recent development of neural machine translation is deep neural machine translation, which uses multiple neural network layers.

Neural networks are used in the Microsoft Translate technology for the Skype voice translation feature, Skype Translator, processing languages such as English and Spanish (https://www.skype.com/en/features/skype-translator/). The Skype voice translation software was initially based on a combination of speech recognition and statistical machine translation.

In speech-to-speech translation, the source audio is converted into raw text in the natural language spoken in the Automated Speech Recognition (ASR) module. The text normalization procedure processes the text for conversational speech to facilitate translation with the text translation engine. The text translation engine is built on specially developed translation models for spoken conversations in real-life situations.

There have been various demonstrations of Skype's successful speech-to-speech translation in real-time, including independent project videos. However, reservations have been expressed in respect to a successful implementation in online classrooms and business conversations between

[3] https://techcrunch.com/2016/05/23/facebook-translation/ Facebook ditches Bing, 800M users now see its own AI text translations, Josh Constine, (https://www.wired.com/2017/05/facebook-open-sources-neural-networks-speed-translations/, 05.09.17 Facebook's New AI Could Lead to Translations That Actually Make Sense, Cade Metz

organizations and in implementations that cross entity boundaries. These concerns involve both practical and security issues.

2.3.2 Domain-Specific Texts and the Machine Translation Market

Accuracy levels vary between language pairs and also in respect of the text types translated. It has been observed that generic translators with machine-learning models are trained on generic data and usually demonstrate a lower accuracy and relevancy level than domain-specific translators based on highly-specific training data.

In general, adaptation to the domain-specific needs of the user is typical of most machine translation services available in the market. These machine translation services, a significant percentage of which constitute Computer-Aided Translation (CAT) tools (Trados being a characteristic example of the oldest companies in the market providing such tools, https://www.sdltrados.com), are based on client-specific translation memory tools and customized machine translation engines. Applications such as GlobalLink are geared towards enterprise level translation and localization tools (http://translations.com/globallink/products/globallink_modules.html) including features and specifications for managing "highly branded, technical, or industry-specific terminology".

On the other hand, freelancers providing translation services are included in the main target group of machine translation software such as Lionbridge Translation Workspace (https://geoworkz.com/). Other machine translation services such as Andovar (https://www.andovar.com) place special emphasis on translation and localization, for example, languages of Southeast Asia.

Nevertheless, there are machine translation services available in the market for specialized machine translation applications. For example, in the domain of Finance, the Lingua Custodia Machine Translation system (http://www.linguacustodia.finance/en/homepage/) processes financial documents and is customizable to specific sub-types of financial documents, such as fund annual reports and portfolio management commentaries, with the system's ability to "learn" from previously translated texts. In the domain of Healthcare, Canopy Speak (https://withcanopy.com/speak/) is an example of a medical translator application with phrase-based translation, having a phrase library constituting a corpus of pre-translated medical phrases, categorized according to type and frequency of medical condition and medical procedure.

In the case of multi-domain translation services, the pre- and post-editing processes are still performed by human translators. Multi-domain translation services are usually offered across a defined number of specific domains, for example, the SYSTRAN Machine Translation system offers a variety of translation services for five domains/industries (http://www.systransoft.com/lp/machine-translation/). Multi-domain translation services may also involve a customization of their Machine Translation platform for specific domains, as in the case of the KantanMT Machine Translation system (https://www.kantanmt.com/).

2.3.3 Machine Translation of Texts, Audio Files, Images and Social Media Feeds

Despite their non-domain-specific application and their training on generic and typically crowd-sourced data, a high translation accuracy has been reported for commercial online cloud-based machine learning applications (apps) performing instant translation of textual, audio and image files for individual users. These machine learning applications offer Text-to-Text, Text-to-Speech, Speech-to-Text, Speech-to-Speech and Image-to-Text translation services.

An example of real-time Speech-to-Speech Translation is iTranslate Voice 2 (iTranslate), a speech-to-speech translation application (app) for travellers and tourists (http://itranslatevoice.com/). The iTranslate Voice 2 speech-to-speech translation app supports 42 languages. Its voice recognition and machine translation software interacts with a "Phrasebook" feature, allowing quick access to frequently used phrases. Other examples of similar speech-to-speech translation apps for travellers and tourists are SayHi, Speak and Translate, Papago and TripLingo, including wearable Speech-to-Speech Translation devices. A typical example is the Pilot (Waverly Labs) wearable Speech-to-Speech Translation device, consisting of a pair of wireless earbuds for facilitating a two-way conversation between speakers of two different languages (https://www.waverlylabs.com/company/). The application currently supports four Romance languages and English. Another example is the "ili" voice translator (https://iamili.com/us/), a small, handheld device voice translator for the translation of simple, common phrases for travellers, without the use of the internet, since it operates offline. It is based on a built-in phrase-based translation engine. However, the translation engine can be updated by plugging the device into a USB port and connecting to the company's website. The device processes the languages English, Spanish, Mandarin Chinese, and Japanese and only performs a one-way translation since,

according to the company's website, "travellers and tourists typically ask simple phrases that require yes or no answers".

An example of real-time Image-to-Text Translation is Textgrabber (ABBYY), translating the text from digitized images from any surface in "almost" real-time with the use of optical character recognition (OCR) technology (http://www.textgrabber.pro/en/).

The machine translation of social media feeds, documents, audio, and images in multilingual content and in real time has been described in presentations of services concerning the US government, focusing on defence and intelligence (intel) use cases, as in the case of the company SDL Government (http://www.sdlgov.com/). The translated content is subjected to further evaluation, for example, whether a posted social media feed indicates individuals who might potentially pose a national threat, as described by SDL Government's CEO Danny Rajan.[4]

2.3.4 Issues in Managing Machine Translation

Accuracy level is the key issue in machine translation applications, constituting the criterion for evaluating their success and efficiency. Inaccurate information and mistranslations continue to exist in machine translation output, not only because machine translation systems are a still-evolving technology, but also due to the complexity of the phenomenon of language itself.

As previously mentioned, an additional issue in machine translation applications is the consequences and impact of mistranslations, not only in the case of critical, "life-or-death" situations, such as in the case of technical texts and medical texts, but also in the domains of Politics and Business.

A third issue is the issue of security and the safe processing of confidential data. Security may concern personal data of users or confidential data of companies, organizations, government or other entities.

Table 2.3.1 summarizes the issues in managing Machine Translation in respect to common categories of available Machine Translation tools for spoken political and journalistic texts.

[4] interview Jun 17, 2017, https://www10.giscafe.com/video/SDL-Government-S.-Danny-Rajan-CEO/411334/media.html

Table 2.3.1 Issues in managing Machine Translation and common categories of available Machine Translation tools for spoken political and journalistic texts

Common categories of available Machine Translation tools for spoken political and journalistic texts	Issues in Managing Machine Translation
specialized / domain-specific machine translation applications multi-domain translation services real-time Speech-to-Speech Translation real-time Image-to-Text Translation	accuracy level consequences and impact of mistranslations confidential data

2.4 Overview of Existing Tools and Resources for Transcription

The choice of transcription tools is usually dictated by the targeted form and type of the generated transcription; however, practical issues may play an additional role.

Easy access to transcription services for a large user group is provided by free online transcription tools such as YouTube and Google Docs. A characteristic example of an online transcription service for UK English audio recordings is "Standish Typing Services Transcriptions" (https://standishtyping.com/). Transcription tools can be customized for specific domains; for example, texts in the domain of the Law, with the transcription software of Dragon Speech Recognition Software (https://www.nuance.com/dragon.html) being one characteristic example.

The range of available transcription tools covers applications providing the basic requirements of text transcription and also more sophisticated software presenting multiple additional features such as linguistic information, prosody and gestures.

A typical example of the latter type of transcription tool is the freely available Anvil Video Annotation Research Tool (http://www.anvil-software.org/), which presents transcribed texts aligned with the respective video and speech signal as data imported from phonetic tools such as Praat. Praat is widely used software for the phonetic analysis of speech, mostly used for research and development in the field of articulatory and speech synthesis (http://fonsg3.hum.uva.nl/praat/).

Other characteristic examples of available online transcription tools with additional specifications are the recently released Google Live Transcribe speech engines (https://www.android.com/accessibility/live-transcribe/), the EXMARaLDA (http://www.exmaralda.org/en/), the Annotation Graph Toolkit (AGTK) (http://agtk.sourceforge.net/), the Express Scribe Transcription Software (http://www.nch.com.au/scribe/index.html) and InqScribe (https://www.inqscribe.com/). The Open Source Annotation Graph Toolkit (AGTK) uses annotation graphs as a formal framework for representing linguistic information, including annotations of linguistic behaviour from audio and video. Apart from its transcription and annotation module, the EXMARaLDA transcription and annotation tool includes a module for managing corpora as well as a module for computer-assisted querying of transcription, annotation and metadata. InqScribe is a less complex tool and is considered ideal for new users. In addition to transcription, the InqScribe transcription tool can also be used for creating subtitles for videos. One of the features of Google Live Transcribe is that it can caption real-time spoken words in over 70 languages and dialects and is available on 1.8 billion Android devices.[5]

Specialized tools for text analytics such as SentimentBuilder (http://sentimentbuilder.com/) can analyse unstructured texts such as emails, reviews or chat data with a Natural Language Processing module.

Some transcription tools are available as open source platforms. For example, the open source Oral History Metadata Synchronizer (OHMS) (http://www.oralhistoryonline.org) assists in relating textual search terms at word-level to the corresponding moment in the recorded data. The application produces a time-correlated transcript or indexed interview. Furthermore, there are online platforms such as “Recogito 2” (http://recogito.pelagios.org/) that allow collaborative document annotation, including images and the presentation of source materials and research results as Open Data (http://recogito.pelagios.org/). Online open source platforms are also available for learning languages and cultures, including

[5]https://venturebeat com.cdn.ampproject.org/c/s/venturebeat.com/2019/08/16/google-open-sources-live-transcribes-speech-engine/amp/ by Emil Protalinski.

ancient languages and literary heritage and culture. The Alpheios project allows the user to view a definition and morphological analysis of words chosen from web pages with Latin, Ancient Greek or Arabic content (http://alpheios.net/).

Example 2.4.1

Example of transcription tool with annotation of linguistic and paralinguistic information: The Anvil Video Annotation Research Tool (http://www.anvil-software.org).

Other tools, such as DM (Digital Mappaemundi), allow the annotation of texts, images and manuscripts. This facility allows users to create digitized resources from material such as manuscripts and photographs and to mark and comment selected fragments or to mark any indications of relations between texts or fragments of interest (https://schoenberg institute.org/dm-tools-for-digital-annotation-and-linking/). Available tools can create resources from scanned paper documents with the use of an optical character recognition engine. For example, the ABBYY FineReader creates editable and searchable electronic files from scanned paper documents, PDFs and digital photographs (https://www.abbyy.com/finereader/). Another example is the online work environment eLaborate (http://elaborate.huygens.knaw.nl/), where results of uploaded scanned, transcribed and annotated text are freely available to all users.

All the above-presented types of transcription and annotation tools can be employed in the processing, analysis and evaluation of spoken political and journalistic texts. Table 2.4.1 summarizes the common types of available transcription tools and the types (or level) of annotation provided.

Table 2.4.1 Common types of available transcription tools and type of annotation

Common types of available transcription tools	Type (or level) of annotation
transcription software, online transcription tools / services open source platforms transcription software of Speech Recognition Software transcription tools for creating subtitles for videos annotation of images and manuscripts	basic text transcription linguistic information prosody gestures

2.5. Strategy for Processing Spoken Political and Journalistic Texts

2.5.1 Requirements, Parameters and Processing Levels

The nature and complexity of spoken political and journalistic texts does not always enable all features of their content and structure to be clearly outlined and, subsequently, processed.

Furthermore, the correct and efficient processing of spoken political and journalistic texts is also dependent on two basic parameters.

The first parameter is the above-described multi-domain content of most spoken political and journalistic texts. The multi-domain content is related both to issues concerning expressions and terminology and to issues concerning stylistic and pragmatic aspects of the spoken texts:

terminology may range from typical terms encountered in politics to specialized scientific terminology; stylistic features may be related to sociocultural or psychological factors; and pragmatic aspects may include argumentation and the expression of opinion.

The second parameter is the efficient use of existing tools and resources for machine translation and transcription.

Due to the features of the multi-domain content of most spoken political and journalistic texts, it is considered difficult for a machine translation application to produce output without any mistranslations. Spoken political and journalistic texts are considered complex texts, and the complexity factor increases when native speakers of two or multiple languages take part in a discussion or interview, especially if the transcribed spoken text is subjected to machine translation. Furthermore, in some cases, the processing of specific political and journalistic texts may be considered confidential, and any documents or other files related to the output may be treated as confidential data.

An additional issue in the correct and efficient processing of spoken political and journalistic texts is the fact that there are limitations in respect of the use of potentially useful resources such as spoken corpora. These limitations are due to the fact that existing resources with spoken corpora do not cover the entire range and particularities of spoken political and journalistic texts, especially in cases where international speakers have their own "variety" of speech and behaviour, which is often a combination of linguistic and paralinguistic features from their native language and the foreign language spoken.

- **A General Framework both for Human Analysts-Evaluators/Translators and for NLP Applications**

In relation to the above, a general framework is proposed for both the correct and efficient processing and the analysis of various types of spoken political and journalistic texts. Specifically, the general framework allows the implementation of a variety of automatic or interactive procedures, depending on text content and issues encountered. Spoken journalistic texts may be processed with respect to three different levels, corresponding to different types of complexity and levels of analysis, processing stages and respective processing speeds.

The proposed general framework concerns both the correct and efficient analysis and/or processing (A) by human evaluators, analysts or translators and (B) by Natural Language Processing (NLP) applications,

including Machine Translation and Data Mining (Opinion Mining/Sentiment Analysis).

The three levels of analysis and processing target the visibility and "processability" of the various aspects of complex information content in spoken political and journalistic texts.

The three levels of analysis are connected to distinctive types of tags serving annotation purposes and/or activating specific processes with the proposed strategies. Furthermore, the distinctive types of tags may also be used for the enrichment of corpora and empirical data for training language models – statistical models and neural networks.

2.5.2 Analysis Levels and Compatibility with Existing Tools and Systems

- **Analysis Levels**

As previously described, the information content of the spoken political and journalistic texts spans various levels of analysis that may be classified into three general categories.

The first level (Level 1) concerns the analysis of terminology and ambiguous phrases where an automatic or interactive "safety-mode" ambiguity resolution is proposed, corresponding to "fast-track"/ "stepping-stone" options used in Spoken Dialogue Systems (Lewis, 2009; Valavani et al., 2015). The "fast-track"/"safety-mode" options are proposed for quick, batch processing and analytical, interactive processing respectively. These processes may be enabled or disabled, depending on the type of processing and level of analysis activated.

Complex semantic information and connotative features are processed at Level 2. Some types of information can be automatically signalized while for other types of information, interactive processes are activated.

The processing of prosodic and paralinguistic features corresponds to Level 3, with the signalization of elements containing information such as prosodic emphasis and gestures. Depending on the type of Automatic Speech Recognition (ASR) System used, prosodic processing may either be automatic or interactive.

The proposed interactive annotation tool for "Terms, Complex Information and Prosody" (referred to as TCIP-Annotation) (Figure 2.5.1) concerns the annotation of the features of Levels 1, 2 and 3 namely the analysis of terminology and ambiguous phrases (Level 1), complex semantic information and indicators of Cognitive Bias (Level 2), and prosodic and paralinguistic features (Level 3).

For the annotation of terminology and ambiguous phrases requiring additional processing (Level 1), the "[SMI]" tag is proposed (presented in Chapter 3), connected to the respective strategies applied and linked to the respective resources. For the activation of the respective strategy/process, the tag may function as a "button". For terminology occurring in spoken journalistic texts, the inserted tags assist the additional processing or direct (machine) translation, including subtitles.

For the annotation of complex semantic information and connotative features (Level 2), the "[IMPL]" (text level)/"[impl]" (word level) tag is proposed, corresponding to processes of the respective implemented strategies. Strategies concerning the processing of features corresponding to Level 2 are presented in Chapter 4.

For the annotation of prosodic and paralinguistic features (Level 3), a set of specialized tags is proposed. The tags for prosodic and paralinguistic features also assist in processes detecting (complex) implied information (including degree of neutrality and Cognitive Bias). This information contributes to the evaluation of speaker behaviour. Strategies concerning the processing of features corresponding to Level 3 are presented in Chapter 5.

- **Compatibility with existing Tools and Systems**

One of the intended functions of the proposed TCIP-Annotation tool is its use as an additional annotation option to existing transcription tools and speech processing applications. The tag types concern text output generated by a Speech Recognition (ASR) module for pre-processing/post-processing, providing options for evaluation, (machine) translation or other processes, including Data Mining applications. The annotation can be run as an additional process or with a possible integration (as an upgrade) into existing tools and systems.

Additionally, the proposed TCIP-Annotation option (Figure 2.5.1), designed to operate on transcribed spoken texts, may also be adapted for the processing of spoken messages, especially for the indication of socio-cultural factors in incoming texts.

It should be stressed that the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) serves as a general framework for integration into existing tools and systems and for adaptation according to the parameters and requirements of the natural language(s) and/or the application(s) concerned. The general framework property of the proposed TCIP-Annotation facilitates its use beyond a

specific application, including research, analysis and educational-training purposes.

- **Enrichment of Corpora and Empirical Data for Data Mining and Deep Learning Neural Networks**

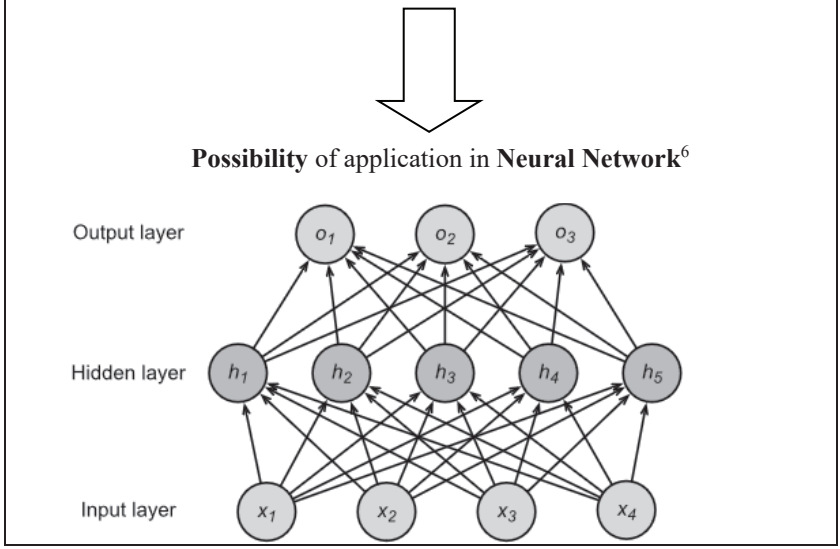
As described in the previous section (2.5.1), the general framework of the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) with the distinctive types of tags may also assist in data compilation for the enrichment of corpora and empirical data, for modelling speaker behaviour and for training language models – statistical models, neural networks and Deep Learning approaches. The distinctive types of tags may be used in Natural Language Processing (NLP) applications, including Machine Translation and Data Mining (Opinion Mining/Sentiment Analysis) (Figures 2.5.1 and 2.5.2).

Figure 2.5.1

Transcription Tool Outline	
Speech Signal	
Text	text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]
Speakers &Annotation	Speaker A/ annot-text- annot-text- Speaker B/ annot-text- annot-text- [Speaker Turns & (Basic) Annotation]
Proposed Annotations	annot-text (**TCIP-Annotation**)

Interactive Annotation for Terms, Complex Information and Prosody (**TCIP-Annotation**)	
TAG-TYPE	**LEVEL OF ANALYSIS**
IMPL tag (text-level) impl tag (word-level)	*Level 1 and Level 2* Audience Factor (I) (Level 1 – Terminology) &Pragmatic Level Factor (II) (Level 2 – Complex Information)
Tag types for Prosodic Features Tag types/Message types for Paralinguistic Features	*Level 3* Prosodic and Paralinguistic Level Factor (III)

Figure 2.5.2

<table>
<tr><td colspan="2">Transcription Tool Outline</td></tr>
<tr><td>Speech Signal</td><td> 
</td></tr>
<tr><td>Text</td><td>text- text- text- text- text- text- text- text- text- text-
[& Machine Translation Option]</td></tr>
<tr><td colspan="2">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation: Visibility in Corpora-Empirical Data)</td></tr>
<tr><td colspan="2"> 
</td></tr>
</table>

[6] Image from: http://d2l.ai/chapter_multilayer-perceptrons/mlp.html#hidden-layers

2.5.3 Three Factors in Processing Spoken Political and Journalistic Texts

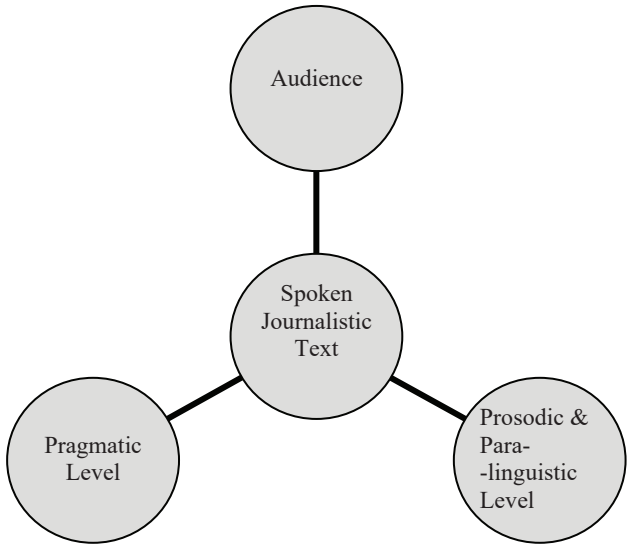
The above-described "three level" processing approach and the corresponding configuration and features of the proposed TCIP-Annotation tool are related to three factors contributing to the correct perception, interpretation, analysis and possible translation of the information content of spoken political and journalistic texts (Figure 2.5.3).

A crucial factor in the analysis of terminology and ambiguous phrases (Level 1) in spoken political and journalistic texts is the Audience Factor (I), namely the targeted receivers and audience of the spoken text. In the case of presentation, transmission, translation or adaptation of spoken political and journalistic texts to non-native speakers or an international public, the processing is linked to the Audience Factor (Audience Factor I). The Audience Factor can, to a certain extent, be linked to the domain type(s) involved in the content of the journalistic text.

For the correct and efficient processing of complex semantic information (Level 2), the Audience Factor is combined with parameters from the Pragmatic Level (II) and, in some cases, even with parameters from the Prosodic and Paralinguistic Level (III), which concerns the processing of prosodic and paralinguistic features (Level 3).

The Audience Factor (I), presented in Chapter 3, is linked to the processing of terminology and ambiguous domain-specific terms in spoken journalistic and political texts. The Pragmatic Level (II) (Pragmatic Level Factor II) (Chapter 4) is linked to the processing of non-terminology and non-domain-specific terms, constituting complex information, involving grammatical and semantic features and often related to socio-cultural factors. Furthermore, this complex information conveys the attitude, emotions, beliefs and intentions of the speaker(s) concerned. Several types of word categories considered as complex information in spoken political and journalistic texts are related to the level of Prosody. The Prosodic and Paralinguistic Level (III), presented in Chapter 5, constitutes an essential element of spoken political and journalistic texts and is directly related to the information content of spoken utterances.

Figure 2.5.3: Three Factors in Processing Spoken Political and Journalistic Texts for Human Analysts-Evaluators/Translators and for NLP Applications.



CHAPTER THREE

AUDIENCE TYPE AND TERMINOLOGY IN SPOKEN JOURNALISTIC TEXTS: USING RESOURCES AND TOOLS FOR EDITING PROCESSES

3.1 Terminology in Journalistic Texts for the International Public: Origins in European Languages

Terminology is a common feature of spoken political and journalistic texts, its use expanding across various topics presented and discussed. The use of terminology in spoken political and journalistic texts spans domains as varied as Politics, the Law, Economics, the Military domain, Agriculture, Chemistry, Physics, Biology, Geology, Energy, Computer Science, Artificial Intelligence and various Technology applications. A significantly large percentage of globally used terminology – including terminology used in the international Media, originates from European languages.

The management of terminology and the resolution of problems with terminology may be related to two types of levels and practices, which can also be related to the question of "How?". The first type of common practice (1) concerns specialized databases, resources and guidelines for professional translators (the Resources Issue –C); the second type of common practice (2) involves linguistic parameters in terminology analysis and translation.

Linguistic parameters concerning the terminology in "traditional" scientific disciplines and professional domains are considered here as "stable parameters", characterized by a typical process of terminology production and structure. Linguistic parameters resulting in the production of terms whose structure and analysis is not related to traditional practices may be considered to be "context-dependent-flexible parameters". Thus, for resolving the question of "How?", the question of "Where" regarding domain is an essential factor in terminology management. Linguistic

parameters in terminology analysis and processing are presented in Sections 3.2 and 3.3).

Furthermore, in addition to domain type, the management of terminology is also related to the requirements of the target readership or audience (Audience, Factor I), described in Sections 3.4 and 3.5 of the present chapter. This relation concerns both context-specific information and domain-text type as crucial factors in terminology management and translation. In particular, context-specific information and text type definition are combined with the correct analysis and the correct choice of terms with respect to the target readership or users. Therefore, the question of "Where" regarding both domain and audience is another essential factor in terminology management.

Cultural aspects in text type and content related to the target audience of the spoken political and journalistic text play a substantial role in understanding linguistic features. The complexity of the factor "Audience" and the overall task complexity in terminology management increases when text content involves terminology from multiple domains, as previously described. The degree of complexity increases even more when the translation and/or processing of terminology from multiple domains involves multiple languages.

In the present chapter, the use of interactive applications for terminology processing is described, concerning the activation of existing terminology resources. User-interactive applications are proposed in cases in which texts contain terminology from multiple domains, both in highly specialized and in less specialized texts. The application presented in Section 3.6 addresses both factors related to the question of "Where", activating domain type and responding to choices in respect of the target audience.

3.1.2 Managing Terminology in Communication: The Case of European Union (EU) Countries

3.1.2.1 Managing Terminology in the European Union (EU) countries

Terminology in a communicative, managerial and, subsequently, a political and journalistic context expands across various domains. Typical practices in processing terminology from multiple languages and multiple domains are presented in terminology management within Europe and in the European Union (EU) countries. The case of terminology management in the European Union (EU) countries is described here as an example.

The European Union has 24 official and working languages from diverse language families. From the Indo-European Language Family, the

language families concerned are: the Romance Languages (French, Italian, Spanish, Portuguese and Romanian), Greek (forming a language family of its own), the Celtic Languages (Irish being the only representative of the EU official and working languages), the Germanic Languages (English, German, Dutch, Danish and Swedish), the Slavic Languages (Polish, Czech, Slovak, Croatian, Slovenian and Bulgarian) and the Baltic Languages (Latvian and Lithuanian). From the Uralic Language Family, the languages and language families concerned are Finnish, Estonian (Baltic-Finnic language family) and Hungarian. The only representative from the Semitic Language Family is Maltese (from Siculo-Arabic, but with a Latin writing system). The 24 official and working languages of the European Union are related to three different writing systems, namely Latin, Greek and Cyrillic, the Latin writing system being the predominant one.

The management of terminology involves the use of resources and implementation of practices concerning the correct use of terms and their translation. Regarding resources, for European Union (EU) countries National Terminology Databases and European Union Terminology Databases are employed. These resources are linked to practical guidelines, namely the European Commission Guidelines and Style Guides for terminology and texts containing specialized terms. The creation of terminology resources involves both linguistic parameters in terminology translation (or analysis) and the requirements of the readership and users of the terminology concerned.

At least for European Union (EU) countries, the complexity of resolving problems with terminology is related to various elements. A basic element in the management of linguistic and practical aspects of terminology is the diversity of languages and language families within the European Union, as well as historical and traditional parameters in the use and creation of terms. The resolution of problems with terminology within the EU countries may be summarized under the question of "How?"

There are basically two general types of practices for resolving problems with terminology within the EU countries. Specialized databases are available with related fora and discussion groups among professional translators who try to resolve problems and agree on a defined term. This is mainly a practice among official translators of EU documents, but there are similar practices on a national level. On the other hand, the resolution of terminology problems is also an issue for linguists (2) –especially in the field of contrastive linguistic analysis, since full equivalency of terms in language pairs is often a problem related to Semantics and Morphosyntax. Linguistic issues related to terminology analysis and processing may be

classified under various categories. Typical problems related to linguistic issues concern ambiguity, polysemy and compound words.

3.1.2.2 Terminology Resources and Databases

The description and presentation of terminology within countries of the European Union requires the differentiation between official national terminology resources and databases and official EU terminology databases, although there may be an overlap. The EU uses standard terminology for its documents, which may range from medical, scientific and technological terms to legal and managerial terms used in politics and EU bureaucracy. There are also "special" EU terms for EU bureaucracy documents which may or may not coincide with related terms in the bureaucracy of each of the national governments.

Many national terminology associations and societies in Europe explicitly state their target to connect all factors and sectors related to the study and dissemination of special and specialized languages, the Italian Association for Terminology (L'Associazione Italiana per la Terminologia, founded in Rome in 1991) being a characteristic example. Government, universities, research organizations, industry and professionals such as interpreters and translators and language professionals are considered the broad target group for terminology research. Additionally, the interaction between researchers and citizens may be regarded as one of the primary objectives of terminology research, as in the case of the Bank of Finnish Terminology in Arts and Sciences of the University of Helsinki (https://tieteentermipankki.fi/wiki/Termipankki:Project).

National terminology associations and societies in Europe also constitute fora for discussing terminology issues among scholars, experts and other professionals, and they may issue guidelines for terminology. For example, a "Best Practice" guide for terminology management is issued by the German Terminology Association (German *Deutscher Terminologie-Tag e.V. – DTT* http://dttev.org/). Founded in 1987, the Association cooperates with other national and international organizations on issues that concern terminology management, aiming to improve technical communication through terminology management. The German Terminology Association cooperates with organizations such as the Council for German-Language Terminology (German *Rat für deutschsprachige Terminologie*), Infoterm, TermNet, the German technical communication association "tekom", the Federal Association of Interpreters and Translators (German *Bundesverband der Dolmetscher und Übersetzer e.V.*) and the European Association for Terminology.

Most national terminology societies and associations in Europe may also be members of larger, international terminology organizations. For example, the Hellenic Society for Terminology – Greece (ELETO) is a member of the International Information Centre for Terminology (INFOTERM), the European Association for Terminology (EAFT), the International Network for Terminology (Termnet) and the International Institute for Terminology Research (IIFT).

The availability and standardization of information are of crucial importance in the European Union. In the countries of the European Union, both national terminology databases and European Union terminology databases are available to translators, scholars, administrative staff and professionals in various fields, as well as to the general public, depending on the type of database concerned.

3.1.2.3 The IATE Database

Aiming to ensure the quality of the written communication of the European Union's (EU's) institutions and bodies, the European Union's multilingual inter-institutional terminology database used in EU institutions and agencies is the "Inter-Active Terminology for Europe" – IATE (http://iate.europa.eu). The IATE web site is administered by the Translation Centre for the Bodies of the European Union in Luxembourg on behalf of the project partners. The IATE database has been in use since 2004 and was built over a period of many years, starting as a project in 1999 aiming to provide a web-based infrastructure for all EU terminology resources, using new technologies. The IATE has been available to the general public since 2007.

The IATE database is used for the collection, dissemination and shared management of terminology related to the affairs of the European Union. In particular, the IATE database is used in the following EU institutions, which are also IATE project partners: the European Commission, the European Parliament, the European Council, the European Court of Justice, the European Court of Auditors, the European Economic & Social Committee, the European Committee of the Regions, the European Central Bank, the European Investment Bank and the Translation Centre for the Bodies of the EU.

As regards its content, the IATE contains EU-specific terminology and jargon and terms from a variety of areas, as diverse as Law, Agriculture and Information Technology. Specifically, in the IATE database, all of the existing terminology databases of the EU's translation services are merged into a single new, inter-institutional database, incorporating the following

legacy databases: Eurodicautom (European Commission), TIS (European Council), Euterpe (European Parliament), Euroterms (European Translation Centre) and CDCTERM (European Court of Auditors).

The IATE database is a live database, with new terms added every day and with constant updating of its contents. The terms of the IATE database are provided by European Union terminologists and translators and are based on information from reliable sources, including translators, administrators, lawyer-linguists and other experts.

IATE is designed to be highly interactive and accessible and contains 8.4 million terms, including approximately (to date) 1.4 million multilingual entries, approximately 540 000 abbreviations and 130 000 phrases. The multilingual IATE database covers all 24 official EU languages, namely: Bulgarian (български), Czech (čeština), Danish (dansk), German (Deutsch), Estonian (eesti keel), Greek (ελληνικά), English, Spanish (español), French (français), Irish (Gaeilge), Croatian (hrvatski), Italian (italiano), Latvian (latviešu valoda), Lithuanian (lietuviu kalba), Hungarian (magyar), Maltese (Malti), Dutch (Nederlands), Polish (polski), Portugese (português), Romanian (româna), Slovak (slovencina), Slovenian (slovenščina), Finnish (suomi) and Swedish (svenska).

3.1.3 Terminology in Communication: Historical, Political and Commercial Factors in Languages of the European Union

In light of the above, most issues of interest for linguists and translators alike arise both from the multitude and from the established equality among all languages in EU documents since, in the European Union, all languages are considered equal. However, in most countries in the European Union, when translation and processing of non-EU documents and terminology is concerned, historical, political and commercial factors play a decisive role in the languages and language pairs involved. For example, in the industrial sector, processing and translating manuals and related documents have a connection to source languages and terminology from the larger industrial countries and to the considerable research on terminology in the languages concerned. In this case, English, French and German constitute typical examples. In the case of German, the Germans have had to translate everything related to their industrial products, since fewer people speak German as a foreign language in comparison to English and French, and also due to the long and significant tradition in processing and translating terminology in Germany. As regards English, political developments in 2017 in the United Kingdom (Brexit) do not seem so far to have affected the role of the English language within the

European Union, since English is one of the main languages of international communication within the EU countries. Apart from the United Kingdom (UK), English, is, in addition to Irish, also one of the official languages of the Republic of Ireland, an EU Member.

Socio-cultural and historic factors affect terms originating from languages traditionally used for scientific terminology and the Law, such as Greek and Latin, as well as for the Arts and various professional domains, such as Italian and French. Terminology in the domain of the Sciences and the Law, especially terms existing before the 20th century, is often characterized by standard processes of terminology production and structure. These processes are usually related to the linguistic processes applied in the Morphosyntactic Level, especially the processes of derivation and composition. Loan words from specific languages traditionally used are a common phenomenon in professional domains existing before the 20th century. On the other hand, terminology from scientific and professional domains existing since or after the 20th century are often neither related to standard processes of terminology production and structure nor originating from specific languages, with the exception of English, widely used in fields as diverse as Computer Science, maritime terms (shipping) and the fashion industry.

The variation in respect to terminology production processes, structure, language of origin and the degree of specialization of terms increases with the development and specialization of most scientific domains and professional fields and their accessibility to the general public.

3.2 Using Resources: Linguistic Parameters in Terminology Processing and Translation

3.2.1 Introduction

3.2.1.1 The Audience Factor

As illustrated by information presented in the previous section (Section 3.1), terminology in a communicative, managerial and, subsequently, political and journalistic context expands across various domains. A terminology domain (professional field or scientific discipline) constituting one of the factors in terminology management described in Section 1 can be related to the question of “Where”. The question of “Where” is also related to the factor of target readership or audience of the terminology. Both “domain” and “audience” contribute to the resolution of linguistic and practical issues in terminology management. For example, the term

"cockpit" is known to the general public and the international audience mostly as a term in the domain of Aviation – Air Travel. However, the term is used in other domains and related users/audiences, for example as a maritime term (Example 3.2.1.1):

Example 3.2.1.1
Translations of "cockpit" as a nautical term:[7]

pozzetto (Italian)
bañera (Spanish)

In other words, to provide solutions to the question of "How?" concerning linguistic parameters (2), the question of "Where" should be addressed, namely the previously stated "Audience" factor in processing spoken political and journalistic texts as transcribed texts (or as input from a Speech Recognition (ASR) module).

3.2.1.2 Domains and "Stable" versus Context-Dependent "Flexible" Linguistic Parameters

As regards the type of professional field or scientific discipline related to the "Where" question, there is the case of terms directly derived from languages traditionally used in the domains concerned. Typical examples are French terms in the domain of Diplomacy (Example 3.2.1.2.a):

Example 3.2.1.2.a
French terms in the domain of Diplomacy:[8]

Chargé d'affaires
Entente
Rapprochement

[7] Glossary of Nautical Terms: English – Spanish, Spanish – English, English – French, French – English, English – Italian, Italian – English. Approved and Released by: Dal Bailey, DIR-IdC, United States Coast Guard Auxiliary Interpreter Corps http://icdept.cgaux.org/, 6/29/2012

[8] eDiplomat Global Portal for Diplomats, Glossary of Diplomatic Terms: http://www.ediplomat.com/nd/glossary.htm
French and Latin Diplomatic Terms by Mark Nichol: https://www.dailywritingtips.com/french-and-latin-diplomatic-terms/
Berridge, G. R., Alan James and Sir Brian Barder. 2003. *A Dictionary of Diplomacy*. 2nd ed. New York, N. Y.: Palgrave Macmillan.

In scientific disciplines and professional domains that existed before the 20th century – for example, Medicine and Physics – terminology formation is the result of traditional standard processes and practices. Linguistic parameters involved in such (traditional) practices and procedures may be considered to be "stable parameters". On the other hand, terminology formation may not be the result of traditional practices and standard processes. A typical example is Computer Science and other disciplines and professional domains developed during or even after the 20th century. Linguistic parameters concerning terminology formation in such cases may be considered to be "flexible parameters". However, it may be noted that traditional terms from various languages are used in recently developed scientific disciplines such as Planetary Science (Example 3.2.1.2.b).

Example 3.2.1.2.b
Terms for surface features of Mars:[9]

mesa (Spanish)
butte (French)
terra (Latin, Italian)
chaos terrain (Greek)

With the availability of scientific texts and other specialized text types to a broader public, restrictions blocking any possible interpretations of terms outside the scientific or professional domain are less strict. This results in a higher possibility of errors in terminology analysis, translation and other forms of processing. For example, typical issues in terminology also include problematic cases where expressions perceived as simple so-called "everyday" words may constitute terms. This phenomenon is related to the increased access of sciences and professional fields to the general public, especially through the Media.

Furthermore, some terms may have different formulations in respect to the readership-audience or users concerned. The variety of alternative terms used is also related to the parallel increase of specialization of most scientific domains and professional fields. In other words, with the absence of context-specific information, terms that might be perceived as belonging to a different domain or as everyday words often lead to false

[9] The Mars Odyssey Mission:
https://mars.nasa.gov/odyssey/multimedia/images/
Mars, Common Surface Features:
https://en.wikipedia.org/wiki/Common_surface_features_of_Mars

interpretation and problematic translations. In such cases, the linguistic parameters involved in the formation of terminology are not stable, but are heavily dependent on the context of the texts in which the terms occur. These parameters may be named context-dependent "flexible" parameters.

Context-dependent "flexible" and "stable" linguistic parameters in terminology formation involve the same types of typical processes in terminology formation or typical practices in terminology creation. These processes may concern derivation and composition (at the Morphosyntactic Level of linguistic analysis) described in the following sections. The similar practices involved may also include the use of "loan words" from other languages or terms from other professional and scientific domains.

3.2.2 Traditional Processes and Practices in Terminology Formation as "Stable" Linguistic Parameters

3.2.2.1 Terminology Tradition

Traditional terms in domains such as Medicine and the Natural Sciences are usually easily perceived as specialized terminology, directly accessible from specialized monolingual, bilingual and multilingual dictionaries and databases or other resources. This possibility minimizes the necessity of the use of linguistic means for additional analysis.

In Europe, the place of origin of many international terms, some types of terminology may originate from or may be traditionally related to one or two languages. For example, the domain of Law has a tradition in Latin, with Roman Law (from the Law of the Twelve Tables (Leges Duodecim Tabularum or Duodecim Tabulae, c. 449 BC) to the Corpus Juris Civilis, AD 529) constituting the basis of the legal systems in Europe, both Western Europe and Eastern Europe (Example 3.2.2.1.a).

Example 3.2.2.1.a
Latin terms in the domain of Law and Diplomacy:

Modus vivendi
Persona non grata
Ultimatum

Another characteristic example is the domain of Medicine, where scientific terms originating from Greek and Latin prevail. Medical terminology may be considered the par-excellence case of where terminology type is related to text type, users and readership. For example,

the medical term “flu” is the commonly used term in “everyday language” for the scientific term “influenza” (Latin) in Medicine. The Natural Sciences, in general, are domains where different terms may apply in “everyday language” and in scientific texts, especially if the terms are related to fields and sectors such as medical treatment (German: “Zitronenmelisse” – Lemon balm or balm mint, scientific term: “Melissa officinalis” – Latin and Greek), fishing (Portuguese: “Bacalhau” – (Atlantic) cod, scientific term: “Gadus morhua” – Latin) and agriculture (French: “mildiou de la vigne”, Downy mildew – a grape disease – “Plasmopara viticola” – Latin and Greek).

These domains are related to the scientific community as well as to industry, government, the law and the general public and also concern documents of international organizations.

3.2.2.2 Terminology Structure

In the domains of Medicine and the Natural Sciences, terminology formation is the result of traditional, standard processes and practices. In contrast to domains such as Computer Science, Engineering, Finance and Business Administration, scientific terms in Medicine and the Natural Sciences are built on a traditional use of combinations of words (compound words) and derivational morphemes, mostly from Latin and (Ancient) Greek, sometimes containing elements from both languages (as in the above-presented term “Melissa officinalis”). For example, the term “gastroenteritis” (or “stomach flu”) is a combination of the words “gastro” (gastir- stomach: Modern and Ancient Greek) + “entero” (“intestines”: Modern and Ancient Greek) + the morpheme “-itis”, which signalizes inflammation, the latter used in medical terminology such as “hepatitis”, “bronchitis”, among others.

This process of constructing or analysing scientific terms is based on derivation and composition at the Morphosyntactic Level (of linguistic analysis). Some European languages are particularly productive as regards the processes of derivation and composition, with German being a characteristic example. This process can be illustrated by the term “Versteinerungstheorie”, (petrification theory – a term from the domain of Law in German-speaking countries, not from the domain of Geology) composed of the words “Versteinerung” (petrification – the geological term) and “Theorie” (theory). The term “Versteinerung” is a result of derivation processes, with the derivational affixes “ver-” (used to describe a process) and “-ung” (for the nominalization of a verb) attached to the stem “Stein” (“stone”). The English term “petrification” is based on the

(Greek) word “petra” for “stone”, where the (Latin-based) derivational affixes describing a process and nominalization of a verb are attached.

The analysis of compound words for purposes such as translation is, therefore, often a complex process. A higher degree of complexity is typical in the analysis of multiword compounds composed of more than two words.

3.2.3 Context-Dependent “Flexible” Linguistic Parameters and Typical Errors in Terminology

3.2.3.1 Polysemy and Ambiguity

Similarities between terms in many European languages often result in errors regarding their correct translation. A typical case is when one term is used as a more general term in one language and is used for a more specific purpose in another language.

A characteristic example are the terms “Flugplatz” in German and “aérodrome” in French, signalizing the general term for landing areas of aircraft (not “Flughafen” (German) or “aéroport” (French), meaning “airport”), but they usually occur with a modifier regarding their use, for example, military use, as opposed to the English equivalent term “airfield”, which usually occurs as a single word without such specifiers (Example 3.2.3.1.a).

Example 3.2.3.1.a

Aircraft landing area:
aérodrome (French)
Flugplatz (German)

Airport:
aéroport (French)
Flughafen (German)

This illustrates the significance of context, which may determine the correct meaning of words and expressions with polysemy or ambiguity. For example, between German and French, the differences between “clinic” and “hospital” are not clear in all cases. In French, the term “clinic” (la clinique) is usually a private hospital, where “hospital” (l'hôpital) is a public hospital. In German, the same differentiation (“Klinik” –clinic “Krankenhaus” – hospital) may apply in many cases,

however, some public institutions, including university hospitals, may use the term "Klinik" ("clinic"). Additionally, the term "Spital" or even "Hospital" (dated) is used in German-speaking countries: The term "Spital" for "hospital" in Austria and in Switzerland and the term "Hospital" was once used for special care homes for the ill or elderly.

Furthermore, there are cases in which various meanings of one term may be related to each other or may have no semantic relation. For example, in Greek, the word "kóre" may mean (1) daughter or (2) girl/young woman (dated) and is also (3) an archaeological term for a statue of a young woman of the Archaic Period; it is also a homonym related to (4) the medical term for eye pupil.

Additional examples of phenomena that may create complications in content understanding or translations are colloquialisms and associations or homonyms related to common nouns, as illustrated in Example 3.2.3.1.b for Russian:

Example 3.2.3.1.b
Colloquialisms and associations for the term "bear" in Russian:

(i)
The name "Mishka" (Мишка)
(diminutive of "Misha" of male name "Mikhail" – Michael)
a colloquialism for "bear" (медве́дь)
(medved) (literally: "honey-eater")

(ii)
Association between "medved" (медве́дь) – "a bear" and Russia's President Dmitry Medvedev (2008 to 2012):

> Reuters, July 26, 2009:[10]
> […] Asked whether he felt uncomfortable with Russia's image of a bear, Medvedev, whose own family name derives from the word "bear", said: "It's an image close to my heart." […]

[10] REUTERS WORLD NEWS, JULY 26, 2009 / 1:43 PM
RUSSIAN BEAR MUST BE MODERN TO BE ATTRACTIVE: MEDVEDEV
BY OLEG SHCHEDROV
https://www.reuters.com/article/us-russia-medvedev/russian-bear-must-be-modern-to-be-attractive-medvedev-idUSTRE56P0G520090726

> ASSOCIATED PRESS. March 9, 2008:[11]
> […] Puns are crucial in many of the jokes about Medvedev, whose last name stems from the Russian word for bear. In one, Putin is asked if he will have Medvedev's portrait in his office. […]

For the resolution of issues related to polysemy and ambiguity, context-specific information plays a decisive role, since terminology cannot be isolated from the contexts of the texts containing the terms. In other words, the factor of "domain" related to the "Where" question contributes to the resolution of linguistic issues in terminology management.

3.2.3.2 "False Friends"

An additional typical example of problematic cases where context-specific information plays a key role in the resolution of linguistic issues in terminology management are the so-called "false friends". This phenomenon is common between languages of the same language family with many linguistic similarities and may often result in complications in the translation of terms. In the case of the so-called "false friends", words and terms may share some semantic features, but not the same meaning. Characteristic examples of English and German – both Germanic languages – are the term "Kaution" in German that does not mean "caution" but "deposit, bail" and the term "isoliert" in German that does not mean "isolate" but "insulated" (Example 3.2.3.2.a).

[11] ASSOCIATED PRESS
Published: Sun, March 9, 2008 12:00 AM. Updated: Sun, March 9, 2008 2:20 PM

https://oklahoman.com/article/3214147/medvedev-already-lampooned-russian-style

Example 3.2.3.2.a

Typical examples of so-called "False Friends" (Gerzymisch-Arbogast, 2003: 40-51).

Translation to German	English	German	Translation to English
ernst, erheblich	serious	seriös	respectable, honest
Vertreter	representative	repräsentativ	impressive, dignified
Vorlesung	lecture	Lektüre	reading matter
Vorsicht	caution	Kaution	deposit, bail
angemessen, ausreichend	adequate	adäquat	appropriate
beeinflussen	affect	Affekt	in the heat of the moment
bezahlen, verbringen, verbrauchen	spend	spenden	to donate
tatsächlich, derzeitig	actual	aktuell	up to date, currrent
Koch, Chefkoch	chef	Chef	leader, boss
abschneiden, absondern	isolate	isoliert	insulated

3.2.3.3 Grammatical Gender

The above-presented phenomena demonstrate that the correct semantic interpretation of terminology is related to the context of the text containing it. Apart from text type and domain at text level, the context of a term may concern the sentence level. In particular, grammatical information at the Morphosyntactic Level may also play a basic role in ambiguity resolution for terms in many European languages. For example, in German, the type of grammatical gender (masculine – "der", feminine "die" and neutral "das") often determines the meaning of a word and/or term. In some cases, terms may occur in the same domain. For example, in the domain of Law, the term "der Erbe" (German), meaning "heir" may co-occur with the term "das Erbe", meaning "inheritance" (Example 3.2.3.2.b). Therefore, context-specific information is not related only to the domain and text type of terminology, but is also important at paragraph level and even at sentence level.

Example 3.2.3.2.b

German nouns with more than one grammatical gender and different semantic meanings (Kurz, 2007, Hyde, 2012).

German	English	German	English
der Flur	hallway	der Leiter	leader
die Flur	meadow	die Leiter	ladder
der Erbe	heir	das Maß	measure
das Erbe	inheritance	die Maß	liter, container (Bavaria)
der Gefallen	favour	der Moment	moment, instant
das Gefallen	pleasure	das Moment	motive, factor
der Gehalt	content	der See	lake
das Gehalt	salary	die See	sea

3.3 Compound Terms in Journalistic Texts

3.3.1 The Head Principle in Compound Words

In most sciences and professional domains, a considerable percentage of words constituting terminology are compound words. Some compound words are fixed expressions while others require analysis for their correct interpretation and/or translation. The analysis of a compound term at the Morphosyntactic Level is related to the determination of its so-called "head". The head of the compound determines the relation between its constituents, according to the Head Principle. The Head Principle states that a compound word expression inherits its (semantic and grammatical) characteristics from one of its components, the "head" (Sternefeld, 2009).

The head of the compound word is language-specific. In languages such as French and German, the head of the compound word can only occupy a specific position in the word structure. In French, the head of the compound is the left component (enfant gâté: enfant (child) + gâté (spoilt) = spoilt child, vin rouge: vin (wine) + rouge (red) = red wine) while in German, the head of the compound is the right component (Bahnhof: Bahn (carriage, rail) + hof (building, court) = railway station, Rotwein: rot (red) + wein (wine) = red wine) (Sternefeld, 2006). Therefore, in French, the analysis and translation or any other processing of compound words and compound terms is initiated from the left component and, in German, the analysis and translation or any other processing of compound words and compound terms is initiated from the right component. Expressed in a

more formal manner, in German, compound words consisting of X + Y have the category Y (Sternefeld, 2009). The right or left position of the compound head also applies in the analysis and translation of terms constituting company names, for example, "NEC Corp" (NEC Corporation) in English and German is rendered as "Groupe NEC" in French and in other languages (for example, "Company NEC" in Greek).

Differences in respect to the structure of compound terms and their equivalent expressions in languages where the head can either be on the left or on the right (for example, Greek, Ralli, 2013; Ralli, 1989) can be illustrated by the following examples (Example 3.3.1.a and Example 3.3.1.b):

Example 3.3.1.a (Valavani, 2019)

[Eurogruppen]-Chef = [Eurogroup]-Chief
Head of the Eurogroup (Greek)
Επικεφαλής της [ομάδας Euro]

Example 3.3.1.b (Valavani, 2019)

Wirtschafts- und Währungsunion =
Economic/ Financial [ellipsis: Union] and Monetary Union
{European}Economic and Monetary Union (Greek)
Οικονομική και νομισματική ένωση

Compound terms composed of more than two constituents, namely multiword compounds, often allow the possibility of more than one possible reading and respective analysis. Multiword compounds are very common in German, where some words can have four or more components. Characteristic examples are the terms "Straßenbahnschienengebiet" (Straßen-bahn-schienen-gebiet), "Straßenbahnglastür" (Straßen-bahn-glas-tür), "Rotweinglasbehälter" (Rot-wein-glas-behälter) and "Busbahnhofhaltestelle" (Bus-bahn-hof-halte-stelle) (Elsen, 2011, Sternefeld, 2006). The components of the terms "Straßenbahnschienengebiet" and "Straßenbahnglastür" can be analysed as follows (Elsen, 2011) (Example 3.3.1.c and Example 3.3.1.d):

Example 3.3.1.c

Straßen-bahn-schienen-gebiet:
(street-carriage/rail-rail/track-area)

Straßenbahnschienengebiet
straßenbahnschiene {-n} {gebiet}
straßenbahn {schiene}
{straße}{-n}{bahn}

Example 3.3.1.d

Straßen-bahn-glas-tür:
(street-carriage/rail-glass-door)

Straßenbahnglastür
straßenbahn glastür
{straße}{-n}{bahn} {glas}{tür}

Some multiword compounds are characterized by a probability of different readings and ambiguity, especially when they contain individual compounds that are fixed in their usage. A typical example is "Busbahnhofhaltestelle" (Bus-bahn-hof-halte-stelle), where "Bahnhof" (train station) and "Haltestelle" (busstop) are fixed in the dictionary. The addition of the component "Bus" (bus) functions as a specifier of the multiword compound "Bahnhof-haltestelle", resulting in the reading: Busbahnhof (bus+trainstation = bus station) + Haltestelle (stop) = "bus station stop". The term can be either analysed as "stop in the bus station" or as "stop (for buses going) to the bus station".

3.4 Case Study: Terminology and Machine Translation in Financial News

3.4.1 Errors in Terminology Processing

The processing of terms constituting compound words by Machine Translation systems may often result in errors. This is common in terminology such as financial terms, especially in the domains of Journalism and the Media.

There are financial terms constituting "traditional" terms or fixed expressions in professional jargon and in the general vocabulary. In these

cases, most Machine Translation systems usually do not produce erroneous or problematic output. However, in many languages, especially in characteristically productive languages for compound words such as German, terminology processing involves a variety of issues needing to be addressed.

Here, we focus on examples of financial terms from the German Media and their processing by Machine Translation systems in English and in Greek. English, as one of the most common languages in the World Wide Web, is a language processed by most online Machine Translation systems and their statistical models (or neural networks). This corresponds to a comparatively larger percentage of correct Machine Translation system output data when English is being processed than with less commonly used languages – such as German – and even less commonly used languages such as Greek.

Furthermore, the quality of the output of Machine Translation systems may often also depend on linguistic similarities between languages. German and English belong to the same language family – Germanic Languages. Greek, a highly inflective language, belongs to a different language family among the Indo-European languages (and the languages in the European Union).

Typical problems in the machine translation of terms, as well as differences in output quality among language pairs processed, are illustrated by examples of financial terms processed by the online Machine Translation System "Google Translate" and derived from the following German financial newspapers and Media (Valavani, 2019; Valavani and Alexandris, 2015): "Die Welt" (www.diewelt.de), "Handelsblatt" (www.handelsblatt.de), "Frankfurter Allgemeine" (www.faz.de), "Wirtschaftswoche" (www.wirtschaftswoche.de) and "Die Deutsche Wirtschaft", formerly "Wirtschaftsblatt" (www.wirtschaftsblatt.de, now: http://die-deutsche-wirtschaft.de/). Typical problems are errors at the Morphosyntactic Level, the Semantic Level or a combination of both, especially when the processing of compound word terminology is involved. In this case, typical errors are a missing component of the compound word, which may often be the head of the compound; an incorrectly inserted component; and the incorrect order of components in the generation of the compound word term in the target language. An additional typical problem occurring in the processing and translation of compound words is the correct handling of Anglicisms.

3.4.2 Errors in the Morphosyntactic Level

Very common errors at the Morphosyntactic Level which also result to errors in the machine translation of compound words are errors in morphological features such as case and grammatical gender. These errors are especially common in languages such as German and Greek, where these features are evidently expressed and marked, as in the case of the wrong grammatical gender (feminine) for the German term "Wirtschaftskrieg" (Example 3.4.2.1) (German: feminine – die Wirtschaft, Greek also feminine: η οικονομία) + "Krieg" (German: masculine – der Krieg, Greek also masculine: ο πόλεμος). Since this is a compound word, the head of the compound is the constituent to the right, namely "Krieg", with the masculine gender. Furthermore, the component "Wirtschaft" behaves as an adjective, modifying the head of the compound word with the masculine gender. Therefore, in the generation in Greek, the grammatical gender of the first component of the compound should be changed to masculine, modifying the second component and head with masculine gender.

Example 3.4.2.1

Errors in the Morphosyntactic Level, including machine translation system improvements with neural networks (Valavani, 2019; Valavani and Alexandris, 2015):

Wirtschaftskrieg
Financial war
Οικονομικής πολέμου (wrong grammatical gender)
– Morphosyntactical error

3.4.3 Errors at the Semantic Level

Errors at the Semantic Level are related to the incorrect choice of words in the target language, but they may also be related to morphological "mismatches" (Mel'ˇcuk and Wanner, 2008; Dorna and Jekat, 2004). The incorrect choice of word may also concern components of compound words, as illustrated by Examples 3.4.3.1 and 3.4.3.2 (Valavani, 2019; Valavani and Alexandris, 2015).

Example 3.4.3.1

Error in Semantics, including machine translation system improvements with neural networks (Valavani, 2019; Valavani and Alexandris, 2015):

Europas Börsen [ENG: European stock exchanges]
*GR-Output:
Ευρωπαϊκή (European) μετοχές (shares)

Example 3.4.3.2

massiven Sanktionsverschärfungen [ENG: Massive sanctions]
*GR-Output:
μαζικές (massive) κυρώσεις (sanctions) σύσφιξης (tightening)

3.4.4 Missing Compound Word Constituent and Missing Head

Missing constituents in compound words of financial terms may include acronyms, as depicted in Example 3.4.4.1 (Valavani, 2019; Valavani and Alexandris, 2015), and words, as described in Example 3.4.4.2 (Valavani, 2019; Valavani and Alexandris, 2015). In Example 3.4.4.1, the acronym "US", correctly processed for English, is not generated in the Greek output. In Example 3.4.4.2, the head of the compound word "industry" (Greek: "βιομηχανία") is correctly processed by the Machine Translation system; however, the component "Gas" is not processed, although a part of the missing component "natural" (as in "natural gas", the Greek equivalent for "gas") is generated. However, there are cases where the head of the compound word is missing, resulting in output where the grammatical category and basic meaning of the compound word is lost. This case is illustrated in the financial terms described in Example 3.4.4.3 (Valavani, 2019; Valavani and Alexandris, 2015).

Example 3.4.4.1

Missing Acronym (Valavani, 2019; Valavani and Alexandris, 2015):

US-Börsenaufsicht [ENG: US stock market supervision]
*GR-Output:
Επιτροπή (Committee) Κεφαλαιαγοράς (capital)

Example 3.4.4.2

Missing constituent (Valavani, 2019; Valavani and Alexandris, 2015):

Öl-und Gasindustrie [ENG: Oil and gas industry]
[^{N}das Öl$^{\pi}$ + und + ^{N}das Gas$^{\pi}$ + ^{F}die Industrie$^{\Pi}$]
GR-Output:
Βιομηχανία πετρελαίου και φυσικού ??
*Industry oil(genitive) and natural ??

Example 3.4.4.3
Missing compound head (Valavani, 2019; Valavani and Alexandris, 2015):

Rüstungs-, Finanz- und Energiebereich
[ENG: Armaments, finance and energy sectors]
GR-Output:
υπεράσπισης, της χρηματοδότησης και της ενέργειας
*defence of-the funding and of-the energy

3.4.5 Incorrect Word Order and Inserted Words

Another category of typical problems in machine translation of compound words is the incorrect order of constituents in the target language output, as described in Example 3.4.5.1. Furthermore, there are cases in which an extra constituent is inserted in the output in the target language, as shown in Example 3.4.5.2. Specifically, in Example 3.4.5.2, the word “worries” (between asterisks) occurring in the context of the compound “German economy” is incorrectly inserted, resulting in the output “German worries economy”. Errors involving incorrect word order and inserted words in the machine translation of compound words may be partially corrected by

specially designed algorithms (Valavani, 2019; Valavani and Alexandris, 2015).

Example 3.4.5.1
Incorrect word order in target language generation, including machine translation system improvements with neural networks (Valavani, 2019; Valavani and Alexandris, 2015):

Deutsche-Bank-Rivalen UBS
[Output: Deutsche Bank rivals UBS]
Corrected version:
(the) Deutsche Bank rival, UBS (Union Bank of Switzerland)
GR-Output:
αντίπαλο γερμανική τράπεζα UBS
*rival German bank UBS

Example 3.4.5.2
Incorrectly inserted component, including machine translation system improvements with neural networks (Valavani, 2019; Valavani and Alexandris, 2015):

In der deutschen Wirtschaft wurden am Donnerstag schon Befürchtungen laut, dass Russland die Beschlüsse zu Strafmaßnahmen mit gleicher Münze zurückzahlen könnte.

[Output: In the German economy … In the German economy on Thursday were already worried that Russia could repay the decisions on punitive measures with the same coin]

Corrected version: In the German economy there were already worries on Thursday that Russia could repay the decisions on punitive measures with the same coin

GR-Output: Στα γερμανικά *φόβους* οικονομία ήταν ήδη δυνατά την Πέμπτη ότι η Ρωσία θα μπορούσε να ξεπληρώσει τις αποφάσεις σχετικά με τις κυρώσεις με το ίδιο νόμισμα.

*Translation: In German *worries* economy …

3.4.6 Anglicisms

The correct handling of Anglicisms is another issue to be addressed in the processing and translation of compound words. In some cases, Anglicisms are identified and preserved in the target language output, as shown in the correct generation in both English and Greek in Example 3.4.6.1

(Valavani, 2019; Valavani and Alexandris, 2015). In other cases, Anglicisms may be subjected to modifications in some languages or may hardly be used in other languages, where the Anglicism is usually replaced by a translation. In Example 3.4.6.2 (Valavani, 2019; Valavani and Alexandris, 2015), the Anglicism "discount" is used in German as "Discounter" with the suffix and grammatical morpheme "-er", signalizing the plural number. In the translation in Greek, the word "Discounter" is not translated, although the word "discount" is often used as an Anglicism. With the English input "discount markets", the Machine Translation system produces "markets/purchases with discount" in Greek ("αγορές με έκπτωση"), where the compound word "discount markets" is not identified as a term expressing a branch-sector of the economy. The availability of context-specific information and definition of text type may contribute to the correct processing and translation of Anglicisms.

Example 3.4.6.1

Correct output with Anglicisms (Valavani, 2019; Valavani and Alexandris, 2015):

Logistik-Zentren [ENG: Logistics centers]
GR-Output:
κέντρα logistics
*centers logistics

Example 3.4.6.2

Problematic output with Anglicisms (Valavani, 2019; Valavani and Alexandris, 2015):
German input: Weltweiten Discounter-Markt
[Output: Worldwide discounter market]
GR-Output:
παγκόσμια αγορά discounters
*world market discounters

3.4.7 Multiple Errors

Most of the above-described errors usually occur in combination with other errors, as illustrated by Example 3.4.7.1 (Valavani, 2019; Valavani and Alexandris, 2015). Incorrect word order may occur with errors at the Semantic Level (Example 3.4.7.1 (i)), errors including the Morphosyntactic Level (Example 3.4.7.1 (iii, iv, v)), or errors as regards the position of a head (Example 3.4.7.1 (ii)) or an incorrect head (Example

3.4.7.1 (v)), appearing in various combinations. Specially designed algorithms are proposed to contribute to the reduction and resolution of multiple errors in the translation and processing of compound words (Valavani, 2019; Valavani and Alexandris, 2015). In addition, as stated in the case of Anglicisms, a significant percentage of multiple errors may be avoided with the availability of context-specific information and definition of text type.

Example 3.4.7.1
Multiple Errors (Valavani, 2019; Valavani and Alexandris, 2015):

(i) Incorrect word order + semantic error
(kurzfristige Geldmarktpapiere – μέσων χρηματαγοράς βραχυπρόθεσμων -*means moneymarket short-term)

(ii) Incorrect word order + Incorrect position of head
(Dollar-Staatsanleihen -κυβέρνηση του δολαρίου ομολόγων – *state of dollar bonds)

(iii) Morphosyntactic error (Change of word category) + semantic error + missing word
(Schweizer Großbank - ελβετικό τραπεζικό – *Swiss bank (Adj))

(iv) Semantic error + Morphosyntactic error (Error in word category) + incorrect position of head / incorrect word order + Morphosyntactic error
(Branchen- und Wirtschaftszeitung -βιομηχανία και την επιχειρηματική εφημερίδα – *industry and the business newspaper)

(v) Morphosyntactic error + incorrect word order + semantic error + Incorrect head
(Nicht-EU-Abnehmerländern-χώρες μη μέλη της ΕΕ πελάτες -*countries non-members of-the EU clients)

3.4.8 Processing Compound Terms in Financial Texts

The theoretical models for the analysis of compound words described in the previous section may function as the basis for algorithms targeted to directly resolve errors in their translation and processing (Valavani, 2019; Valavani and Alexandris, 2015) (in compliance with the Speed Issue –B), especially in texts rich in terminology. Thus, compound words constituting terminology may be processed for Machine Translation

purposes with the implementation of theoretical models. Unless the Machine Translation system is restricted to a highly specialized domain and/or application with the respective sublanguage or Controlled Language, the complexity of compound words may often require their interactive processing. This practice applies both to Machine Translation systems and to other types of Natural Language Processing (NLP) systems.

We propose the interactive processing of compound words constituting terminology in combination with a proposed re-ordering process of constituents in German compound words, especially in the domain of financial texts (Valavani, 2019; Valavani and Alexandris, 2015). In the proposed re-ordering process of constituents, a rule-based approach is implemented, where the System operates with lexical information from available resources and tools, for example, corpora, lexicons, WordNets (in compliance with the Resources Issue-C), taggers and lemmatizers. The proposed re-ordering process of constituents in German compound words includes a structure recognition algorithm, identifying the structure of compound words, hyphenated compound words, and noun phrases entered by the User. The System identifies the head of the compound or of the noun phrase and activates a process of "head-based re-ordering" (Koehn, 2010), proposing possible solutions to the User. The User may accept or reject a proposed structure or may select from a variety of possible analyses. The identification of the head is of crucial importance in languages where different parameters apply as regards the position of the head (Sternefeld, 2006), as illustrated in the following examples for the language pair German–Greek (Examples 3.4.8.1, 3.4.8.2 and 3.4.8.3).

In the first examples (Example 3.4.8.1.a and Example 3.4.8.1.b), (Valavani, 2019; Valavani and Alexandris, 2015; Koehn, 2010), both the German and the Greek compound word constituting a financial term have the same position of the head and the same order of the constituents. In Example 3.4.8.2.a and Example 3.4.8.2.b, the constituents have the opposite order, resulting in the opposite positions of the heads.

Example 3.4.8.1.a

Example of proposed algorithm output (Valavani, 2019; Valavani and Alexandris, 2015) based on the re-ordering process (Koehn, 2010):

Term: Energy Company

German:
Energiekonzern
[1- Energie] [2- konzern]
[1- Energy] [2- Company]
Order of constituents: [1,2]
Greek:
Ενεργειακή εταιρεία
[1-Ενεργειακή] [2- εταιρεία]
[1- Energy] [2- Company]
Order of constituents: [1,2]

Example 3.4.8.1.b

Example of proposed algorithm output (Valavani, 2019; Valavani and Alexandris, 2015) based on the re-ordering process (Koehn, 2010):

Term: Economic and Monetary Union
German:
Wirtschafts- und Währungsunion (Genitive, unmarked)
[1- Wirtschafts-] [2- und] [3- Währungs] [4- union]
[1- Economic] [2- and] [3- Monetary] [4- Union]
Order of constituents: [1,2,3,4]
Greek:
Οικονομικής και νομισματικής ένωσης (Genitive)
[1- Οικονομικής] [2- και] [3- νομισματικής] [4- ένωσης]
[1- Economic] [2- and] [3- Monetary] [4- Union]
Order of constituents: [1,2,3,4]

Example 3.4.8.2.a

Example of proposed algorithm output (Valavani, 2019; Valavani and Alexandris, 2015) based on the re-ordering process (Koehn, 2010):

Term: Price battle
German:
Preisschlacht
[1- Preis] [2- schlacht]
[1- Price] [2- battle]
Order of constituents: [1,2]
Greek:
Μάχη των τιμών
[2- Μάχη] [1- των τιμών]
[2- battle] [1- of prices]
Order of constituents: [2,1]

Example 3.4.8.2.b

Example of proposed algorithm output (Valavani, 2019; Valavani and Alexandris, 2015) based on the re-ordering process (Koehn, 2010):

Term: Eurogroup chief
German:
Eurogruppen-Chef
[1- Euro] [2- gruppen]- [3- Chef]
[1- Euro] [2- group] [3- chief]
Order of constituents: [1,2,3]
Greek:
Επικεφαλής της ομάδας Euro
[3- Επικεφαλής] [2- της ομάδας] [1- Euro]
[3- chief] [2- of the group] [1- Euro]
Order of constituents: [3,2,1]

In some cases, the sublanguage of the terminology concerned requires the insertion of an additional constituent in the compound word, as demonstrated in Example 3.4.8.3.a and in Example 3.4.8.3.b. In some cases, there is an insertion of more than one word as equivalents to a singular constituent. For example, in Example 3.4.8.3.b, the Greek equivalent for “media” has the analytical form of “media of mass information”, where the constituents “of mass information” define the

constituent “media”. The expression “media of mass information” is the equivalent analytical form of “media” and, therefore, all constituents of the expression are assigned the same number.

Example 3.4.8.3.a

Examples of proposed algorithm output (Valavani, 2019; Valavani and Alexandris, 2015) based on the re-ordering process (Koehn, 2010):

Term: Monetary Financial Institutions (Central banks)
German:
Geldhäuser
[1- Geld] [2- häuser]
[1- Money] [2- houses]
Order of constituents: [1,2]
Greek:
Χρηματοπιστωτικά ιδρύματα
[1- Χρηματο] [3- πιστωτικά] [2- ιδρύματα]
[1- Money] [3- credit] [2- institutions (houses)]
Order of constituents: [1,3,2]

Example 3.4.8.3.b

Examples of proposed algorithm output (Valavani, 2019; Valavani and Alexandris, 2015) based on the re-ordering process (Koehn, 2010):

Term: Retail and media stocks
German:
Einzelhandels- und Medienaktien
[1- Einzel] [2- handels-] [3- und] [4- Medien] [5- aktien]
[1- Retail] [2- trade] [3- and] [4- media] [5- stocks]
Order of constituents: [1,2,3,4,5]
Greek:
Μετοχή Λιανικού εμπορίου και μέσων μαζικής ενημέρωσης (indefinite grammatical number)
[5- Μετοχή] [1- Λιανικού] [2- εμπορίου] [3- και] [4- μέσων] [4-a- μαζικής] [4-b- ενημέρωσης]
[5- stocks] [1- of Retail] [2- trade] [3- and] [4- Media] [4-a- of mass] [4-b- information]
Order of constituents: [5,1,2,3,4,4-a,4-b]

A commonly used strategy that functions independent of the rule-based approach presented here or, in some cases, that functions in combination with a rule-based approach, are practices based on statistical models (or neural networks). Statistical models operate on parallel corpora processing language models on large sets of data acquired from the corpora. The size of the parallel corpora and data processed usually determines the degree of robustness of the language models and related statistical models used. In other words, it may be noted that the larger the corpora, the better the translation quality. If the proposed rule-based approach is used, the above-described re-ordering process may be activated after the recognition of compound words. Compound word recognition may be statistically based and/or assisted by language resources and tools, for example, lexicons and taggers.

The efficiency of rule-based approaches or statistically-based approaches or a combination of both is not only determined by the size of parallel corpora and data processed by the proposed algorithms and statistical models, but also by the degree of specialization of the domain and/or application concerned. The degree of specialization of a text containing terminology and compound word terms is directly related to text type and audience or users concerned.

3.5 Terminology Management and Audience Type

3.5.1 Terminology and Level of Expertise

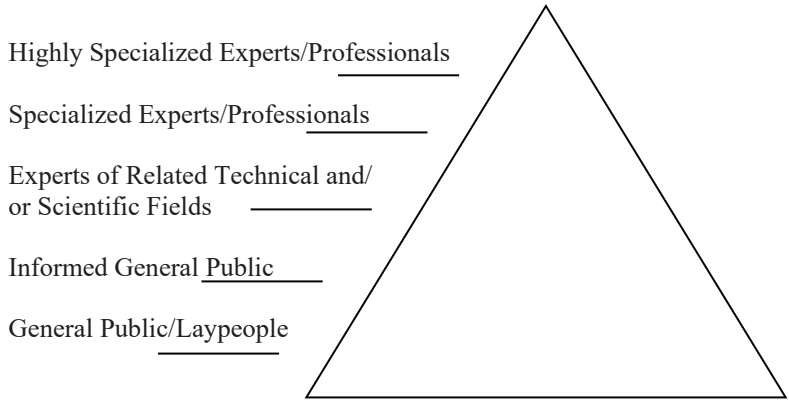
The second factor related to the above-presented question of "Where" is the factor of target readership or audience. In particular, the factor "domain", concerning context-specific information and text type, is related to the correct analysis and the correct choice of terms in respect of the factor "target audience/users" (the Audience Factor).

The level of expertise of the terminology users and the readership of the respective texts may, in some cases, determine the terminology type, linguistic parameters and nature of linguistic issues to be resolved. These levels can be depicted in the Communication Pyramid (Desblache, 2001; Alexandris, 2013), as described by Lucile Desblache. In particular, the peak of the pyramid, constituting the smallest section of the structure, corresponds to highly specialized experts and highly specialized professionals. The lower part of the peak corresponds to specialized experts and specialized professionals. The middle levels of the Communication Pyramid correspond to the experts of related professional, technical and/or scientific fields as well as the informed general public. The bottom of the

pyramid, constituting the largest section of the structure, corresponds to the general public.

These differentiations, ranging from highly specialized experts and highly specialized professionals to the general public, are of crucial importance in texts covering a broad spectrum of domains, degrees of expertise and levels of administration/government in both the public and the private sectors. This is the case for some types of spoken political and journalistic texts related to the domains of Finance and/or International Affairs (Geopolitics, the Military). In addition, the general public's degree of familiarity with different types of terminology may vary among Member State countries of an international organization or even among communities within the same country.

Figure 3.5.1: The Communication Pyramid according to Desblache, 2001 (Alexandris, 2013)



Therefore, the use of either specialized terminology or more general terms is not only typical of a wide range of scientific fields and professional domains, but it is also related to the diversity of the target (national or international) audience. Thus, considerations similar to User Requirements in software design are taken into account for the target audience of the terminology concerned. The Audience Requirements for the scientific field and/or professional domain terminology determine the choice and degree of analysis and/or reformulation of terminology, as well as the structure and style of the texts to be processed: languages may vary both in respect of (a) the choice of possibilities and flexibility of versions

and forms of specialized terminology versus more general terms and in respect of (b) the acceptable style and structure of texts.

3.5.2 Cultural Aspects and Terminology

Requirements for an international audience (Alexandris, 2010) involve cultural aspects that are directly related to linguistic issues concerning (i) the choice of terms and/or terminology, (ii) the possible reformulation of terms – often based on their correct analysis, and (iii) the impact of terms on sentence structure and the general structure and style of the transcribed or processed texts produced.

The cultural backgrounds of the international audience are directly related to the cultural aspects of spoken journalistic texts. Cultural aspects play a substantial role in perceiving and understanding linguistic features. Therefore, cultural aspects related to the target audience influence procedures and practices related to processing spoken political and journalistic texts.

As regards Audience Requirements, the recipients may speak no foreign language or very little of a foreign language, or they may have a satisfactory competence of a foreign language for basic transactions in private and professional life, or they may have an above-average or even a fairly good fluency of a foreign language or more than one foreign language (Table 3.5.1) (native or near-native speakers are not included). In other words, the international public may be divided into groups, depending on (a) knowledge or fluency of a foreign language and (b) exposure to international culture. This is an important factor in the use of Anglicisms or other foreign language terms used by an international professional or scientific community that are introduced into spoken political and journalistic texts. In this case, terms may not always be familiar to a more general public in one country and language community, as opposed to another country and language community.

Table 3.5.1: Audience Groups: Foreign Languages

International Audience and Foreign Languages:
speak no foreign language or very little of a foreign language
satisfactory/average competence in a foreign language for basic transactions
above-average/fairly good fluency in one or more foreign languages (native or near-native speakers are not included)

It should be noted that recipients in an international audience (international public) may be very fluent in a foreign language or more than one foreign language, but are either non-native speakers and/or often lack the necessary exposure to the culture related to the foreign language concerned.

The perception and understanding of terminology by a general public and international audience is not only related to the possible use of expressions originating from a foreign language, but is also related to the familiarity of scientific terms and/or terms in a professional domain in the everyday life of a language community. For example, specialized financial terms become more familiar in a society where politics become increasingly connected to the International Market or where a considerable percentage of citizens are interested in the Stock Market. In this case, many financial terms may not require any explanation or reformulation.

The determination of Audience Requirements may not be necessary for specialized professionals or for non-expert users of terminology with an above-average or even a fairly good fluency in one or more foreign languages. Examples of the latter category are journalists, economists and other professionals working with multilingual written and spoken texts – including government officials, either in specialized domains or in general fields.

3.5.3 Audience Types in the International Public

3.5.3.1 Introduction

The International Public as an Audience Type may be divided in three (3) general categories depending on the:

(i) general social and cultural context in which the discussion or interaction takes place;
(ii) Speaker or Audience expectations from the discussion or interaction;[12] and
(iii) Speaker or Audience behaviour, reflecting the degree of familiarity of the society with the topic or domain discussed.

In journalistic texts for the International Public, these differences are not limited to the typical differences observed concerning age, gender, professional and personal interests, and general lifestyle. Specifically, the relationship between Speakers and Audience reflects the degree of familiarity of the society with the topic or domain discussed. It may be observed that the International Public can be divided into the categories: Experienced Audience, Inexperienced Audience and "Distantiated" Audience (Alexandris, 2013).[13]

3.5.3.2 Audience Types and Choice of Terms and Terminology

As previously discussed, the choice of terms and/or terminology is related to the needs and characteristics of the target audience, readership or user groups. The choice and type of formulation of terms and terminology are determined by the features of the target user group and any related socio-cultural factors. Three general categories of Audience Types are distinguished.

[12] This categorization reflects User expectations from the System (Wiegers and Beatty, 2013: 102-108, Alexandris, 2010: 3-11, Alexandris, 2013: 5-18)
[13] This categorization reflects multilingual applications for the general and international public Experienced Users, Inexperienced Users and Distantiated Users (Alexandris, 2013: 5-18).

- **Experienced Audience**

The first category may be classified as "Experienced Audience" and involves recipients in communities where the general public has a significant familiarity with the topic or domain concerned. In this case, minimal or no additional adaptations or processing of the terminology concerned are necessary.

For example, in the case of a (high) technology topic, computers, or, in general, most types of electronic devices in any form, an "Experienced Audience" is typical of many recipients in various countries, especially professionals and the younger generations. In most of these communities there is a traditional relationship with electronic devices and machines in general.

These features are also typical of countries with an industrial tradition, where the traditional relationship of society to machines has existed since the Industrial Revolution. Additionally, in other countries (for example, in some Asian countries), the rapid development of electronic technology and the significant innovation in areas such as software and robotics has contributed decisively to the absolute familiarity of society with computers and electronic devices, and in some cases, there is a tendency towards attachment (Matsumoto et al., 2009) or animism of these objects. This tendency is most visible in the pictures and diagrams that accompany various manuals of devices from some of these countries, where the devices often seem to have the characteristics of a living body such as eyes and mouth, and speak or express emotions (for example, act bothered when they are cleaned or when they are installed incorrectly). These entities may be compared in their behaviour to domestic pets.

- **Inexperienced Audience**

In contrast to the first Audience category, another Audience category concerns recipients belonging to communities where the general public is only very recently acquainted with the topic or domain concerned.

In the above-described example of the (high) technology topic, this is the case where the relationship between the general public and high technology electronic devices and computers is recent. In this case, any real experience with computers and electronic devices is restricted to only a minority of Users. This Audience group is also typical in some remote areas (mountains, islands) with mostly elderly inhabitants. Recipients of this category, which may be described as an "Inexperienced Audience", may belong to communities with little relation to (high technology)

electronic devices or machines. Such a relationship with a computer is common in many developing countries, where there has been a relatively recent introduction of sophisticated electronic devices, computers, and even Human–Computer Interaction Systems, especially in schools, hospitals and community clinics and local authorities, mainly within the framework of government development programs or projects of international organizations. For these Users, the computer or device (for example, a mobile phone) is a new element in their daily lives.

For the Audience of the second category, the information conveyed with the terminology concerned should be adapted or processed in order to be easily understood by all recipients. Simple expressions and explanatory elements should be used.

- **"Distantiated" Audience**

A third category of Audience type to be considered are recipients in communities where the general public has knowledge but may not have either a significant degree of familiarity or a significant degree of interest of the political, social or scientific topic or domain concerned.

In the above-described example of the (high) technology topic, this is the case when the general public is not characterized by a traditional relationship of society to machines, and where there has also been no recent introduction of electronic devices and computers. In this case, the majority of Users have an experience with computers and electronic devices. In addition, for the majority of the general public, computers and electronic devices do not generally constitute an element of culture and lifestyle. These recipients may be characterized as a "Distantiated Audience". In the case of the (high) technology topic, this Audience group is also typical in professions and occupations not directly related to (high) technology applications and is also typical in older generations.

In communities with a predominately "Distantiated" Audience, there should be a balance between using too much terminology and professional jargon and using simplistic terms with too much explanatory information. In this case, the decision-making process is facilitated by direct access to all types of acceptable options, either in a dictionary or language resource.

- **Common Topics with varying Audience Types**

Topics discussed in political and journalistic texts that usually have an "Experienced", an "Inexperienced" and a "Distantiated" Audience in the international public are:

- Domestic Policy,
- Geopolitics (International Relations),
- Economy/Finance and
- Environmental Issues.

To facilitate terminology management, the use of an interactive application is proposed, presented in the following Section (3.6). The proposed application presents the choice and possible reformulation of terms within the context of sentence structure, text structure and acceptable style for the Audience Type concerned, ensuring "understandability", correctness, appropriateness and efficiency of the terms used.

3.6 Resource Input and Interactive Applications for Terminology Processing

3.6.1 Development of Applications for Multiple Domains and Multiple Languages

The previous section illustrated the complexity of the "Audience" factor of terminology in spoken political and journalistic texts. The degree of complexity in terminology management increases when terminology from multiple domains requires translation and/or processing in one or multiple languages. Terminology from multiple domains may occur both in highly specialized and in less specialized texts.

- **Financial Terms and Military Terms**

Typical categories of terminology that may co-occur in highly specialized and in less specialized texts are terms from the domains of Finance and the Military, both frequently occurring in spoken political and journalistic texts. This group of co-occurring domains and their terminology is very common and is accessible to a wide range of Audience Types and user groups, including the international public.

Apart from highly specialized contexts, financial terms and military terms occur in texts intended for non-specialist professionals and/or decision-makers, such as journalists, politicians and managers. These texts often contain terminology from more than one specialized domain, often resulting in ambiguities and other complications in translation or processing due to an overlap in the related fields of specialized terms. The degree of complexity in processing such text types increases when multilingual texts and an international public are involved (Alexandris, 2013). In this case, the application processing texts and terminology must be characterized by the possibility to manage terminology from (1) multiple domains, (2) with precision and correctness, (3) speed and efficiency. An application designed to handle this task (Valavani et al., 2015) is based on the integration of the elements of "domain" and "audience/users", both related to the question of "Where", presented at the beginning of the present chapter.

3.6.2 Application Design for Transcribed Journalistic Texts

3.6.2.1 The "Safety Mode" Interactive Analysis (SMI Analysis) with Resource Input

In the designed application, the identification of sublanguage type in each section of the processed (transcribed) text (text block) (Sublang-Type) allows the separate treatment and processing of multiple sublanguages, as well as sublanguage-related error prediction and ambiguity resolution (in compliance with the Speed Issue-B). The language-independent "Safety Mode" Interactive Analysis (SMI Analysis) (Valavani et al., 2015) presented here, based on analytical forms employed in Controlled Languages (Lehrndorfer, 1996), includes the identification of "hidden" compound or multiword terms with the signalization of the chosen sublanguage. It is noted that Controlled Language specifications are targeted to exclude ambiguity and polysemy in sentence content and the terminology it contains (Smart, 2006; Wojcik and Holmback, 1996; Lehrndorfer, 1996; Alexandris, 2009).

Terms can be subjected to interactive analytical processing if requested by the User: ambiguities may be resolved, both across sublanguages and within the same sublanguage. For selected sets of words, including multiword terms, a list of candidate sublanguages is signalized with the respective tag. This is of special importance in specialized terminology appearing in texts such as political and journalistic texts. The User decides the type of sublanguage activated, if multiple sublanguages are concerned.

In particular, the signalization of the sublanguage type helps resolve ambiguities – for instance, in the case of terms such as "unit", which corresponds to different concepts in the sublanguages of Finance-Economy, Computer Science – Information Technology (IT) and the Military. The identified domains are related to corresponding lexica (dictionaries), databases, corpora and other resources (Resources-C).

Different domains corresponding to different sublanguages are already indicated in the structure of the Universal Words within the framework of the UNL language resource (Uchida et al., 2005; Uchida et al., 1999), as well as in systems such as OWL (Loaiza et al., 2014) or in other applications and language resources (the use of Resources Issue –C). Especially in languages highly productive in compound words, such as German, sublanguage type signalization helps identify and separate fixed expressions and specialist terminology from other types of compound words and multiword expressions (such as "ad hoc" compounds in German, Busch and Stenschke, 2008), the latter often requiring a morphological analysis for the convenience of international Users.

Furthermore, as stated above, the signalization of the sublanguage type helps identify "hidden" compound/multiword terms. For example, in the case of the multiword term "Unions-Wirtschaftsfluegel" in German (retrieved from financial texts), the implied or "hidden" component is the word "Partei" – "political party", and the word "Union" corresponds to different semantics according to sublanguage and context. The multiword term "Unions-Wirtschaftsfluegel" (literally "business wing of the Union party") (Valavani et al., 2015) requires expert knowledge for further processing and/or translation in the target language. Another example is the military term "patrol", where the "hidden" component is the word "unit", as a part of the compound term "patrol unit". In addition, the term "patrol (unit)" is differentiated from the verb "(to) patrol" (Xue et al., 2012).

The identification of a chosen sublanguage type allows the automatic processing of a specific sublanguage to be activated, if applicable. If a sublanguage is chosen and activated, the option of the language-independent "Safety Mode" Interactive Analysis (SMI Analysis) module may function as a "stepping stone" or "safety net" (Lewis, 2009; Lewis, 2010) if problematic cases are encountered. If ambiguities occur within the same sublanguage, differences in semantic content and possible readings are presented to the User. This is the most usual case with compound words and multiword terms.

The first feature of the proposed design is the analysis of the incoming text in separate blocks, corresponding to the existing paragraphs, since in these types of texts (financial or military domain) a different type of information and sublanguage may be predominant in different paragraphs. The type of sublanguage is identified in each block (Sublang-Type), allowing the identification of multiple sublanguages and their separate treatment and processing. Text is analysed in blocks to identify the sublanguage, which is subsequently linked to the User's choice to activate the option of "fast-track" or "safety-mode", namely a partially interactive or a fully interactive mode (Valavani et al., 2015).

3.6.2.2 Interaction: Sublanguage Identification, the "Safety Mode" and "Fast-Track" Option

The "fast-track" or "safety-mode" option constitutes the second feature of the proposed design (the Speed Issue – B). The "fast-track" option is a partially interactive mode to be chosen by Users with expert knowledge of the predominant sublanguage type identified and/or whose native language shares many common features with the language of the text processed (for example, if the language pair is English and Dutch). The "safety-mode" option with the language-independent "Safety Mode" Interactive Analysis (SMI Analysis) is a fully interactive mode to be chosen by Users with a general knowledge but no expertise in the predominant sublanguage type concerned and/or whose native language shares few common features with the language of the text concerned (for example, Greek and Chinese). The "fast-track" option can be activated according to User choice, allowing the adaption of the present interface to various levels of expertise.

As a first step in the interaction, the User inserts the text in the respective field of the designed editor. The module signalizes the sublanguage type with the largest percentage of terms, indicating candidate sublanguage types. In the second step of the interaction, the User chooses the sublanguage type and then either activates automatic processes related to the chosen sublanguage or selects any problematic words constituting specialized terminology. In this case, the module activates a "stepping stone" or "safety net" mode (Lewis, 2009; Lewis, 2010), similar to strategies employed in Speech User Interfaces (SUIs) (Jurafsky and Martin, 2008; Jurafsky and Martin, 2010).

3.6.2.3 The "Safety Mode" Interactive Analysis (SMI Analysis) and Compound Terms

In order to ensure a simplified form of an independent analysis across languages and language families, the presented analyses in the "Safety Mode" Interactive Analysis (SMI Analysis) are neither identical to nor similar to but compatible with the presentations of logical relations with the Universal Word –UNL framework and its resources (Uchida et al., 2005; Uchida et al., 1999): The Universal Networking Language: http://www.undl.org.

Compound words or multiword terms are analysed according to the parameters of the natural language concerned. For example, in German compound terms and multiword terms, the component constituting the "head" of the term (Sternefeld, 2006) is identified, and a set of possible relations between the components is shown with the indication of the most probable reading (Valavani et al., 2015). This feature is of special importance in cases where neologisms are concerned or in very productive languages such as German, where there is a continuous formation of new ("ad hoc") compound words.

The types of analyses depend on the types of natural languages concerned. In the case of German, multiword compound words are identifiable, as most components occur as a single string, in some cases separated by a dash. By applying morphological parameters, the head of German compound words and multiword terminology is identified to the right (Sternefeld, 2006).

It is observed that in English and Greek expressions constituting multiword terms, the terms do not occur as a single string and are not always easily identified, even by human editors or translators. In particular, in the following example (Example 3.6.2.3.a), the financial term "Preisschlacht" (German) – "price war" (English) both constitute compound words in both languages and are analysed as "war/battle between/about prices", an analysis which assists the conversion of the term into its equivalent and acceptable form in cases (or in languages) where there is no respective term in the form of a compound word, such as Greek. Additionally, there are cases where the context or even the readership-user group (and target audience Type) plays the decisive role in determining whether an equivalent term may be generated as a compound word or in more analytical form, as in the example of "Umsatzrückgang" (German) (Example 3.6.2.3.a), translated as "decline in sales" or "sales decline" and analysed as "decline/fall of sales".

Example 3.6.2.3.a

"Safety Mode" Interactive Analysis" (SMI Analysis) of German Financial Terms (Valavani, Alexandris, Tassis and Iliakis, 2015).

GERMAN-INPUT (TEXT):	SMI-ANALYSIS:	ENGLISH TERM:
Preisschlacht [^{M}der Preis+ ^{F}die Schlacht-HEAD] GR-ANALYSIS: Μάχη των τιμών [^{F}η μάχη (the battle)+ ^{F}η τιμή (the price)]	[war/battle OF prices] [war BETWEEN /ABOUT prices]	price war
Umsatzrückgang [^{M}der Umsatz$^{\pi}$ + ^{M}der Rückgang-HEAD] GR-ANALYSIS: Πτώση των πωλήσεων [^{F}η πτώση (the fall)+ ^{F}η πώληση (the sale)]	[decline/fall OF sales] [sales SUBJECT decline VERB] [lowered sales]	decline in sales (Or :) sales decline

Alternative analyses are presented in the interface, according to which components in the multiword terms are chosen to have a closer relation to each other (Valavani et al., 2015). Presented SMI analyses are a simplified form of logical relations between components, for example, "BELONGS-TO", and "OBJECT-OF-ACTION" (Valavani et al., 2015). Furthermore, as in analytical forms of Controlled Languages (Xue et al., 2012), multiword terms can be converted into sentences.

For example, in the case of military terms constituting compound words, the analytical forms presenting the logical relations between components allow the insertion of additional words and respective information for the transfer and generation of their precise and acceptable form in the target language. In Example 3.6.2.3.b, the term "Military Intelligence" is analysed as "Service for Military Intelligence", to be generated as "Service (of/for-Genitive case)-Intelligence/Information (of/for for-Genitive case)-Army – Υπηρεσία Πληροφοριών Στρατού" in Greek. With a similar procedure, in Example 3.6.2.3.b, the term "Army Assault Team" is analysed as "team for assault of Army- team belongs to Army", to be generated as "Team (of/for-Genitive case)-Assault (of/for for-Genitive case)-Army – Ομάδα Κρούσης Στρατού" in Greek. We note

the importance of the grammatical feature of case, which is essential for the correct analysis of terms in Greek and in other European languages rich in these types of morphological features. Furthermore, it should be noted that the terms in Example 3.6.2.3.b also illustrate the importance of the determination of sublanguage for the correct choice of words and expressions constituting terms. In particular, as illustrated in Example 3.6.2.3.b, in the domain of Military Terminology, the concept and term "information" ("Πληροφοριών" – genitive plural) when related to services is replaced by the term "intelligence" in English. In a similar way, in the domain of Military Terminology the term "assault" corresponds to the equivalent term ("assault") in Greek ("κρούση"), where the same word "κρούση" also corresponds to the concepts "attack, strike, impact, knock-tap and probing-test", according to context and domain.

Example 3.6.2.3.b

"Safety Mode" Interactive Analysis" (SMI Analysis) of English Military Terms (Valavani, Alexandris, Tassis and Iliakis, 2015).

UW GENERATED TERM (UNL resource):	SMI-ANALYSIS:	GR - TERM:
[Στρατιωτικών Πληροφοριών] "Military Intelligence"	[Service FOR Military Intelligence] => (Identified by SUBLANG-TYPE)	[Υπηρεσία Πληροφοριών Στρατού] "Military Intelligence"
[Στρατός Assault Team] "Army Assault Team"	[Team FOR Assault OF Army] [Team SUBJECT-OF-ACTION Assault] [Team BELONGS-TO Army]	[Ομάδα Κρούσης Στρατού] "Army Assault Team"

In the designed application, the statistics of Users' choices for the possible analyses presented can be registered and assigned a respective probability (Valavani et al., 2015).

Unaided automatic ambiguity resolution may be problematic for Systems processing diverse languages and language families, especially

when significant differences in fundamental elements expressing logical relations and grammatical information are concerned. The "Safety Mode" Interactive Analysis (SMI Analysis) process combines automatic and interactive processing (in compliance with the Speed Issue –B), integrating expert knowledge and Controlled Language practices, allowing the User to proceed with fast-track editing of the texts with specialized terminology or to activate the interactive-analytical "stepping stone" or "safety mode", as applied in Speech User Interfaces (SUI) Systems (Lewis, 2009; Lewis, 2010). This possibility is compatible with the needs of professionals managing spoken texts and written documents typically combining various domains: journalists, translators, officials, experts and administrative staff in the government, research and industrial sectors.

The designed application, integrating analyses available from resources (Resources-C), may be integrated in existing tools and/or adapted to text-types and users in various domains.

- **The SMI Analysis in the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)**

For the annotation of terminology and ambiguous phrases requiring additional processing (Level 1), the "[SMI]" tag is integrated within the framework of the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) described in the previous chapter (Chapter 2). The interactive annotation of the previously described grammatical and semantic features includes the analysis of terminology and ambiguous phrases (Level 1).

The "[SMI]" tag is connected to the respective strategies applied, with the link to the appropriate resources (Figure 3.6.1). In particular, the "[SMI]" tag may function as a "button" for the activation of the previously presented "Safety Mode" Interactive Analysis (SMI Analysis) processes. The inserted tags may also assist other processes such as (machine) translation or the insertion of subtitles.

Figure 3.6.1

Transcription Tool Outline	
Speech Signal	
Text	text- text- text- text- text- text- text- text- text- [& Machine Translation Option]
Speaker Turns and (Basic) Annotation	Speaker A/ annot-text- annot-text- Speaker B/ annot-text- annot-text
Proposed Annotations	annot-text-[Terms / Complex-Info/ Prosody-Paraling]

Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)		
Input	**[SMI] TAG** (SMI–Analysis)	**Activation of [SMI] process** and choice of equivalent expressions

CHAPTER FOUR

STRATEGIES FOR MANAGING AND EVALUATING COMPLEX INFORMATION IN SPOKEN JOURNALISTIC TEXTS

4.1 Complex Information and the Pragmatic Factor

4.1.1 The Complexity Issue

In the previous chapter it was demonstrated how the elements of "domain" related to text type and the Audience factor (I) are related to the choice of terms and terminology in spoken political and journalistic texts. The present chapter addresses the issue of complex semantics (the Complexity Issue – A) in spoken political and journalistic texts and the connection to the Pragmatic Level factor (II) for their resolution.

A basic feature contributing to the complexity of spoken journalistic texts is the presence of implied information and connotative features, reflecting the attitude, opinion and overall position of the Speaker(s) concerned. The presence of this type of content usually occurs in subtle forms, although in some cases its presence is evident from the use of characteristic types of words and expressions and paralinguistic features – for example, various forms of shouting, cries or laughter.

Other typical indicators of implied information and connotative features are fixed expressions and idioms. Yet it should be noted that fixed expressions and idioms do not occur often enough in texts to signalize a point of view or attitude conveyed. Fixed expressions and idioms seldom constitute implied information that is not noticed since they are usually easily detected, even by non-native speakers with a fair command of the language concerned. They are also easily accessed in specialized dictionaries for idiomatic expressions and in other printed or online resources.

An analysis and evaluation of grammatical and semantic features of words and expressions with semi-automatic and interactive procedures involving the Pragmatic Level is proposed, aiming at the correct and complete evaluation and/or transfer of information content, including indicators of a Speaker's attitude and intentions.

Content involving implied information and connotative features and reflecting the intentions, opinions, attitudes and overall behaviour of the Speaker(s)-Participants concerned will be henceforth referred to as "non-neutral" content in spoken utterances.

4.1.2 Characteristic Features of Transcribed Spoken Journalistic Texts

As previously discussed, the evaluation, translation, machine translation or other forms of processing of transcribed journalistic texts is often a complex task. In interviews and discussions, beyond headline news and formal statements, spoken journalistic texts concern a wide range of elements that pose challenges in their translation and processing, especially since not only what is said, but how it is said is of equal importance.

Furthermore, as previously described (Chapter 2), transcribed spoken political and journalistic texts are usually not domain-specific, making them less than ideal input for Natural Language Processing applications such as Machine Translation: Machine Translation is ideal for written and domain-specific texts (Jurafsky and Martin, 2010, Werthmann and Witt, 2014).

The following phenomena constitute issues in the evaluation, translation, machine translation or other forms of processing of (transcribed) spoken journalistic texts:

Spoken political and journalistic texts, especially if they not domain-specific/specialized texts, are often characterized by "non-neutral" content, namely:

(a) ambiguity;
(b) implied information and connotative features; and
(c) socio-cultural features.

Spoken texts contain additional information constituting (d) paralinguistic features, which are also related to socio-cultural features.

Spoken-transcribed journalistic texts may contain a high degree of the above-presented phenomena, due to the nature of their content related to politics and society.

Additional factors of complexity are general cross-cultural differences with respect to communication where opinions may or may not be explicitly expressed, where silence may or may not function as an

acceptable response (Du et al., 2017) or where elements such as word play, understatements and irony may or may not be widely used.

From the international public, most experts – such as journalists, economists and other professionals working with multilingual written and transcribed journalistic texts available from the media and the web – usually have an above-average or even a fairly good fluency in a foreign language (for example, English) or more than one foreign languages, but are may be non-native speakers and/or often lack the necessary exposure to the culture(s) related to the foreign language(s) concerned, especially if the place of work/correspondence changes frequently. Thus "non-neutral" content, including essential information presented either in a subtle form or in an indirect way ("explicitation", De Silva, 2006), such as text-in-context relationships and socio-textual practices, is often undetected.

The international public – a broad and varied type of audience – is generally interested in having an insight into a specific issue or event from an insider's or an outsider's point of view or from an international perspective. These points of view are not always explicitly expressed and are rather conveyed in an indirect manner. Titles often give a fair idea of the degree of neutrality in a journalistic text; however, this does not apply in all cases. To perceive implicit information and to understand the speaker's or author's spirit, the reader or viewer has to "read between the lines" (Alexandris, 2010). Some members of the international public seem to face particular challenges due to the linguistic and cultural features of their mother tongue, as in the case of Japanese students facing difficulties in understanding verbal irony in American English (Davis, 2000).

Furthermore, the international public often has to make choices in respect to what types of online spoken/written journalistic texts to use for professional purposes and what types of online spoken/written journalistic texts to omit and/or discard.

In some cases, the User-Journalist seeks texts with "non-neutral" content, providing emotionally and socio-culturally "marked" elements, namely implied information and connotative features beyond the framework of the "Who/What-When-Where-(How)" information content. In other cases, the User-Journalist seeks texts containing neutral, "unmarked" information. This decision-making process may be time-consuming, since the User-Journalist is required to read the text many times. Detailed reading is required to check whether the text contains "non-neutral" content: connotative features, speaker and culture-dependent emotionally and socio-culturally "marked" elements, and implied points of view.

4.1.3 The Pragmatic Factor in Spoken Journalistic Texts

4.1.3.1 Speech Acts and the Pragmatic Level

Unlike many text types, in the speech acts (Austin, 1962; Searle, 1976) of spoken political and journalistic texts, all five basic kinds of illocutionary acts defined by Searle (1976) are represented, namely Assertives (or Representatives), Directives, Commissives, Expressives and Declarations.

Searle (1976):

Representatives. "The point or purpose of the members of the representative class is to commit the speaker (in varying degrees) to something's being the case, to the truth of the expressed proposition. All of the members of the representative class are assessable on the dimension of assessment which includes true and false. […]"

Directives. "The illocutionary point of these consists in the fact that they are attempts (of varying degrees, and hence, more precisely, they are determinates of the determinable which includes attempting) by the speaker to get the hearer to do something. […]"

Commissives. "[…] Commissives then are those illocutionary acts whose point is to commit the speaker (again in varying degrees) to some future course of action. [...]"

Expressives. "The illocutionary point of this class is to express the psychological state specified in the sincerity condition about a state of affairs specified in the propositional content. The paradigms of Expressive verbs are 'thank', 'congratulate', 'apologize', 'condole', 'deplore', and 'welcome'. Notice that in expressives there is no direction of fit. In performing an expressive, the speaker is neither trying to get the world to match the words nor the words to match the world, rather the truth of the expressed proposition is presupposed. […]"

According to recent research (Ilić and Radulović, 2015), commissive illocutionary acts are identified as "indicators of politicians' explicit commitment to a chosen course of action" and expressive illocutionary acts as "indicators of politicians' explicit attitudes to their own or other politicians' chosen practices" (Ilić and Radulović, 2015). However, in spoken political and journalistic texts, it has been observed that these five

basic kinds of illocutionary acts are distributed across various types of interactions between Speakers-Participants.

Recently proposed computations of a speech act's meaning in a given situation are connected to an array of factors (Nolan, 2017): "lexicon and language grammar, recognition of belief, desire and intentions in the type of situation and the associated illocutionary force, cultural conventions, general, specialist and cultural knowledge, common ground". Furthermore, alternative taxonomies of speech acts are proposed based on the factor of "Politeness" versus "Impoliteness" (Katz, 2015).

These approaches contribute to the analysis of the speech acts encountered in spoken texts. However, additional factors and parameters are required for a correct in-depth analysis, evaluation and processing of spoken political and journalistic texts, especially if an international audience is concerned. These factors and parameters include the relation of the speech act to the type of spoken journalistic text and the detection of implied information in Speaker behaviour.

4.1.3.2 Spoken Journalistic Text Types: Headline News and News Reports

In headline news or news reports, journalistic text types can be differentiated at the Pragmatic Level according to the type of speech act performed in them. The basic speech acts in journalistic texts can be divided into four types, namely "Announcement", "Description", "Declaration" and "Expression" (Alexandris and Fotinea 2004) (Table 4.1.1).

The "Announcement" Speech Act involves the announcement of news. This speech act is performed by journalists (anchor-men and correspondents) only and may be described as the type of speech act performed in most online spoken/written journalistic texts constituting headline news (Table 4.1.1).

The "Description" Speech Act (performed by all speakers and, in rare cases, by politicians) involves the description of a situation. In most online spoken/written journalistic texts, this speech act is performed by correspondents (Table 4.1.1).

The "Declaration" Speech Act is related to the declaration of one's opinion, position or the announcement of facts. The "Declaration" Speech Act is performed by politicians and by non-politicians, namely professionals such as government officials, police chiefs, doctors, or experts in a scientific field. The "Declaration" Speech Act is also performed by journalists explicitly stating their opinions (Table 4.1.1).

The "Expression" Speech Act involves the expression of one's feelings and is usually limited to speakers that are neither journalists nor politicians (Table 4.1.1). However, speakers/journalists may implicitly express their opinions or even their feelings in contexts appearing to be "Announcement" or "Description" Speech Acts. In these cases, essential information, presented either in a subtle form or in an indirect way, is often undetected, especially by the international public.

The above-presented speech act types correspond to the most typical Speaker type performing them and may be referred to as pre-defined "explicit" speech acts, determined by the type and content of the Headline News program in the Media. In other words, in a Headline News program, news is announced by the Journalist-Anchor(s), Journalist-Correspondents are asked to describe an event or situation, Politicians make declarations and people are asked to describe an event or situation or to express their feelings. Speakers performing speech acts other than the one(s) typically corresponding to them may display characteristics of other Speaker types related to them. For example, politicians may be asked to describe or express and can, therefore, display characteristics of other Speaker categories such as "Non-Trained Speakers: Officials, Professionals" or "Non-Trained Speakers: General Public" (Table 4.1.1).

Table 4.1.1 Speech Act type and correspondence to most typical Speaker type in Headline News (Alexandris and Fotinea 2004).

	Announce	Describe	Declare	Express
Journalist-Anchor	Yes			
Journalist - Correspondent	Yes	Yes		
Politician			Yes	
Non-Trained Speakers: Officials, Professionals			Yes	Yes
Non-Trained Speakers: General Public		Yes		Yes

4.1.3.3 Interviews and Panel Discussions

In interviews and panel discussions, interactions between Speakers-Participants often involve argumentation and explanation of viewpoints and opinions in respect to questions asked by the journalists ("Obtaining Information Asked") and the answers provided ("Providing Information Asked"). In other words, interviews and panel discussions include "Argumentation" and "Explanation" Speech Acts.

The "Argumentation" and "Explanation" Speech Acts can directly express the Speakers' intentions. However, they can be related to illocutionary acts not restricted to "Obtaining Information Asked" or "Providing Information Asked" concerning one or more of the following three categories of pointers to implied ("Hidden") Speech Acts, analysed in Section 4.4.:

"Express Policy",
"Make Impression" and
"Presence".

For journalists, the "Express Policy" pointer concerns expressing a widely accepted opinion or a policy of the network concerned. For interviewees, the "Express Policy" pointer concerns actively representing a policy, in addition to expressing an opinion requested in the discussion or interview.

For journalists, the "Make Impression" pointer concerns the strategy of purposefully creating tension in the interview or discussion in order to make the interaction more interesting to the viewers and audience. For interviewees, the "Make Impression" pointer concerns purposefully displaying power.

Furthermore, the "Presence" pointer expresses the Speaker's reluctance to answer questions, avoidance of topics, even silence as an answer in order to signalize a polite or symbolic presence in the discussion or interview, but not an active participation.

Implied Information and connotative features and other types of "non-neutral" content in spoken journalistic texts are related mainly to the "Express Policy" and "Make Impression" pointers to "Hidden" Speech Acts. Thus, the speech acts and pointers to speech acts in spoken political journalistic texts may be summarized as follows (Table 4.1.2**)**:

Table 4.1.2 Speech Act types and pointers to speech acts in spoken political journalistic texts.

Headline News ("explicit" Speech Acts): Announce (ANC) Describe (DESC) Declare (DECL) Express (EXPR) Other Interviews – Discussions ("explicit" Speech Acts): Announce (ANC) Describe (DESC) Declare (DECL) Express (EXPR) Argumentation (ARGM) Explanation (EXPL) Other Pointers to "implied" ("Hidden") Speech Acts: "Express Policy" (POL) "Make Impression" (IMP) "Presence" (PRES)

4.1.3.4 "Non-Neutral" Content in Transcribed Spoken Journalistic Texts

The above-presented speech act types and implied illocutionary acts are linked to the proposed strategies for the evaluation, processing and transfer of complex information in spoken political and journalistic texts. The strategies described in the present chapter constitute a part of the proposed general framework for both the correct and efficient analysis and/or processing (A) by human evaluators, analysts or translators and (B) by Natural Language Processing (NLP) applications, including Machine Translation and Data Mining (Opinion Mining/Sentiment Analysis).

The present approach and analysis described here focuses on the detection, signalization and processing of "non-neutral" content in spoken utterances. "Non-neutral" content as a complex type of information

includes ambiguous or connotative features, socio-cultural features and other types of information implied and/or information not uttered.

The primary focus of the present analysis, approaches and strategies is the role and impact of individual words in the "non-neutral" content of spoken utterances and spoken interactions.

In addition, as a "bonus" feature, individual words are elements easily detected in spoken texts, and their processing constitutes a less complex task in speech applications, transcription tools, online Machine Translation and other NLP applications.

We summarize "non-neutral content" related to grammatical category and word structure at the Morphosyntactic Level under "Grammatical Features". "Non-neutral content" not directly related to grammatical category and word structure but to "deeper" associative and sociocultural aspects of word meaning is summarized under "Semantic Features". "Non-neutral content" concerning only the Prosodic-Paralinguistic Level is summarized under "Prosodic-Paralinguistic Features".

The three general categories of "Non-neutral content" at the Linguistic (L) and the Prosodic-Paralinguistic (P-P) Levels can, therefore, be listed as follows:

Word level (L): Word category and word structure – Grammatical Features.

Word level (L): "Deeper" mainly associative and sociocultural aspects of word meaning – connection to Prosody and Phonology – Semantic Features.

Prosodic-Paralinguistic Level (P-P) – only Prosodic-Paralinguistic Features.

As described above, features marking "non-neutral" content at the word level facilitate its processing by speech applications and NLP applications. In particular, features marking "non-neutral" content at word level facilitate its signalization and processing by Speech Recognition Systems (ASR), Part-of-Speech (POS) Taggers and other types of tools, as well as its adaptation and transfer to another natural language.

The management of "non-neutral" content in spoken utterances allows the successful completion of tasks such as the evaluation of texts with respect to their degree of neutrality and objectivity; the identification of the intention and attitude of the Speaker(s) concerned; and the correct information transfer in translation or machine translation (MT) processes, Opinion Mining and Sentiment Analysis.

Features marking "non-neutral" content in subtle forms may vary across languages. Here, we focus primarily on – without been limited to – features detected in English, as a widely-spoken language by a large percentage of the international public and with a broad variety of fully developed and accessible transcription, machine translation and natural language processing (NLP) tools and other resources, such as WordNets.

- **The Gricean Cooperative Principle**

In many cases, it is observed that "non-neutral" content is related to violations of Maxims of the Gricean Cooperative Principle (Hatim, 1997; Grice, 1975). In other cases, "non-neutral" content is related to the Speaker's behaviour in consciously or subconsciously expressing attitude, beliefs or emotions and/or consciously or subconsciously creating distance or proximity towards the other Speaker(s) or audience.

"Non-neutral" content, as information, is detected in linguistic and in prosodic-paralinguistic features, as well as in combinations of both.

The detection and processing strategies presented include word categories expressing actions or modifying actions/entities and contain extra/connotative features beyond their basic semantic content. Detection-strategies also include word groups with evident relation to expressions and culture-specific elements (Alexandris, 2013; Alexandris, 2010).

Most detection strategies presented are based on the parameters of the flouting of Grice's Cooperative Principle (Grice, 1989; Hatim, 1997). The flouting of Grice's Cooperative Principle related to Irony (Hatim, 1997), is observed to apply to various types of "non-neutral" content in general.

In the case of "non-neutral" content, the Speaker violates the Maxim of Quantity in the Gricean Cooperative Principle and/or the Maxim of Quality ("1. Do not say what you believe to be false", "2. Do not say that for which you lack adequate evidence") (Grice, 1975) and/or the Maxim of Manner (Submaxim 2. "Avoid ambiguity") (Grice, 1975).

Grice's Maxims:

Maxim of quality
Supermaxim:
Try to make your contribution one that is true.
Submaxims:
Do not say what you believe to be false.
Do not say that for which you lack adequate evidence.

Maxim of quantity
Make your contribution as informative as is required
(for the current purposes of the exchange).
Do not make your contribution more informative than is required.

Maxim of relation
Be relevant.

Maxim of manner
Supermaxim:
Be perspicuous.
Submaxims:
Avoid obscurity of expression.
Avoid ambiguity.
Be brief (avoid unnecessary prolixity).
Be orderly.

The violations of Maxims of the Gricean Cooperative Principle may be used as a general theoretical framework at the Pragmatic Level (the Pragmatic Level II Factor). The Pragmatic Level corresponds to Level 2- "Complex-Information" of the proposed general framework for the analysis and processing of spoken political and journalistic texts presented in Chapter 2.

Parameters concerning the Pragmatic Level (II) may vary according to the natural languages and cultural features involved, especially if Non-European Languages such as Chinese (Li, 2008) or Persian (Agazeynali and Hossein, 2009) are concerned. We, therefore, focus on English as one of the most widely spoken languages used in the international media and related or comparable issues and linguistic phenomena in other languages.

In the present chapter, we focus on complex information and related features linked to the Pragmatic factor (II) and occurring mainly at the Linguistic Level (L). These linguistic features may pose challenges with respect to their identification or perception by an international audience and/or their transfer in the target language(s), as well as subsequent complications in Natural Language Processing (NLP) applications. However, these "challenging" linguistic features may also assist in the determination and evaluation of the following:

Information content of spoken utterance
Speaker Intentions
Speaker Attitude

It should also be noted that linguistic phenomena related to complex information and "non-neutral" content are not always directly detectable from the context and require an in-depth knowledge of the language or languages concerned. Therefore, most types of "non-neutral" content typically have a high degree of complexity, in contrast to "context-specific" cases such as some types of Irony (Contradictory or Reactionary) (Examples 4.1.1 – 4.1.3).

Example 4.1.1

Arabic – Contrastive and Reactionary irony (Ghazala, 2007).

(i)
Contrastive irony; e.g.

Great! I have lost everything!
(عظيم. لقد خسرتُ كل شيء!)

(ii)
Reactionary irony

-"I have to teach you a lesson"! ((لزاماً) علي أن ألقنك درساً!)

-"O, I'll be grateful": (سوف أكون ممتناً لك)

Example 4.1.2

Chinese (Traditional) from microblogs (Tang and Cheng, 2014).

(i)
(s1) 點餐都要等半小時，服務還真是好阿
I have to wait for half an hour to order. The service is definitely really good.

(ii)
(s6)很好!!!!我可以再笨一點 再笨一點阿...
Very Good!!!! It is okay for me to be more idiotic…

Example 4.1.3

Hindi – Hindi-English code-mixed tweets. (Vijay et al., 2018).

(i)
T2: \The kahawat `old is gold' purani hogaee. Aaj kal ki nasal kehti hai `gold is old', but the old kahawat only makes sense.
#MindF #Irony."

Translation: \The saying `old is gold' is old. Today's generation thinks `gold is old' but only the old one makes sense.
#MindF #Irony. "

(ii)
T3: \mere single hone ke bawzood mujhe ye nahi pata tha aaj rose day he #irony."

Translation: \In spite of me being single, I didn't know today is rose day #irony."

- **Evaluating "Non-neutral" Content**

As previously discussed, the evaluation of content in spoken political and journalistic texts concerns the combination of the information content in spoken utterances with the intentions and attitude of the Speaker, since not only what is said but how it is said is of equal importance.

Native Speakers may consciously or subconsciously perceive and understand all aspects of the information content of a spoken utterance reflecting the Speaker's intentions, attitude and beliefs. The perception and understanding of this information may facilitate in-depth evaluation and processing of information content.

However, when an international audience is concerned, the relation of information content of the spoken utterances with the intentions and attitude of the Speaker results in two basic problems:

(1) Non-native speakers, including the international public, may not always perceive and understand the information content of a spoken utterance in relation to the intentions or attitude of a speaker.

(2) The connection of information content of a spoken utterance with the intentions and attitude of the Speaker is not always easily processed with fully automatic Machine Translation (MT) and other NLP applications.

For the correct transfer of the complete information content, including indicators of a Speaker's attitude and intentions, interactive and semi-automatic processes are proposed. The strategies and processes presented here may be used for the evaluation of spoken transcribed journalistic texts, for their translation or for other processing tasks.

4.2 Grammatical Features and Implied Information

4.2.1 Introduction

Grammatical features are observed to play the role of "pointers" to "non-neutral" content in spoken transcribed journalistic texts. Some types of grammatical features may signalize texts with "non-neutral" content by the frequency of their occurrence. These grammatical features may be classified under the "Frequency" category. Other types of grammatical features are inherently ambiguous and may be purposefully used by Speakers. These grammatical features constitute the "Ambiguity" category. Furthermore, there are types of grammatical features that expose the Speaker's attitude and behaviour towards the other Speaker(s) or audience. These features form the "Attitude" category.

Grammatical features involving the Morphosyntactic Level of linguistic analysis are easily detected and processed by Natural Language Processing (NLP) tools, such as taggers and parsers. This enables the development of automatic or interactive applications for their efficient processing.

4.2.2 The "Frequency" Category

Grammatical features of the "Frequency" category as pointers to "non-neutral" content concern adjectives, adverbials and particles as word categories.

We note that similar phenomena concerning adjectives and adverbials as pointers to "non-neutral" content are observed and processed in Non-European Languages such as Chinese (Tang and Cheng, 2014) and Arabic (Alhamzi, 2015).

Other linguistic features in the "Frequency" category are linguistic features at the Morphological Level, namely derivational suffixes and specific types of verb stems.

Grammatical features of the "Frequency" category indicate "non-neutral" content of spoken texts if they occur in a relatively high frequency and are detected and evaluated with automatic procedures.

4.2.2.1 Percentage and Choice of Adjectives, Adverbials and Particles

Previous studies (Alexandris et al, 2017) have demonstrated the link between a large percentage of adjectives and "non-neutral" content and implied connotative features in journalistic texts.

The choice of adjectives is, additionally, related to semantic features related to (i) mode, (ii) malignant/benign action or (iii) emotional/ethical gravity (Alexandris, 2010; Alexandris, 2013). These types of features have been labelled as "Implied Connotative Features". Typical examples are "dirty little (secret)", "(how) ludicrous", "big (lie)" (Example 4.2.2.1.a) and "really ridiculous", "highly likely guilty" (Example 4.2.2.1.c) and "halbgefrorenem Lächeln" (German: "half-frozen smile") (Example 4.2.2.1.d).

In addition to adjectives, a large percentage of adverbials and particles have also been observed to signalize "non-neutral" content and implied connotative features in spoken journalistic texts (Alexandris et al, 2017). Typical examples are "frankly", "just", "really", "real" (Example 4.2.2.1.a) or "really, truly, deep down" (Example 4.2.2.1.b). Adverbials and particles are also used as a means of either intensifying or "toning down" the content of an entire spoken phrase, sentence or overall utterance. In this case, adverbials and particles may play a similar role to prosodic features, as presented in the following chapter (Chapter 5).

Example 4.2.2.1.a

(Fragment) (Alexandris, 2010)

…"dirty little (secret)", "(how) ludicrous", "big (lie)", "frankly", "just", "really", "real"…

Speaker: Kathryn Serkes, Assn. of American Physicians and Surgeons

Lou Dobbs Tonight, CNN, Is universal health care the solution for the United States health care system? CNN, Added On August 19, 2009, http://www.cnn.com

Example 4.2.2.1.b

…and that **really, truly, deep down** and with a pinky swear, …
https://www.theatlantic.com/politics/archive/2018/07/the-russians-are-coming/565478/

The following transcribed spoken text illustrates the presence of a significant occurrence of adjectives, adverbs, and adjectival and adverbial phrases in spoken journalistic texts:

Example 4.2.2.1.c

Transcribed Spoken Text:

Foreign Minister Sergey Lavrov's interview with BBC HardTalk 720-16-04-2018
16 April 2018 22:30 - 720-16-04-2018
http://www.mid.ru/en/foreign_policy/news/-/asset_publisher/cKNonkJE02Bw/content/id/3172318
https://www.youtube.com/watch?v=-zJ41whNgR0

Question: Do you accept it?

Sergey Lavrov: We don't accept this. I mean you have **hard talk**, you know, we want **hard facts**. And "**highly likely**" is **really ridiculous**. And the policies of our Western friends…

Question: Sorry, when you say "**highly likely**", you mean the assessment that chemical weapons were used in Douma by the Assad government forces?

Sergey Lavrov: No, I said "**highly likely**" as a new invention of the British diplomacy to describe why they punish people – because these people are **highly likely guilty**, like in *Alice in Wonderland* by Lewis Carroll – when he described a trial. And when they discovered that the jury could be engaged, the King said "Let's ask the jury" and the Queen shouted "No jury! Sentence first – verdict afterwards." That's the logic of "**highly likely**".

Example 4.2.2.1.d

Während die Premierministerin mit **halbgefrorenem** Lächeln daneben stand, …

http://www.spiegel.de/politik/ausland/donald-trump-in-grossbritannien-may-brueskiert-queen-getroffen-a-1218382.html

4.2.2.2 Semantic Features of Verbs

Features labelled as "non-neutral" content are also present in the stems of verbs. In particular, verbs (or nominalizations of verbs) containing semantic features related to (i) mode, (ii) malignant/benign action or (iii) emotional/ethical gravity (Alexandris, 2010; Alexandris, 2013) are related to texts containing mostly "non-neutral" content. A characteristic example is the verb "plummet" (of stock market prices), as opposed to the more general term "fall". Another example from a spoken German text concerning domestic policy is "zurückrudern" ("to row back"), as opposed to the more general term "go back". These descriptive words are rich in semantic features. The richness/accumulation of these semantic features may also be described as additional semantic restrictions or "Selectional Restrictions" (Gayral et al., 2000; Wilks and Fass, 1992), located at the end-nodes of an ontology of words (or in a WordNet). The features defining each verb, ranging from the more general to the more restrictive concept, can be formalized from standard and formal definitions and examples from dictionaries, a methodology encountered in Data Mining applications (Kontos et al., 2000). This property facilitates any automatic detection and processing of "non-neutral" content verbs in Natural Language Processing (NLP) applications.

Typical examples of the above-described verb types are "looms" (Example 4.2.2.2.a), "rams" (Example 4.2.2.2.b), "vowed", "loves", "dumb folded" (Example 4.2.2.2.c) and "axed", "plummeting", "enveloped" (Example 4.2.2.2.d).

Example 4.2.2.2.a

"A crisis **looms** over China's chip sector"
https://www.techinasia.com/zte-saga-illustrates-crisis-looming-chinas-semiconductor-industry

Example 4.2.2.2.b

Meanwhile, the more **savage** wing of the Republican Party **rams** through legislation serving the interests of the real constituency, *kicking the rest in the face*

https://www.frontline.in/politics/the-growth-of-rightwing-forces-is-ominous/article10108703.ece

Example 4.2.2.2.c

(Fragment) (Alexandris, 2010b)

(Complete online transcribed text "Buying the War", April 25, 2007, PBS available at http://www.pbs.org/moyers/journal/btw/transcript1.html).

GEORGE WILL (ABC 10/28/01): The administration knows he's **vowed**, […] has **vowed** revenge, he has anthrax, he **loves** biological weapons, he has terrorist training camps, including 747s to practice on...

BILL MOYERS: It was proving difficult to distinguish the opinion of the pundits from the policies of the administration…but as the *hullabaloo* over […] grew in Washington, Bob Simon of CBS News 60 Minutes was **dumb folded**...[…….]

Example 4.2.2.2.d

(Alexandris, 2010b)

(Nordic nerves Denmark and the euro Jan 29th 2009 | COPENHAGEN, From *The Economist* print edition

Title: Danes ponder joining the euro, Icelanders wish they could

DENMARK'S story has an Old Testament resonance just now. Seven years of *plenty* since Anders Fogh Rasmussen became prime minister in 2001 are now being followed by *leaner* times. Danes *hardly* face seven years of famine, but jobs are being **axed**, property prices are **plummeting** and belts are being tightened everywhere. The government has already produced two bank rescue packages and it is now pondering the notion of a *much larger* fiscal stimulus. […] Yet the *gloom* has not, so far, **enveloped** the prime minister […]

4.2.2.3 Derivational Suffixes

Word groups with "non-neutral" content also include nouns with suffixes producing diminutives, derivational suffixes resulting in a (i) verbalization, (ii) an adjectivization or (iii) an additional nominalization of proper nouns (Alexandris, 2010; Alexandris, 2013). The most typical categories of derivational suffixes where implied connotative features are likely to occur are diminutives (or suffixes containing maximizing features), suffixes used from a foreign language, suffixes signalizing gender (Greek) and specific types of suffixes resulting in a nominalization (German). From the overall category of derivational suffixes, diminutives typically occurring in German and Greek may be perplexing to the international audience in cases where in the native language of the recipient there is a limited use of such elements.

In particular, in some languages such as German and Greek, the boundaries between literal and connotatively "marked" use of diminutives is not always clear. Furthermore, in Greek, diminutives (for example, "-aki") are also used as a form of Positive Politeness (Sifianou, 2001).

Additionally, in English, a subset of connotatively "marked" derivational suffixes related to suffixes from foreign languages is typically observable. Characteristic examples are the derivational suffixes "-istas" from Spanish and "-ette" and "esque" derivational suffixes of French origin, which may contain connotative elements in some contexts. We also note that stems of words of French origin in German can – in certain cases – be of connotative content, even having a slight nuance of irony.

An example of a connotatively "marked" derivational suffix in German is "-erei" used for the nominalization of a verb or appended to a noun. For a non-native speaker, the boundary between the neutral and connotatively "marked" derivational suffix "-erei" may not always be clear. For example, in the word "Malerei" ("a painting"), the "erei" suffix nominalizes the verb "malen" ("to paint"). However, there are connotative features in the "-erei" suffix in the case of the word "Schreierei", a nominalization of the verb "schreien" ("to scream").

In the case of Greek, some general rules apply for certain types of connotatively "marked" derivational suffixes such as derivational suffixes with maximizing features ("-ar´as," "´ara") ("alitar´as," = a big punk "periptos´ara" = a big "basket case" – of a person), or cases in which a suffix with a female grammatical gender is used for words on which the masculine grammatical gender is used as a default ("-a": "dimosiogr´afa" (suffix: female gender – a female journalist, pejorative), as opposed to "dimosiogr´afos" (suffix: male gender – a male/female journalist) and "ethopoi´a" (suffix: female gender – a female actor, pejorative), as opposed to "ethopoi´os" (suffix: male gender – a male/female actor).

4.2.2.4 Automatic Procedures: Processing Grammatical Features with Online Tools and Resources

The previously described types of word categories linked to "non-neutral" content may be grouped into a finite set based on word type, word stems or suffix type, namely at word level or at morpheme level – the Morphological Level. Therefore, grammatical features as "non-neutral" content are detected and processed at the Morphosyntactic Level, making them directly accessible to Natural Language Processing (NLP) applications.

The type of "non-neutral" content described in the present section can also be signalized as special tags linked to the previously described word-groups either at word-level or at morpheme-level:

Word-level: (a) adjectives, (b) adverbs and (c) specific categories of nouns and expressions (Alexandris, 2013; Alexandris, 2010).

Morpheme-level: (d) the verb-stem of verbs containing semantic features related to mode, malignant/benign action or emotional/ethical gravity, (e) the suffix of nouns with suffixes producing diminutives, (f) verb-stems connected to derivational suffixes, resulting in a nominalization of verbs (excluding derivational suffixes producing participles and actor thematic roles) and (g) stems of proper nouns connected to derivational suffixes, resulting in a verbalization or adjectivization of proper nouns (Alexandris, 2013; Alexandris, 2010).

There is a signalization of additional types of "non-neutral" content contained in grammar, as in the case of (h) adverbials or particles used in languages such as English or German for an emphatic or casual/spontaneous effect (Alexandris, 2013; Alexandris, 2010).

For languages of different language families, the tags and annotation may be adapted to detect and process connotative features – "non-neutral" content – in other morphological entities or in other types of linguistic elements, such as the analysis of characters (for example, in Chinese).

Signalization of grammatical features, namely, word-categories such as adjectives and adverbials, is implemented with the Stanford Log-Linear Part-of-Speech Tagger. Additionally, recognition on a word-stem or a suffix basis involves the detection of types of verbs, related to specific semantic features (also accessible with WordNets and/or Selectional Restrictions) (Alexandris et al, 2017; Mylonakis, 2016).

In the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation), there is an activated process for the automatic signalization of "non-neutral" content in incoming texts. Previous studies (Alexandris, 2013; Alexandris, 2010) propose an annotation tool indicating and highlighting the largest possible percentage of the points in the texts signalizing such "marked" elements (Alexandris

et al, 2017; Mylonakis, 2016), as described in Table 4.2.2.4.1, Table 4.2.2.4.2 and Examples 4.2.2.4.a, 4.2.2.4.b and 4.2.2.4.c. The implemented processing tool for the annotation and automatic signalization of "non-neutral" content in incoming texts is, henceforth, referred to as the "IMPLY" Module.

For speed and efficiency, the "IMPLY" Module operates on keyword detection at morpheme-level or word-level and interacts with a database, a practice typically employed in Speech Processing applications, especially Spoken Dialog Systems, where processing speed plays a crucial role (in compliance with the Speed Issue –B).

For languages of different language families, the annotation processes of the "IMPLY" Module may be adapted for the detection of "non-neutral" content and operate on other morphological entities or on other types of linguistic elements, such as the analysis of characters (in languages such as Chinese).

Table 4.2.2.4.1: Example of text with a significantly large percentage of "non-neutral" content.
(Alexandris et al, 2017; Mylonakis, 2016)

http://edition.cnn.com/2016/04/04/opinions/wisconsin-humble-political-celebrities-opinion-borsuk/index.html	52 matches
humble/JJ big/JJ big/JJ little/JJ humility/NN surprising/JJ loaded/VBN big/JJ like/VBP pretty/RB bit/NN humility/NN humiliation/NN remarkable/JJ best/JJS big/JJ much/JJ likely/JJ just/RB wondered/VBD bit/NN soundly/RB just/RB much/JJ interesting/JJ much/RB much/RB humbling/JJ humiliating/JJ sharply/RB just/RB bluntly/RB much/JJ imagine/VB big/JJ dicey/JJ think/VB great/JJ splintering/VBG just/RB bad/JJ humility/NN humbled/VBN big/JJ best/JJS seems/VBZ bit/NN humble/JJ humility/NN amazing/JJ big/JJ big/JJ soundly/RB sharply/RB frequently/RB bluntly/RB Literally/RB originally/RB lately/RB belatedly/RB necessarily/RB only/RB have/VB: 3 Donald/NNP: 2 Trump/NNP: 2 I/PRP: 2 was/VBD: 2 he/PRP: 2 he/PRP: 3 Hillary/NNP: 2 Clinton/NNP: 2 Sanders/NNP: 2 Sanders/NNP: 2 Clinton/NNP: 2 done/VBN: 2 better/JJR: 2 has/VBZ: 2 much/RB: 2 race/NN: 2 him/PRP: 2 Republican/JJ: 2 would/MD: 2 his/PRP$: 2 would/MD: 2 you/PRP: 2 've/VBP: 2 that/WDT: 2	19% Adjectives: 8% Adverbs: 6% Other: 5% Word repetitions in same sentence

Table 4.2.2.4.2: Example of text with a large percentage of "non-neutral" content.
(Alexandris et al, 2017; Mylonakis, 2016)

http://www.bbc.com/news/election-us-2016-35962179	38 matches
much/JJ sharp/JJ sick/JJ quickly/RB fine/JJ disappointing/JJ just/RB decimated/VBN heartily/RB booed/VBN proud/JJ think/VBP important/JJ think/VBP nervous/JJ think/VBP think/VBP sick/JJ negative/JJ surprisingly/RB pessimistic/JJ flaring/VBG pretty/RB relentless/JJ unfortunately/RB worse/JJR think/VBP glad/JJ stumping/VBG harsh/JJ negative/JJ flaring/VBG calm/VB deep/JJ calm/JJ good/JJ just/RB much/RB disastrous/JJ only/RB truly/RB properly/RB usually/RB carefully/RB quickly/RB deeply/RB heartily/RB relatively/RB famously/RB surprisingly/RB typically/RB early/RB unfortunately/RB certainly/RB largely/RB certainly/RB authentically/RB eventually/RB virtually/RB New/NNP: 2 contests/NNS: 2 he/PRP: 2 her/PRP$: 2 campaign/NN: 2 manufacturing/VBG: 2 her/PRP$: 2 who/WP: 2 Democratic/JJ: 2 people/NNS: 2 vote/NN: 2 we/PRP: 2 he/PRP: 2 state/NN: 2 their/PRP$: 2 as/RB: 4 far/RB: 2 support/NN: 2 I/PRP: 5 can/MD: 2 talk/VB: 2 I/PRP: 2 their/PRP$: 3 are/VBP: 3 he/PRP: 2 Sanders/NNP: 2 campaign/NN: 2 back/RB: 2	15% Adjectives: 7% Adverbs: 5% Other: 3% Word repetitions in same sentence

Example 4.2.2.4.a

System Output for Text 1: High percentage of "marked" elements.

(Alexandris et al, 2017; Mylonakis, 2016)

Text 1 CNN: *Will Wisconsin humble some big egos?*
http://edition.cnn.com/2016/04/04/opinions/wisconsin-humble-political-celebrities-opinion-borsuk/index.html

High percentage of "marked" elements

Total Words: 1014 – Percentage of Adjectives: 8% (85 words), Percentage of Adverbs: 6% (63 words)

********* Words that match with database *********

humble/JJ big/JJ big/JJ little/JJ humility/NN surprising/JJ loaded/VBN big/JJ like/VBP pretty/RB bit/NN humility/NN humiliation/NN remarkable/JJ best/JJS big/JJ much/JJ likely/JJ just/RB wondered/VBD bit/NN soundly/RB just/RB much/JJ interesting/JJ much/RB much/RB humbling/JJ humiliating/JJ sharply/RB just/RB bluntly/RB much/JJ imagine/VB big/JJ dicey/JJ think/VB great/JJ splintering/VBG just/RB bad/JJ humility/NN humbled/VBN big/JJ best/JJS seems/VBZ bit/NN humble/JJ humility/NN amazing/JJ big/JJ big/JJ

********* Adverbs end with -ly *********

soundly/RB sharply/RB frequently/RB bluntly/RB Literally/RB originally/RB lately/RB belatedly/RB necessarily/RB only/RB

********* Word repetitions in the same sentence *********

have/VB: 3 Donald/NNP: 2 Trump/NNP: 2 I/PRP: 2 was/VBD: 2 he/PRP: 2 he/PRP: 3 Hillary/NNP: 2 Clinton/NNP: 2 Sanders/NNP: 2 Sanders/NNP: 2 Clinton/NNP: 2 done/VBN: 2 better/JJR: 2 has/VBZ: 2 much/RB: 2 race/NN: 2 him/PRP: 2 Republican/JJ: 2 would/MD: 2 his/PRP$: 2 would/MD: 2 you/PRP: 2 've/VBP: 2 that/WDT: 2

Example 4.2.2.4.b

System Output for Text 2: Medium to High percentage of "marked" elements.

(Mylonakis, 2016)

Text 2 BBC: ***US election 2016: Gloves come off for Clinton and Sanders***
http://www.bbc.com/news/election-us-2016-35962179

Medium to High percentage of "marked" elements
Total Words: 1328 – Percentage of Adjectives: 7% (99 words), Percentage of Adverbs: 5% (62 words)

********* Words that match with database *********
much/JJ sharp/JJ sick/JJ quickly/RB fine/JJ disappointing/JJ just/RB decimated/VBN heartily/RB booed/VBN proud/JJ think/VBP important/JJ think/VBP nervous/JJ think/VBP think/VBP sick/JJ negative/JJ surprisingly/RB pessimistic/JJ flaring/VBG pretty/RB relentless/JJ unfortunately/RB worse/JJR think/VBP glad/JJ stumping/VBG harsh/JJ negative/JJ flaring/VBG calm/VB deep/JJ calm/JJ good/JJ just/RB much/RB disastrous/JJ
********* Adverbs end with -ly *********
only/RB truly/RB properly/RB usually/RB carefully/RB quickly/RB deeply/RB heartily/RB relatively/RB famously/RB surprisingly/RB typically/RB early/RB unfortunately/RB certainly/RB largely/RB certainly/RB authentically/RB eventually/RB virtually/RB
********* Word repetitions in the same sentence *********
New/NNP: 2 contests/NNS: 2 he/PRP: 2 her/PRP$: 2 campaign/NN: 2 manufacturing/VBG: 2 her/PRP$: 2 who/WP: 2 Democratic/JJ: 2 people/NNS: 2 vote/NN: 2 we/PRP: 2 he/PRP: 2 state/NN: 2 their/PRP$: 2 as/RB: 4 far/RB: 2 support/NN: 2 I/PRP: 5 can/MD: 2 talk/VB: 2 I/PRP: 2 their/PRP$: 3 are/VBP: 3 he/PRP: 2 Sanders/NNP: 2 campaign/NN: 2 back/RB: 2

Example 4.2.2.4.c

System Output for Text 3: Low percentage of "marked" elements.

(Alexandris et al, 2017; Mylonakis, 2016)

Text 3 Guardian: ***G20: Is it time to go back to the future, before globalisation?***

https://www.theguardian.com/business/2016/sep/04/g20-is-it-time-to-go-back-to-the-future-before-globalisation

Low percentage of "marked" elements:
Total Words: 1211 – Percentage of Adjectives: 9% (106 words), Percentage of Adverbs: 4% (47 words)

********* Words that match with database *********
just/RB reasonable/JJ striking/JJ inconceivable/JJ difficult/JJ just/RB quickly/RB good/JJ Interestingly/RB big/JJ bad/JJ difficult/JJ just/RB important/JJ strong/JJ dysfunctional/JJ unsurprising/JJ
********* Adverbs end with -ly *********
equally/RB quickly/RB only/RB Interestingly/RB only/RB
********* Word repetitions in the same sentence *********
was/VBD: 2 has/VBZ: 2 as/RB: 3 has/VBZ: 2 is/VBZ: 2 lack/NN: 2 be/VB: 2 is/VBZ: 2 power/NN: 2 putting/VBG: 2 alternative/JJ: 2 strategy/NN: 2 together/RB: 2 was/VBD: 2 was/VBD: 2 as/RB: 2 were/VBD: 2 party/NN: 2 was/VBD: 2 Labour/NNP: 2 is/VBZ: 2 as/RB: 2 why/WRB: 3 he/PRP: 2

4.2.2.5 Signalizing Implied Information of the "Frequency" Category

With the presented automatic procedures concerning the processing of grammatical features of the "Frequency" category (in compliance with the Speed Issue – B), the presence of a significant occurrence of the previously described word types (such as adjectives, adverbs and adjectival and adverbial phrases) in spoken political and journalistic texts indicates a low degree of objectivity in (transcribed) spoken input.

A low degree of objectivity in a transcribed speech, discussion or interview may occur within the framework of the ("explicit") Speech Acts: Describe (DESC), Declare (DECL), Express (EXPR), Argumentation (ARGM) or Explanation (EXLP).

In transcribed spoken texts containing a high percentage of the "Frequency" category, there is a violation of the Maxims of the Gricean Cooperative Principle (Grice, 1975).

For example, with the significant occurrence of adjectives, there is extra information added to the basic content of the utterance consisting of the necessary information required to fulfil the Gricean Cooperative Principle in respect of the Maxim of Quantity ("Do not make your contribution more informative than is required"). With the high frequency of the above-described features, the Speaker violates the Maxim of Quantity in the Gricean Cooperative Principle. In this case, the Speaker expresses attitude and intentions.

In the proposed TCIP-Annotation (Figure 4.2.1), the generation of the "[IMPL]" (Pragmatics) tag at text or passage level – at the end of the (transcribed) text segment with a significant percentage of the "Frequency" category – signalizes a low degree of objectivity in a speech, discussion or interview. In this case, the "[IMPL]" tag is generated and inserted after the activation of the above-described "IMPLY" Module, signalizing the percentage of "non-neutral" content detected at the Morphosyntactic Level.

Figure 4.2.1

<table>
<tr><td colspan="4">Transcription Tool Outline</td></tr>
<tr><td>Speech Signal</td><td colspan="3"> 
</td></tr>
<tr><td>Text</td><td colspan="3">text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]</td></tr>
<tr><td>Speaker Turns and (Basic) Annotation</td><td colspan="3">Speaker A/ annot-text- annot-text-
Speaker B/ annot-text- annot-text-</td></tr>
<tr><td>Proposed Annotations</td><td colspan="3">annot-text-[Terms / Complex-Info/ Prosody-Paraling]</td></tr>
<tr><td></td><td colspan="3">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)</td></tr>
<tr><td></td><td>Input</td><td>(Transcribed) TEXT SEGMENT</td><td>Activation of “IMPLY” Module

Generation of [IMPL] TAG</td></tr>
</table>

4.2.3 The “Ambiguity” Category

4.2.3.1 Introduction

Grammatical features of the “Ambiguity” category linked to “non-neutral” content concern modal verbs, past participles and gerunds as word categories. This category also includes verbs with prefixes related to multiple meanings and also allowing word play.

As in the case of the “Frequency” category, the Speaker expresses intentions and attitude in a transcribed speech, discussion or interview which may occur within the framework of the (“explicit”) Speech Acts:

Describe (DESC), Declare (DECL), Express (EXPR), Argumentation (ARGM) or Explanation (EXLP).

These grammatical features indicate "non-neutral" content not at text level but in individual utterances and are detected and evaluated with interactive procedures activated in the proposed TCIP-Annotation.

4.2.3.2 Modal Verbs

Modal verbs such as "must", "should" ("soll" in German) and even "would" ("würde" in German) and "shall" constitute a typical problem, since the distinction between their literal semantic meaning and their polite or connotative use is not always visible to the international recipient. Modal verbs (a) may be used literally or (b) may be used to express a suggestion or a prediction, (c) an understatement or even irony.

We note that modal verbs and other phenomena related to politeness in English and German demonstrate an incompatibility in respect to other European languages, such as Polish and Russian. The boundaries of the possible differentiations with respect to the semantics of modal verbs become less evident in the context of political and journalistic texts, especially in spoken texts. For example, in some political and journalistic texts, the phrase "We would like to see further reforms" may be equivalent to "We demand further reforms".

In the context of specific text types, such as technical texts, the use of the modal verb is related to specific speech acts. For example, the German modal verbs "muss" ("must"), "darf" ("is-allowed"), "kann" ("can") and "soll" ("should"), are related to speech acts expressing "command/direction," "prohibition", "permission," or "possibility/recommendation" respectively (Lehrndorfer, 1996) (Example 4.2.3.2.a).

Example 4.2.3.2.a
(Translations are close to source text) (Alexandris, 2010)

(i) The appliance must be turned off
(ii) Das Gerät muss ausgeschaltet werden (German)

(iii) The appliance is not allowed to be turned off
(iv) Das Gerät darf nicht ausgeschaltet werden (German)

(v) The appliance can be turned off
(vi) Das Gerät kann ausgeschaltet werden (German)
(vii) The appliance should be turned off
(viii) Das Gerät sollte ausgeschaltet werden (German)

However, these differentiations become less evident in the context of spoken journalistic texts. For example, in English, the verbs "must", "should" and even "shall" are often used in a similar way, although the verb "must" is related to the strongest expression and is usually characterized by less complex semantics. Additionally, the semantic interpretation of the verbs "may" and "might" can be identical in some contexts. Thus, in Example 4.2.3.2.b, the modal verbs are used (i) literally or (ii) to express a suggestion or a prediction or (iii) to express an understatement (Example 4.2.3.2.b).

Example 4.2.3.2.b
(Alexandris, 2010)

(i) In this case, all negotiations must start within the next few hours.
(ii) In this case, all negotiations should start within the next few hours.
(iii) In this case, we may block all negotiations.

The correct interpretation of the semantic content of modal verbs is context-specific; however, modal verbs may also signalize utterances in spoken and written texts where implied information and connotative features – "non-neutral" content – are likely to occur.

4.2.3.3 Implied Ongoing or Implied Completed Actions: Past Participles

Another example of ambiguous grammatical features and their possible links to "non-neutral" content are past participles in languages such as German.

A typical problematic case is ambiguity in respect to implied ongoing or implied completed actions is expressed by German past participles. The past participle may result to ambiguities where it is not clear whether an ongoing process or a terminated process is being expressed ("Vorgangspassiv" or "Zustandspassiv" respectively).

These ambiguities may be resolved within a sublanguage framework such as technical or scientific texts.[14] However, in the context of

[14] A typical example is "die geladene Batterie"
(analysed as "die Batterie die geladen wird" –
"the battery that is being loaded (now)" or
"die Batterie die geladen ist" – "the battery that has (already) been loaded")
(Lehrndorfer, 1996).

journalistic texts, including news reports, the semantics of the German past participle may continue to be ambiguous.

Often the past participle is used to convey information that is naturally ambiguous or it may be purposefully used to preserve ambiguity. A typical example is "der geprüften Anlagen" (analysed as "der Anlagen die geprüft werden" – "of the establishments that are investigated (now)" or "der Anlagen die geprüft worden sind" – "of the establishments that are have (already) been investigated"). Another typical example is "die geöffnete Archiven" (analysed as "die Archiven die geöffnet werden" – "the archives that are being opened (now)" or "die Archiven die geöffnet sind" – "the archives that have (already) been opened"). An additional example is the phrase "in der Verhandlung behandelten Punkten" (analysed as "die Punkte die in der Verhandlung behandelt werden" – "the points in the negotiation that are being dealt with (now)" or "die Punkte die in der Verhandlung behandelt worden sind" – "the points that have (already) been negotiated") (Alexandris, 2012) (Example 4.2.3.3.a).

Example 4.2.3.3.a

German:
"in der Verhandlung behandelten Punkten"
"the points in the negotiation that are being dealt with (now)" or
"the points that have (already) been negotiated"

4.2.3.4 Presence or Absence of Implied Semantics in Gerunds

The successful interpretation or translation of English gerunds in other languages is highly dependent on the context of the written or spoken text in which the gerund occurs. A nominalization of gerunds in subject position for translation into languages such as German or Greek may imply the semantics related to the noun form of the concept.

For example, the gerund "living" in subject position is often rendered as "life" in German and Greek, namely the nouns "Leben" and "zo΄i", respectively. In some cases, the chosen expression for the equivalent term in the languages concerned is correct. In other cases, for example, where the gerund "living" is restricted only to the meaning of "residence" and is not related to "(quality of) life", the equivalent terms in other languages may contain additional information not intended by the author or speaker in the source language (Example 4.2.3.4.a).

Another typical example is the gerund “making”, in sublanguage-independent contexts (as in non-technical or non-scientific texts) often rendered as “creation” in German and Greek, namely the nouns “Schaffung/Erschaffung” and “dimiourg´ia”, respectively.

In translations of political and journalistic texts, the absence of a sublanguage-specific framework makes the choice of the correct equivalent difficult (Alexandris, 2012). Thus, in cases where the gerund “making” is not related to “creation” and restricted only to the meaning of “building” or “production”, the additional information contained in chosen equivalent terms in other languages may contain additional superfluous connotative elements and semantic features.

Example 4.2.3.4.a

“living”
= “life” (German): “Leben”
= “life” (Greek): “zo´i”

4.2.3.5 Verb Prefixes and Word Play

Prepositions in verb prefixes are often problematic to an international recipient group and to professionals (for example, officials, journalists) playing the role of “semi-professional” translators, since some prefixes eventually become a part of the verb stem or constitute word forms either historically or recently constructed by the language community. Ambiguities with respect to language use in verb prefixes, with a prefix preposition as a “fixed” or more “lax” or optional constituent, are often resolved within a context or sublanguage-specific framework. However, in non-sublanguage-specific texts such as political and journalistic texts, such cases are often subject to word play. For example, the German verb “einfallen” may have the meaning of “to come up with (an idea)” and be connected to a second meaning, within another framework, “to (forcefully) enter” (Harrap’s Standard German and English Dictionary) in the context of “in Afghanistan einfallen” (Example 4.2.3.5.a). Additional examples are the expressions “underpaid”, analysed as two words (“under” and the verb “to pay”), versus “undergone” (English), analysed as one word but containing the word “gone”, semantically related to the word “lost” and subjected to word play in some contexts.

Example 4.2.3.5.a

German:
“einfallen” = “to come up with (an idea)”
“einfallen” = “to (forcefully) enter”
Example: “in Afghanistan einfallen”

4.2.4 The “Attitude” Category

4.2.4.1 Introduction

Grammatical features linked to “non-neutral” content of the “Attitude” category include word categories such as the imperative infinitive, particles and adverbials. These grammatical word categories are detected at word level. At the Morphological Level, specific types of verb stems are also included in the “Attitude” category. These grammatical features may be used by the Speaker to express intentions and attitude, and they may occur within the framework of the Speech Acts Describe (DESC), Declare (DECL), Express (EXPR), Argumentation (ARGM) or Explanation (EXLP).

As in the case of the “Ambiguity” category, these word categories and grammatical features indicate “non-neutral” content at individual utterance level and are detected and evaluated with interactive procedures in the proposed TCIP-Annotation.

4.2.4.2 Adverbials, Particles and Speaker Behaviour

The category of word groups with implied connotative features – “non-neutral” content – also involves a specific set of particles, adverbials and exclamations, at least for European languages such as English and German. Typical examples of such elements are the expressions “merely”, “utterly”, “surely”, “doch” (German), “eben” (German) and temporal expressions such as “now” and “gleich” in German. In spoken language, these adverbials and particles may either be used to emphasize the semantic content of the spoken phrase or sentence’s overall utterance (Emphasis) or to allow a more casual or spontaneous effect of the overall spoken utterance (Casual).

In English, discourse markers comprising particles, adverbials and exclamations may be used in various ways, allowing multiple interpretations according to the context in which they are produced. Typical examples are the expressions “Right” and “Well”, used as exclamations and discourse

particles. The expression “Right”, originally an adjective, may be used literally to express agreement or any other form of confirmation agreement, as well as a reluctant or hesitant acceptance or confirmation and, in some cases, even frustration, expressed from the side of the speaker. The expression “Well”, originally an adverb, is also used as a discourse marker for the opening of sentence, the expression of hesitation or a feeling of awkwardness expressed by the speaker. In some cases, the expression may also be used in a casual, communicative spirit, such as in the sentence “Well, hello to you too”.

The above-described differentiations are not always easily perceived by non-native speakers and the international audience, often resulting in loss of implied information in a spoken text.

It may also be noted that in English and in German, the addition of the adverbial “now” (Example 4.2.4.2.a) and “gleich” (German: “(right) now”) (Example 4.2.4.2.b) seems to soften any harsh effect (Alexandris, 2010).

Example 4.2.4.2.a
English:

(i) I will ask you some more questions
(ii) I will ask you some more questions *now* (Adverb)

Example 4.2.4.2.b
German:

(i) Ich werde Ihnen einige weitere Fragen stellen
(ii) Ich werde Ihnen *gleich* (Adverb) einige weitere Fragen stellen

It is observed that the use of adverbials and particles for more casual or spontaneous effect in spoken utterances may substitute prosodic features such as prosodic emphasis. Furthermore, there are examples of particles where the presence or absence of prosodic emphasis determines their role in a spoken utterance, such as the case of discourse particles in Greek. For Greek discourse particles identified as “politeness markers” (“Tell me” -pite mou” and “Mabey” -mipos), the absence of prosodic emphasis signalizes them as politeness markers, while with the presence of prosodic emphasis they only have the property of discourse particles.

4.2.4.3 Implied Distance: The Imperative Infinitive

Another problematic case of "non-neutral" content focusing on the German language is the implied distance expressed by the German imperative infinitive (Imperativisches Infinitiv), which is strongly impersonal and excludes the implication of a specific subject, unlike the imperative verb in English.

A typical example of the German imperative infinitive in technical texts and manuals is the phrase "Kabel senkrecht nach oben wegführen" – "Place the wire horizontally towards the top" (Leicht und Ruppel, 2009). It may be noted that the German imperative infinitive, usually translated with an imperative finite verb (sometimes within an elliptical sentence), is less problematic within a specific sublanguage framework such as technical texts and manuals.

In the case of non-technical texts, the essence of the impersonal nature of the German imperative infinitive, as in the title "Gesetze Abschaffen!" ("Abolish Laws!" – literal translation) may not always be successfully conveyed in the target language, the only near equivalent impersonal form being the use of the passive.

4.2.4.4 Personal versus Impersonal Verbal Features

In verb-framed and pro-drop languages such a Spanish, Italian or Greek, the verb's semantic content contains the features of the verb's subject. In this case, the semantic content of the verbs allows the usage or interpretation of the "personal" tone related to the verb's subject: "(yo) tengo" – (I) have (Spanish). For example, the Greek verb "΄kano" ("I-do/make") is a verb containing the features of the verb's subject, and its semantics is not only restricted to the task-specific content of the English equivalent verb "do" or the equivalent German verb "machen".

- **"Intention-Behaviour" (IB) Verbs**

The above-described "personal" verbal features of pro-drop languages (such as Greek) can be intensified with prosodic emphasis. This property is integrated and implemented in Human–Computer Interaction (HCI) applications where the role of Prosody emphasizes the semantics of the word group concerned. Specifically, in Service-oriented Human–Computer Interaction (HCI) applications (Example 4.2.4.4), prosodic emphasis is given on words signalizing the User–System Relationship ("Usr-Sys-Rel" words). These words are:

(1) verbs expressing the System's intention (action) to serve the User;
(2) expressions (usually verbs) indicating the System's apologies, failure or error in respect to a task executed to serve the User;
(3) verbs expressing the User's actions or intentions;
(4) nouns expressing a task related to the actual interaction involving good intentions ("cooperation"); and
(5) nouns expressing a task related to the System's services.

These word categories may be described as expressions related to the System's positive attitude toward the User (Alexandris, 2010).

For spoken journalistic texts, these verbs can be grouped under a general category of "Intention-Behaviour" (IB) verbs, including verbs (I) of "Feeling-Intention-Attitude" type, for example, "expect", "take into account", "feel", "wish", "hope"; (II) of "Speech-Behaviour" type, for example, "demand", "request", "ask", "support", "convinced"; and (III) of "Benign-Malignant Behaviour" type, for example "attack", "defend".

"Intention-Behaviour" (IB) verbs can be integrated in automatic or interactive processes. In the case of automatic processes, WordNets or specially constructed lexicons or other resources are required.

Example 4.2.4.4.a

Prosodic Emphasis and Non-Task-related Speech Acts from Dialog Systems: Greek

(Prosodic Emphasis on IB verbs is underlined; other types of Prosodic Emphasis are indicated as italics)

(Alexandris, 2010)

1. Συγγνώμη *δεν* σας άκουσα (HCI-Dialog System Speech Act: "Justify")
2. Θα σας κάνω *μερικές* ερωτήσεις *ακόμα* (HCI-Dialog System Speech Act: "Introduce-new-task")
3. Σας ευχαριστούμε *πολύ* για την συνεργασία σας (HCI-Dialog System Speech Act: "Thank")
4. Σας ευχαριστώ για τα *επιπλέον* στοιχεία (HCI-Dialog System Speech Act: "Thank")
5. Προφανώς ολοκληρώσατε με τις *επιπλέον* πληροφορίες (HCI-Dialog System Speech Act: "Reminder")

Example 4.2.4.4.b
Translations close to the syntax of original spoken utterances

1. I am sorry**,** I could *not* hear you**.** (HCI-Dialog System Speech Act: "Justify")
2. I will (Greek: make**)** you *some more* questions (HCI-Dialog System Speech Act: "Introduce-new-task")
3. We thank you *very much* for your cooperation **(**HCI-Dialog System Speech Act: "Thank")
4. I thank yo*u* for the *additional* information (HCI-Dialog System Speech Act: "Thank")
5. You have obviously completed providing the *additional* input (HCI-Dialog System Speech Act: "Reminder")

4.2.5 The "Ambiguity" Category and the "Attitude" Category: Conclusions and Processing Tools

The grammatical features of the "Ambiguity" and the "Attitude" categories may be used by the Speaker to express attitude and intentions. As in the case of the grammatical features of the "Frequency" category, these grammatical features may occur within the framework of the ("explicit") Speech Acts: Describe (DESC), Declare (DECL), Express (EXPR), Argumentation (ARGM) or Explanation (EXLP).

For the processing of grammatical features of the "Ambiguity" and the "Attitude" category, an interactive procedure is proposed. As previously described (Chapter 2), the application of interactive and semi-automatic processes enables the correct transfer of the complete information content, including indicators of a Speaker's attitude and intentions.

- **The "Safety Mode Interactive Analysis" (SMI Analysis) for Grammatical Features of the "Ambiguity" and "Attitude" Categories**

Similarly to the case of interactive processing of ambiguous compound terms presented in the previous Chapter (Chapter 3), for the processing of the above-described grammatical features related to the "Ambiguity" and "Attitude" categories, the "Safety Mode Interactive Analysis" (SMI Analysis) is proposed, where words are analysed according to the parameters of the natural language concerned. In this case, the editor is activated with the identification of words of the above-described

categories constituting ambiguous “non-neutral” content identified by the User.

As described in Chapter 3, for the annotation of terminology and ambiguous phrases requiring additional processing, the “[SMI]” tag is proposed in the TCIP-Annotation framework (Figure 4.2.2), functioning as a “button” and activating the respective interactive processing module, linked to the related resources.

The presented SMI analyses are an analytical form of the possible variations of grammatical information, for example, “the points in the negotiation that are being dealt with (now)” [PRESENT] or “the points in the negotiation that are being dealt with (already)” [PAST].

In other cases, distinctive signalizations are presented such as “POSSIBILTY”, or “CERTAINTY” for modal verbs, or “COMMUNICATIVE” or “EMPHATIC” for adverbials and particles. As in the case of interactive processing of ambiguous compound terms, the presented analyses are compatible with the presentations of logical relations with the Universal Word – UNL framework and its resources, which aims to present a simplified form of an independent analysis across languages and language families (Uchida et al., 2005; Uchida et al., 1999: The Universal Networking Language: http://www.undl.org).

Figure 4.2.2

Transcription Tool Outline	
Speech Signal	
Text	text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]
Speaker Turns and (Basic) Annotation	Speaker A/ annot-text- annot-text- Speaker B/ annot-text- annot-text-
Proposed Annotations	annot-text-[Terms / Complex-Info/ Prosody-Paraling]

Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)		
Input	**[SMI] TAG** **(Activation of SMI–Analysis)**	Choice of Equivalent Expressions

Table 4.2.5.1: "Safety Mode Interactive Analysis" (SMI Analysis) based on application for German Financial Terms (Valavani, Alexandris, Tassis and Iliakis, 2015).

INPUT (TEXT):	SMI-ANALYSIS:	Equivalent Expressions:
"In this case, we may block all negotiations"	CAT: Modal verb [POSSIBILITY] [CERTAINTY]	**might** In this case, we might block all negotiations (Or :) **will** In this case, we will block all negotiations
"…in der Verhandlung behandelten Punkten"	CAT:Past Participle "die Punkte die in der Verhandlung behandelt werden" [PRESENT] die Punkte die in der Verhandlung behandelt worden sind" [PAST]	 "the points in the negotiation that are being dealt with (**now**)" (Or :) "the points in the negotiation that are being dealt with (**already**)"
"living"	CAT:Gerund [NOUN] [VERB]	**life** (Or :) **living**
"einfallen"	CAT: Verb + Preposition ein-fallen	= "**to come up with** (an idea)" = "**to** (forcefully) **enter**"
"Gesetze Abschaffen!"	CAT: Imperative Infinitive [+ IMPERSONAL, + DISTANCE]	**[impersonal]** "Abolish Laws!"-(literal translation)

"doch"	CAT: Particle	**[communicative] yes** (Or :) **[emphatic]** **yes**
"άκουσα"	Special Word Category: IB Verb hear (suffix – subject) [- IMPERSONAL, -DISTANCE]	**[communicative]** "I hear you"

- **Additional Applications of Grammatical Features linked to Complex Information – "Non-Neutral" Content**

As a final note, the identification of specific types of grammatical features may enable the evaluation and processing of complex information and/or "non-neutral" content in written texts (for example, journalistic texts, legal documents or historical texts used as reference works), in combination with spoken journalistic texts. These types of grammatical features may be integrated for Information Extraction (IE) and Information Retrieval (IR), in addition to keywords and other expressions typically used in these applications (Mausam et al., 2012).

4.2.6 Explaining Intentions with Grammatical Features: The Case of Parallel Evaluation of Information Content of Ancient "Journalistic" Texts with Current Political Affairs

Information contained in spoken journalistic texts can be directly combined with respective information contained in written journalistic texts and other types of written texts used as reference work, such as historical texts. Historical texts are often used parallel to journalistic texts for comparison and evaluation with respect to current political affairs. The present processing approach allows the extraction of political and diplomatic information of the past and its presentation parallel to current written or spoken transcribed journalistic texts, allowing accessibility to a broader, international public.

- **Using Grammatical Features**

As in the case of transcribed spoken journalistic texts, grammatical features may contribute to the processing and extraction of complex information from "journalistic" texts of the past, including translated historical texts. Particles, conjunctions and stems of specific types of verbs such as the previously presented "IB" (Intention-Behaviour) verbs are, among other grammatical features, key elements allowing access to information closer to the original source-language text (Alexandris et al, 2017).

In the case of the historical text presented here, a typical grammatical feature of the Explanation (EXPL) Speech Act, namely conjunctions (CONJ), is connected to another grammatical feature, the "IB" (Intention-Behaviour) verbs, for the extraction of information regarding diplomacy and geopolitical relations and its comparison to the content of present-day spoken political discussion and interviews.

- **Choosing an Assistive Translation**

Diplomacy, especially international politics and bilateral relations of the past and present, including mentalities and attitudes of politicians and military men or reactions of citizens to policies, constitute complex information that is difficult to process or retrieve automatically. In some languages, difficulties involving the direct access to information with recently implemented Machine Translation and Information Extraction (and Data Mining) methods is, in many cases, problematic, due to complications related to linguistic phenomena, such as the extensive use of pronouns and other forms of anaphora and context-dependent expressions.

In previous studies concerning the processing of ancient texts (Alexandris, 2014; Alexandris, 2012), in the partially implemented module proposed for an interactive Machine Translation, Information Retrieval and/or Data Mining, the translation process involved a sublanguage-specific ontology assisted by a multilingual ontology such as the Universal Word Framework (Uchida et al., 1999; Uchida et al., 2005). Pre-existing resources and tools are involved in the translation process (compliance with the use of Resources Issue – C). These include online machine translation systems such as Google Translate in combination with online available translations. These translations play the role of the so-called "Assistive" or "Buffer" translation, where any existing linguistic issues are already resolved by the translation itself (Example 4.2.6.a).

Assistive "Buffer" translations should be carefully chosen with respect to their quality. High quality translations in languages with close linguistic, geographical and/or cultural proximity to the source language are especially efficient, since they may transfer a broader spectrum of explicit and implied information. Furthermore, it should be noted that expressions related to politics and diplomacy may vary across languages and language communities and are often difficult to detect and process. Thus, the use of an assistive "Buffer" translation with a connection to the sublanguage-specific ontology and possibly other multilingual ontologies, such as the Universal Word- UNL framework, may significantly assist the interactive information extraction, data mining and/or machine translation process.

In the texts of the Ancient Greek historian Thucydides ("History of the Peloponnesian War"), information is not usually expressed in the typical form and style of most journalistic texts of the international media, and therefore, it is not easily processible with conventional Natural Language Processing strategies. The Katharevousa Greek assistive "Buffer" translation constitutes a minimal cross-linguistic interference translation, being very close to the original Ancient Greek text, and explicitly presents most of the information implied by pronouns and other forms of anaphora and context-dependent expressions in the original Ancient Greek text which are difficult to process and retrieve (Alexandris, 2014; Alexandris, 2012) (Example 4.2.6.a).

Similar "Assistive" ("Buffer") translations may be implemented for accessing and processing information in historical texts in other languages such as Sanskrit/Hindi, Farsi (Persian) and Mandarin Chinese.

Example 4.2.6.a

Application of the assistive "Buffer" Translation for accessing cause-effect relationships in diplomatic information for Thucydides' "History of the Peloponnesian War" (Alexandris, 2012).

Set language: Language: English:
Set Source Text: Ancient Greek, Author: Thucydides
English Translation:
http://classics.mit.edu/Thucydides/pelopwar.mb.txt [2.11.4]

The course of war cannot be foreseen, and its attacks are generally dictated by the impulse of the moment; and where overweening self-confidence has despised preparation, a wise apprehension often been able to make head against superior numbers.

Google-Translate of BUFFER TRANSLATION: As the fortunes of war are hidden and small events big events can be generated, and military operations are mostly in a boiling passion. And many times less power, because of anticipation, of which impose a sense of failure, effectively repelled more numerous, which was found unprepared because they underestimated her opponent.

Original Ancient Text:
http://www.greek-language.gr/greekLang/ancient_greek/tools/corpora [2.11.4]

ἄδηλα γὰρ τὰ τῶν πολέμων, καὶ ἐξ ὀλίγου τὰ πολλὰ καὶ δι' ὀργῆς αἱ ἐπιχειρήσεις γίγνονται· πολλάκις τε τὸ ἔλασσον πλῆθος δεδιὸς ἄμεινον ἠμύνατο τοὺς πλέονας διὰ τὸ καταφρονοῦντας ἀπαρασκεύους γενέσθαι.

- **Assistive Translation and Information Extraction**

The translations concerned are in formal Modern Greek or "Katharevousa", a "compromise" between Ancient Greek and Modern Greek, in particular, by prominent Greek statesman and political leader Eleftherios Venizelos (1864–1936), published in 1940 in the University of Oxford, after his death and also provided online (Centre for the Greek language: Portal for the Greek Language: www.greeklanguage.gr, E.Venizelos Translation [1940] 1960). These translations, combining both linguistic proximity to the original text and expert knowledge, function as an assistive "Buffer" translation, connecting the User-Journalist's queries with keywords translated from English (or another language) to Greek and presenting respective passages from English translations (for example, Crawley, 1903) (or in another language) (Example 4.2.6.b). Therefore, expert knowledge is integrated in the present strategy, often with additional features constituting information not always visible in translations in other languages, mainly due to linguistic parameters. The example in Example 4.2.6.b related to the keyword query "allies" and "change sides" illustrates the additional information (in curly brackets "{}") from the Assistive Translation, as well as its similarity to the original ancient text (we note that the Athenians and Lacedaemonians (Spartans) were the superpowers of the time).[15]

[15] Assistive Translation (for Search and Extraction): [5.29.1] Πρώτοι οι Μαντινείς και οι σύμμαχοί των προσεχώρησαν εις την συμμαχίαν ταύτην, εκ φόβου των Λακεδαιμονίων. Διότι, διαρκούντος ακόμη του προς τους Αθηναίους πολέμου, οι Μαντινείς είχαν υποτάξει μέρος της Αρκαδίας, και ενόμιζαν, ότι οι Λακεδαιμόνιοι δεν θα τους επέτρεπαν να διατηρήσουν την επ' αυτού κυριαρχίαν, ήδη οπότε αι χείρες των ήσαν ελεύθεραι. Ώστε προθύμως εστράφησαν προς το Άργος θεωρούντες αυτό πόλιν ισχυράν, και ανέκαθεν αντίπαλον των Λακεδαιμονίων, και επί πλέον δημοκρατουμένην, όπως και αυτοί.
Original Ancient Text: [5.29.1] Μαντινῆς δ' αὐτοῖς καὶ οἱ ξύμμαχοι αὐτῶν πρῶτοι προσεχώρησαν, δεδιότες τοὺς Λακεδαιμονίους. τοῖς γὰρ Μαντινεῦσι μέρος τι τῆς Ἀρκαδίας κατέστραπτο ὑπήκοον ἔτι τοῦ πρὸς Ἀθηναίους πολέμου ὄντος, καὶ ἐνόμιζον οὐ περιόψεσθαι σφᾶς τοὺς Λακεδαιμονίους ἄρχειν, ἐπειδὴ καὶ σχολὴν ἦγον· ὥστε ἄσμενοι πρὸς τοὺς Ἀργείους ἐτράποντο, πόλιν τε μεγάλην νομίζοντες καὶ Λακεδαιμονίοις αἰεὶ διάφορον, δημοκρατουμένην τε ὥσπερ καὶ αὐτοί.

Example 4.2.6.b

Example of query and related passages for accessing cause-effect relationships in diplomatic information for Thucydides' "History of the Peloponnesian War".

Query: "Allies" "change sides"	
Video[16]	
Speech Signal[17]	
Current Journalistic/ Political Text	text- text- text- text- text- text- text- text- text- [& Machine Translation Option]

Ancient Text (Query: "Allies" "change sides")

English translation (for Queries) (MIT Classics Archive):
The Mantineans and their allies were the first to come over {become allies with} through fear of the Lacedaemonians. {Because} Having taken advantage of the war against Athens to reduce a large part of Arcadia into subjection, they thought that Lacedaemon would not leave them undisturbed in their conquests, now that she had leisure to interfere, and consequently gladly turned to a powerful city like Argos, the historical enemy of the Lacedaemonians, and a sister democracy.

As stated above, extracting the requested information from passages in the "Assistive" translation is based on (1) the recognition of a defined set of conjunctions (CONJ) and (2) the recognition of a set of words concerning intention and behaviour, annotated as the previously described "Intention-Behaviour" – IB words (verbs and participles) (Alexandris et al, 2017). IB words contained in extracted passages can be related to a

[16] Image from www.shutterstock.com
[17] Image from www.shutterstock.com

singular query containing keywords from the keyword Query Ontology, the database of keywords assisting queries:

(Q- Keyword): Query: [Q- Keyword(s)] IB <CONJ> IB [Q- Keyword(s)].

The IB words occur "before" and "after" the conjunction (CONJ). The text containing the IB word(s) before the conjunction CONJ expresses the "Result (Outcome)" relation. The text containing the IB word(s) after the conjunction CONJ expresses the "Cause (Source)" relation. However, for some types of conjunctions, the reverse order applies. The order and type of "Cause (Source)" and "Result (Outcome)" is dependent on the type of conjunction concerned. This type of order is defined according to the information structure in the Assistive ("Buffer") Translation, which allows a strict formalization of information content based on syntactic structure, similarly to formalizations for creating Controlled Languages (Alexandris et al, 2017).

The group of specified conjunctions describing causal relations contains expressions such as "because" and "due to" ("διότι", "επειδή", "άλλωστε", "δια το", "δηλαδή", "ένεκα", "ένεκεν", "ώστε"). Relations between topics may concern IB verbs: (I) of "Feeling-Intention-Attitude" type, what was believed, what was felt, what was intended, what attitude prevailed (Int-Intention), (II) of "Speech-Behaviour" type (Sp-Speech), what was said and (III) of "Benign-Malignant Behaviour" type, actual behaviour (Bh-Behavior). The types of IB verbs are tagged (Int, Sp, Bh) for possible use in other applications.

Examples of the "Feeling-Intention-Attitude" type (Int) are verbs such as "were intended to" ("διατεθειμένοι"), "ignored", "were ignorant about" ("ηγνόουν"), "expected", "calculated", "took into account" ("υπελόγιζαν"). Typical examples of the "Speech-Behaviour" type (Sp) are the verbs "asked", "demanded" ("εζήτουν"), "convinced" ("πείσουν"), "supported", "backed" ("υπεστήριζε"). An example of the "Benign-Malignant Behaviour" type (Bh) is "secured" (in context of negotiation) ("εξασφαλίσας").

In the following example (implementation in JAVA) (Alexandris et al, 2017), the passages contain cause-efect relations related to the keywords "subjects (of superpowers)","revolt" and "carried away" from the Query Ontology (Q). A query concerning the possibility of a revolution by people controlled by a superpower ("subjects (of superpowers)", "revolt") is refined and assisted with the aid of keywords from the Query Ontology. Search and extraction is performed with the combination of the above-described IB verbs and CONJ, extracting one or multiple passages containing the requested keywords (Example 4.2.6.c):

Example 4.2.6.c

Example of query and related keywords for accessing cause-effect relations in diplomatic information for Thucydides' "History of the Peloponnesian War" (Alexandris et al, 2017).

SPOKEN TEXT [Current Journalistic/Political Text]

"Allies" – "revolt"

User QUERY: [Q- Keyword(s)] IB <CONJ> IB [Q- Keyword(s)]

[subjects (of superpowers), revolt (Q)] (IB-Int: showed desire) <CONJ: because> (IB-Sp: admit) [carried away (Q), passion (Q)]

The extracted passages are presented to the User-Journalist (The Eighth Book, Chapter XXIV, Nineteenth and Twentieth Years of the War – Revolt of Ionia – Intervention of Persia – The War in Ionia). The additional information from the Assistive Translation (Katharevousa Greek text) is depicted in curly brackets ("{}") (Example 4.2.6.d):

Example 4.2.6.d. Example of extracted passages for accessing cause-effect relations in diplomatic information for Thucydides' "History of the Peloponnesian War" (Alexandris et al, 2017).

http://www.mikrosapoplous.gr/thucy/vivlia/vivlio8.htm

English Translation: But above all, the subjects of the Athenians showed a readiness to revolt {against rule} even beyond their ability, {because} judging the circumstances with {carried away by} {revolutionary} passion, and refusing even to hear of the Athenians being able to last out the coming summer.

Assistive Translation: Before: CONJ ("διότι")-IB: "εκτιμώμεναι": [Αλλ' οι, υπήκοοι προ πάντων των Αθηναίων εδείκνυαν μεγάλην επιθυμίαν όπως αποτινάξουν την κυριαρχίαν των και αν ακόμη αι δυνάμεις των ορθώς εκτιμώμεναι δεν ήσαν επαρκείς εις τούτο]

After: IB: "παραδεχθούν": [διότι εις τας κρίσεις των παρεσύροντο από τον επαναστατικόν οργασμόν, και δεν ήθελαν να παραδεχθούν καν ότι οι Αθηναίοι ήτο ενδεχόμενον να ανθέξουν κατά το προσεχές θέρος].

4.3 Semantic Features

4.3.1 A "Deeper" Level of Complex Information

Features in Semantics are related to semantic and sociolinguistic parameters in the language concerned, requiring an in-depth knowledge of the language, including a perspective from history and/or literature and (symbolisms, associations) and a perspective from the current use of the word/expression in the present socio-cultural context (politics, trends, society).

The resolution of problems and other issues related to features in Semantics is heavily dependent on the analyst's/evaluator's/translator's knowledge and the decision to modify or not to modify the actual type of expressions processed in order to correctly convey the Speaker's intention.

Features in Semantics can be detected at a context-specific or "horizontal" level. A facet of the word's semantic content related to its current use in politics is easily retrievable with online search in journalistic texts and political speeches. Features in Semantics at a context-specific or "horizontal" level include widely-used expressions, slang, and words related to current political slogans or other forms of political associations. A wide range of available online corpora and lexica and other resources can assist in the above-described process, which, in some cases, may be time consuming.

However, there are types of commonly used words that, in some contexts, can be related to implied connotative features and "non-neutral" content. These words are so common that a search in available online corpora and lexica usually cannot highlight their "non-neutral" content in journalistic texts and political speeches. The facets of the semantic content of these word types may be described as existing in a deeper "vertical" level ("deep level") related to symbolisms, associations and even to their phonological structure. These commonly used words are often primitive nouns, verbs and adjectives and are usually located at the upper nodes of ontologies and WordNets. In languages such as Chinese, primitive nouns, verbs and adjectives can correspond to pictograms (for example, "moon", "mountain", "mother", "big").

The "deep level" can also connect aspects of the word's semantic content ("Meaning") with the Phonological and Prosodic level ("Prosody-Phonology"):

- Meaning
- Prosody-Phonology

Finally, we note that the presence of a singular word with complex semantics in a spoken journalistic text may "set the tone" of the entire spoken text and/or the Speaker(s) behaviour.

- **The Question of "How?" addressed by the Question of "Where?" – Revisited**

Unlike the case of terminology in spoken journalistic texts presented in the previous chapter (Chapter 3), the question of "Where" related to the factor of target readership/audience and domain may not always contribute to the resolution of non-terminology words with complex semantics, namely the "How" question. Non-terminology words with complex semantics may be language- and culture-specific; however, they are usually widely used, everyday words, and speakers are usually not aware of their potential effects or impact on a different audience or a wider audience.

However, this does not imply that to provide solutions to the question of "How", the question of "Where" should not be addressed. In this case, the question of "Where" is not the domain of the text and the target audience, but the level of depth regarding the complex semantic information – the above-stated "deep level".

The complex semantic information located at the "deep level" is related to the previously described combination of the information content of spoken utterances with the intentions and attitude of the Speaker, where both what is said and how it is said are of equal importance. This complex type of information is perceived and understood by native speakers – consciously or subconsciously; however, it may be problematic when non-native speakers and an international public is concerned.

- **"Stable" versus Context-Dependent "Flexible" Linguistic Parameters – Revisited**

Unlike "non-neutral" content in grammatical features that are directly detectable and processable, non-terminology words with complex semantics are not determined by specific, "stable" parameters.

Similarly to terminology directly derived from historical and traditional usage, (non-terminology) words with complex semantics are connected to their most common, widely accepted or traditional usage in the natural language concerned. In particular, non-terminology words with complex semantics may be related to their polysemy in the natural language. This polysemy may influence the type of connotation or other features in the semantic content of the word in question.

An additional factor is the origin and/or etymology of the word; how it has been traditionally used; possible historical, social or religious associations; or its role in literature.

Furthermore, phonetic-phonological features may, in some cases, be related to the complex semantics of words with "non-neutral" content.

In other words, the above-described parameters concerned may be considered to be "flexible" parameters, as previously presented in the case of terminology (Chapter 3).

4.3.2 "Gravity" of Words

Commonly used, semantically "primitive" nouns, verbs, adjectives or adverbs may sometimes be problematic when it comes to their correct interpretation and transfer in another language. It is often observed that the semantic equivalent of the same word in one language sometimes may appear more formal or with more gravity than in another language. These words with "gravity" in their meaning may either emphasize the role of the word in an utterance or be related to word play and subtle suggested information. In particular, the presence of such words may contribute to the degree of formality or intensity of conveyed information in a spoken utterance.

These differences between languages are often related to polysemy, where the possible meanings and uses of a word seem to "cast a shadow" over its most commonly used meaning. Therefore, the most commonly used meaning, appearing as the "first" meaning in a dictionary, online lexicon or translation memory (the use of Resources-C), may not always correspond to a correct transfer in the target language.

For example, the word "lazy" has a negative connotation in English, but in some contexts, it is also associated with the meaning of "laid back" ("a lazy afternoon"). The equivalent of "lazy" in German, the word "faul" may, in some contexts, appear to be of too negative "gravity" to accurately correspond to the English word "lazy" (Example 4.3.2.1). We note that in German the word "faul" also means "rotten", for example, "faule Eier" ("rotten eggs"). Another example of polysemy which may be related to the "gravity" of a word connected to its multiple meanings is "logos" in Greek, which is connected to meanings such as "speech", "logic", "intelligence", "reason", "word of honour", "ratio" (in mathematics) and even "God" (in religious texts) (Example 4.3.2.1).

Example 4.3.2.1

(Alexandris, 2018b)

- "lazy" vs "faul" (German)
- "logos" (Greek): "speech", "logic", "intelligence", "reason", "word of honor", "ratio" (in mathematics) "God" (in religious texts)

Furthermore, some words may contain semantic features characterizing them with the exact opposite of "gravity", namely a lack of "gravity". A typical example is the word "pink" in American English (Example 4.3.2.2), even the word "nice" (Example 4.3.2.4), as opposed to the words "deal" (Example 4.3.2.3) and "trust" (Example 4.3.2.4 and Example 4.3.2.5). In both cases, "Gravity" is observed to be a feature to apply in both cases and can be marked as either "+ Gravity" or "-Gravity".

Such words can often be related to Lexical Bias concerning semantic perception (Trofimova, 2014) (presented in the following section). International speakers may misinterpret the intention of a native speaker due to the "gravity" of words in their native tongue: word play and subtle suggested information may often go unnoticed by an international public in political discussions and interviews.

Words with perceived "gravity" in their semantic content that can create complications in their correct interpretation, transfer and/or processing are linked to the following properties:

- Commonly used, semantically "primitive" nouns, verbs, adjectives and adverbs.
- Polysemy – multiple uses and meanings.

The detection and processing of "Gravity" words may be difficult to integrate in automatic procedures. However, with the aid of ontologies and other resources, "gravity" words can be included in post-processing procedures.

In particular, an indication of the polysemy of "Gravity" words, available from lexical resources (in compliance with the Resources issue–C) in an interactive post-editing process may facilitate the correct transfer of the complete information content including a Speaker's attitude and intentions. However, it should be stressed that the interactive processing procedure of "Gravity" words may also require prosodic input, since "Gravity" words may be accompanied by prosodic emphasis or another

type of distinctive prosodic feature. In this case, the integration and processing of prosodic/phonological features requires the use of transcribers or other speech processing tools.

Example 4.3.2.2

"**pink**" (American English)

pink ("tickled pink" – American English: very pleased)

https://dictionary.cambridge.org/dictionary/english/tickled-pink
pinkie/ pinky = the smallest finger of a person's hand (American English)
https://dictionary.cambridge.org/dictionary/english/pinkie#translations

and that really, truly, deep down and with a pinky swear,

https://www.theatlantic.com/politics/archive/2018/07/the-russians-are-coming/565478/

Example 4.3.2.3

"deal" (American English)

Boston Globe, **Boston.com** Politics
Fact Check: Trump And Clinton Debate For The First Time

September 26, 20168:48 PM ET

DONALD TRUMP

Let me tell you, let me tell you. Hillary has experience but it's bad experience. We have made so many bad deals during the last...so she's got experience that I agree but it's bad, bad experience. Whether it's the Iran deal that you're so in love with where we gave them 150 billion dollars back...whether it's the Iran deal whether it's anything...you almost can't name a good **deal**. I agree, she's got experience but it's bad experience. And this country can't afford to have another four years of that kind of experience.

https://www.npr.org/2016/09/26/495115346/fact-check-first-presidential-debate?utm_source=twitter.com&utm_medium=social&utm_campaign=npr&utm_term=nprnews&utm_content=20160926?utm_source=twitter.com&utm_medium=social&utm_campaign=npr&utm_term=nprnews&utm_content=20160926

Example 4.3.2.4

Transcribed Spoken Test: (Including "IB" Words):
Foreign Minister Sergey Lavrov's interview with BBC HardTalk 720-16-04-2018

Question: You say there is no **trust**. You mean zero **trust** now between Russia and the United States?

Sergey Lavrov: I said they are losing the last remnants of trust – which is not yet zero.

Question: Not yet zero. I just wonder: as Foreign Minister of Russia when you wake up in the morning and you read on Twitter the words of the United States President and the Commander-in-Chief saying in essence: Get ready Russia; our nice, new, smart missiles are coming – what do you make of that?

Sergey Lavrov: Well that the President of the United States writes his tweet.

Question: And your response to those tweets is?

Sergey Lavrov: Well, the proof of the pudding is in the eating, as you know. So, we waited for these smart new – what else was there? – **nice** missiles to be used at the attack and we calculated that two thirds of them did not reach their target because they were intercepted.

Example 4.3.2.5

STATE OF THE UNION

Interview With Florida Senator Marco Rubio; Interview With Massachusetts Congressman Seth Moulton; Interview With Former Trump Adviser Carter Page; GOP Representative: Putin Is "Manipulating" Trump; President Trump Invites Putin To Washington; Air Force One Getting A Makeover In This Week's "State of the Cartoonion". Aired 9- 10a ET
Aired July 22, 2018 - 09:00 ET
http://transcripts.cnn.com/TRANSCRIPTS/1807/22/sotu.01.html
TAPPER: Someone else that thinks she's a part of a new generation of leaders, Democratic congressional candidate Alexandria Ocasio-Cortez, hit the campaign trail with Senator Bernie Sanders this weekend in Kansas.

She says her platform, which includes universal jobs guarantee, forgiveness of all student loan debt, abolishing ICE, represents the future of the Democratic Party. Do you agree?

MOULTON: Well, I think that she has an important voice in the Democratic Party. But the reality is that, if we're going to be a majority party, if we're actually going to win in November, we have got to have a diversity of views.

And I think that's one of the things that's made our party strong in the past. But, if we become narrower, if we become more divided, then you know what? We can do that as Democrats. We're just not going to win.

And I think that the stakes are so high in November. The stakes are so high to put a check on this president, to put a check on the administration, to restore some balance in Washington, that we have got to make sure that we have a broad base.

And we should have people like Alexandria in our party, but we should also have people like Amy McGrath in Kentucky, this amazing woman who was the first woman to fly an F/A-18 in the Marine Corps in combat. She's running in a tough district, a tough district that Alexandria couldn't win, but that Amy can.

And she's a leader that people will look to and say, I'm going to get behind Amy just because -- because I believe in her leadership, because I **trust** her judgment, not just because she's a Democrat, but be someone -- but because she's someone who has served her country before and someone we can **trust**.

We need people like that in the party as well.

TAPPER: All right, Congressman settlement, Democratic of Massachusetts, thank you so much, sir. Appreciate your time.

4.3.3 “Evocative” Words

Another word group that can be related to Lexical Bias concerning their semantic perception (Trofimova, 2014) is a group which we refer to as “Evocative” words. Similarly to the above-described category, “Evocative” words are commonly used, semantically “primitive” nouns,

verbs, adjectives or adverbs. Their evocative element concerns their "deeper" meanings related to their use in tradition, in music and in literature and sometimes may be related to emotional impact in discussions and speeches.

Since this word category concerns common everyday words, their evocative features are less obvious and are not always consciously used or perceived by native speakers. As in previously presented words with "gravity" in their meaning, with "Evocative" words, word play and subtle nuances in expressions may often be unnoticed by an international audience.

In contrast to "Gravity" words, "Evocative" words usually contribute to a descriptive or emotional tone in an utterance. These common words may be related to concepts such as colours, for example, "grau" ("grey") in German or the natural world, for example, "thalassa" ("sea") in Greek or "moon" in English (Example 4.3.3.1).

Words with "evocative" usage in specific contexts often co-occur with words with a positive or a negative connotation or with a scholarly or vulgar usage. For example, the word "Hund" (German: "dog") co-occurs with the word "Verlierer" (German: "loser") and is used with its evocative properties (Example 4.3.3.3).

Example 4.3.3.1

(Alexandris, 2018b)

- "moon"
- "grau" ("grey") (German)
- "thalassa" ("sea") (Greek) "moon"

These words are not easily detected with automatic procedures. However, in many cases they either receive prosodic emphasis and/or their phonetic-phonological features are intensified when articulated by native speakers. These elusive words are linked to the following properties:

- Commonly used, semantically "primitive" nouns, verbs, adjectives and adverbs.
- Commonly used in tradition, in music and in literature.
- Often have prosodic and phonetic-phonological features intensified.

The intensification of phonetic-phonological features and/or the use of prosodic emphasis in "Evocative" words underlines the "deeper" levels of the semantics of the word in question. Unlike the case of "prosodically sensitive" words (Alexandris, 2008) in English, prosodic emphasis in "Evocative" words does not play a modifying role similar to that of the adverbials "very" or "big" (Example 4.3.3.2):

Example 4.3.3.2

- "It was a big(emphasis) truck". = It was a (really) big truck
- "Wow, that was some(emphasis) desert! = Wow, that was some (very good) desert!"

As in the case of "Gravity" words, the detection and processing of "Evocative" words is not easily integrated into automatic procedures. A more realistic approach would be including this word group in post-processing procedures with the aid of resources identifying typical contexts in which the words occur, as well as possible collocations.

In particular, an interactive post-editing process may contain a special tag for the indication of the connotative features of "Evocative" words, as indicators of a Speaker's attitude and intentions. These connotative features may be described with simplified descriptions, for example: "positive"/"negative" or "+ high" for sophisticated, scholarly or literary usage; "+low" for colloquial, slang or vulgar usage; or "other" if none of the previous cases apply.

As in the case of "Gravity" words, the interactive processing procedure of "Evocative" words may require prosodic input, in this case, prosodic emphasis: any form of stressing distinctive phonetic and phonological features or any other form of special prosodic features. The use of transcribers or other speech processing tools is required for the integration and processing of these prosodic features.

Example 4.3.3.3

https://www.berliner-zeitung.de/politik/kommentar-zum-aerger-in-der-cdu-angela-merkel-muss-ihren-politischen-nachlass-regeln-29639694

Berliner Zeitung, 20.07.2018

Entsetzen, Enttäuschung und Unruhe zeigt sich schließlich in ihrer Partei, die darin zumindest fürs Erste (mal) sogar die SPD übertrifft, was man erstmal schaffen muss. Wochen- und monatelange Verhandlungen sind vorbei, die Phase der Ungewissheit beendet - und die CDU schleicht sich davon wie ein geprügelter **Hund,** ein reichlich geflledderter Verlierer, und die Müdigkeit der Vorsitzenden nach langen Nächten tut ihr Übriges. Ein Aufbruch soll die neue Regierung qua Eigendefinition vermitteln. Der größte Partner überlässt das erstmal den anderen.

[…]

Erneuerung ist das Stichwort - das Interessante ist, dass die Erneuerung darin bestehen soll, ein Stück weit zurückzukehren zur „alten CDU“, wenn auch nicht gleich zum **Kinder-Küche-Kirche**-Modell vielleicht.

This inherently “deep”, complex semantic information, stressed but not determined by Prosody, is signalized in the proposed TCIP-Annotation option (Figure 4.3.1) by the respective “[impl]” tag at word level for “Gravity” or “Evocative” words. The “[impl]” tag allows the indication of additional information, including prosodic information, if applicable. The prosodic information can be indicated by an additional tag for the respective prosodic features, such as prosodic emphasis or a special stress in the articulation of phonetic and phonological features.

“Gravity” words and “Evocative” words can be related to language-specific and culture-specific word categories with similar complex semantics and characteristics defined in other languages such as “Kenayeh” (allusion) words in Arabic and Persian (Kheirandish and Dorri, 2013).

Figure 4.3.1

Transcription Tool Outline	
Speech Signal	
Text	text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]
Speaker Turns and (Basic) Annotation	Speaker A/ annot-text- annot-text- Speaker B/ annot-text- annot-text-
Proposed Annotations	annot-text-[Terms / Complex-Info/ Prosody-Paraling]

Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)	
Input	**[impl] TAG**
	+ Prosodic Features

4.4 Semantic Features and Cognitive Bias

4.4.1 Cognitive Bias: Lexical Bias and Confidence Bias

Both “Gravity” words and “Evocative” words are related to socio-cultural elements and can, therefore, be perceived in a different manner by native speakers and the international audience. Differences in the perception of “Gravity” and “Evocative” words may be linked to Cognitive Bias as regards their meaning and the evaluation of the overall spoken interaction. Associations and other types of relations between words can be related to Cognitive Bias, in particular Lexical Bias (Trofimova, 2014), and can also

be used to evaluate interviews or discussions and the existence of Cognitive Bias between the Speakers-Participants. The evaluation of spoken interactions may also concern any existing Confidence Bias (a category of Cognitive Bias) (Hilbert, 2012) of the evaluator.

The following definitions of Confidence Bias (Hilbert, 2012) and Lexical Bias (Trofimova, 2014) are presented as types of Cognitive Bias:

- "The ***confidence bias*** originates in the internal uncertainty of the judge, rather than environmental uncertainty regarding the objective evidence (like conservatism or the exaggerated expectation bias). It refers to subjective uncertainty about the objective facts (see Wagenaar & Keren, 1985). More specifically, the confidence bias is the experimentally confirmed fact that we tend to be overconfident in our judgments when we are fairly certain about something, and under-confident when we have a high level of subjective uncertainty (for discussions see Keren, 1997; Liberman & Tversky, 1993; McClelland and Bolger)." **(Hilbert, 2012)**
- **"**Methodological considerations of studies investigating the semantic perception of ***lexical material***:
- The main challenge in studying the **semantic perception of words** is the diversity of meanings and associations that people attribute to the words. Meaning appeared to be individually unique and different not only between people from different cultures, social and family background, but also between all individuals". **(Trofimova, 2014)**

As presented in previous research (Alexandris, 2018a), Cognitive Bias can be determined from the form of generated visual representations of dialog flow (I), for evaluating success or failure of spoken interaction. The generated visual representations are intended to facilitate evaluation processes, therefore saving time (in compliance with the Speed Issue – B). This is related to by-passing Confidence Bias (Hilbert, 2012) of the evaluators of the interview or discussion. Cognitive Bias is also measured in the form of triple tuples as perceived relationship-distances between word-topics (II), related to a type of Lexical Bias (Trofimova, 2014) concerning semantic perception (Alexandris, 2018a).

In the research presented, Cognitive Bias is attributed to a large extent to current political and context-specific associations, which may vary among Speakers. However, "Gravity" words (for example, "country" or "people") and "Evocative" words may be the same for many Speakers belonging to the same native language and/or same language community (Example 4.4.1).

Example 4.4.1

Fragments of interviews and relationships of topics (names of countries, nations and people withheld):

- **Citizens** - **Laws** - *National*-**state** - *country* **Nationals** - **minority group** - **people** – **country** - *country's* **culture** - **nationalist** – **nationalism** - **violence** - **Law**

- Country's **Economy** - country's **people** - country's **Economy** - country's **people** - country's **foreign policy** (with country X) - country X's **people** - country' Xs **foreign policy** (with other countries) - country's **people**

In the presented approach concerning an interactive system (Alexandris, 2018a), topics are defined (by the User) at a local level with the activation of the "Identify Topic" command, in respect of the question asked or issue addressed by the interviewer or moderator. This interactive topic definition, based on previous research concerning the interactive annotation of pragmatic features in transcribed journalistic texts (Alexandris et al., 2015), allows the content of answers, responses and reactions to be checked with respect to the question asked or issue addressed. Topics, treated as local variables, are registered and tracked. The automatic signalization of nouns by the Stanford POS Tagger in each turn taken by the speakers-participants in the respective segment in the dialog structure provides assistance in choice of topic (Alexandris, 2018a). We note that the use of registered and tracked keywords, treated as local variables, is crucial for the signalization of each topic and the relationships between topics, since automatic Rhetorical Structure Theory (RST) analysis procedures (Stede et al., 2017; Zeldes, 2016) usually involve larger (written) texts and may not produce the required results.

With the activation of the "Identify Relation" command, relation types between topics are determined by the User. In the domain of journalistic texts, these relations cannot be strictly semantic and rely heavily on associations and world knowledge: automatic processes may result in errors.

The User chooses the type of relation ("Repetition", "Association", "Generalization" or "Topic Switch") between the topic of the question or issue addressed and the topic of the respective response or reaction (Alexandris et al., 2015).

The "Repetition" relation ("REP" tag) involves the repetition of the same word or synonym and corresponds to the generation of the shortest distance between defined topics ("Distance 1" – a short line or one dash in the generated pattern).

The "Association" relation ("ASOC" tag, "Distance 2"), defined by the User's world knowledge (can be evaluated with a lexicon or WordNet) is represented as a longer line to the next word-node (a longer line or two dashes).

The "Generalization" relation ("GEN" tag), also defined by the User's world knowledge (comparable to a lexicon or WordNet) corresponds to the generation of the longest distance between defined topics ("Distance 3" – the longest line or three dashes). The "Topic Switch" relation ("SWITCH" tag) is used when the topic of a discussion or interview changes between selected topics without any evident semantic relations. "Topic Switch" (Distance 4: slash "/") generates a break in the sequence of topics. Examples of segments in (interactively) generated patterns from user-specific choices between topics (Tpc) are the following (Example 4.4.2.a):

Example 4.4.2.a

- "Britain"-"the UK" (REP-1): TpcA-TpcB.
- "propaganda"-"social-media" (ASOC-2): TpcA--TpcB.
- "police"-"security" (GEN-3): TpcA---TpcB.
- "security"/"entrepreneurship" (SWITCH-4): TpcA/TpcB.

The distances (II) between topics in the generated patterns (I) are registered as triple tuples (triplets): (Britain, the UK, 1), (propaganda, social media, 2), (police, security, 3), (security, entrepreneurship, 4) (Example 4.4.2.b):

Example 4.4.2.b

- (Britain, the UK, 1)
- (propaganda, social media, 2)
- (police, security, 3)
- (security, entrepreneurship, 4)

The content (i) and form (ii) of the generated patterns (for example, multiple breaks) as visual representations of Cognitive Bias aim to depict:

- (1) The degree to which all topics are addressed.
- (2) What topics are avoided – either by changing a topic or by persisting to address the same topic: observed to be evident in the length and form of the generated pattern.
- (3) How participants may be led or even forced into addressing a topic – by association or generalization: this is also observed in the length and form of the generated patterns.

Therefore, targeting to by-pass Confidence Bias (Hilbert, 2012) of users-evaluators (II), the above-presented points allow the determination of the Speakers-Participants in the conversation (or interview) who were successful in their spoken interaction and the Speakers-Participants who were less successful. Simultaneously, the perceived relationship-distances between word-topics perceived by the User, related to the above-stated type of Lexical Bias (Trofimova, 2014), are generated and measured in the above-presented form of triple tuples (II) (Example 4.4.2.b).

Varying degrees of familiarity and bias with topics discussed in spoken journalistic texts result in different perceptions of successful conversations or debates. Therefore, evaluators may "forgive" any complications or mistakes.

It is also observed that data from transcriptions and respective visual representations created so far indicates cases of observed differences between identified topic relations among some journalists that are non-native speakers of English (especially with respect to "ASOC" and "SWITCH"). Differences may in some cases be attributed to lack of world knowledge of the language community concerned (Paltridge, 2012; Hatim, 1997; Wardhaugh, 1992), particularly in non-native speakers. This implies that the international audience may often perceive and receive different and/or incomplete information in respect to evaluating conversation and interaction (Yu et al., 2010; Alexandris, 2010; Ma, 2010; Pan, 2000). Topics and words generating diverse reactions and choices from Users result in the generation of different forms of generated visual representations for the same conversation or interaction (Example 4.4.3):

Example 4.4.3

(Alexandris, 2018a)

- "Country Z" – "defence spending" (ASOC) or (SWITCH)
- "Country Z" — "defence spending" (ASOC)
- "Country Z" / "defence spending" (SWITCH)

In the first case (Example 4.4.3), the "Country Z" (in this case, the United States of America) can be associated with "defence spending" for the American audience (ASOC). For an international audience, the concepts "United States of America" and "defence spending" may be perceived as unrelated to each other and are, therefore, evaluated as a change of topic (SWITCH) in a discussion or interview.

4.4.2 Generating Graphic Representations of Cognitive Bias

As described above, the generated graphic representation is based on the relationships of the topics to each other, including distances from one word to another. In previous research (Alexandris, 2018a; Alexandris et al., 2015), Distances 1, 2 and 3 were depicted as vertical lines from top to bottom, in the case of the generation of a tree-like structure, or as horizontal lines from left to right, in the case of the generation of a graph. Topic switches were depicted as breaks in the continuous flow of the generated graphic representation, generating a new, disconnected point or node. This approach envisioned a possible further development with graphic forms similar to discourse trees (Carlson et al., 2001; Marcu, 1999); however, it presented difficulties in matching points of the generated structure to the respective segments of the spoken text.

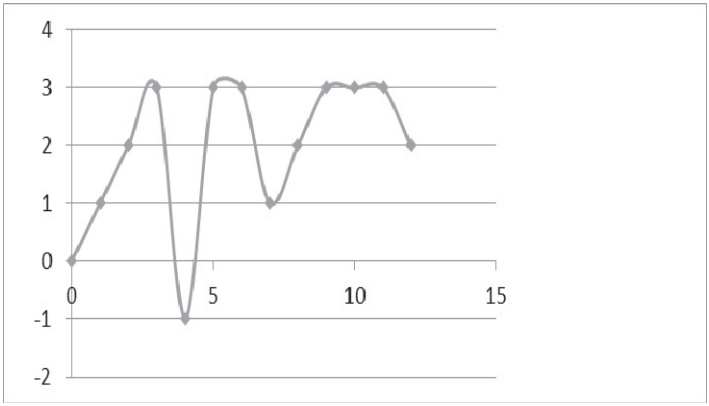
The present approach aims to allow the alignment of the generated graphic representation with the respective segments of the spoken text, facilitating a possible integration into transcription tools (Mourouzidis et al., 2019).

Similarly to the approaches presented in previous research (Alexandris, 2018a; Alexandris et al., 2015), the length of the lines between points corresponding to topics depends on the type of distance to the next word-node, with the shortest line corresponding to the relationship of "Repetition", related to Distance 1, and the longest line corresponding to the relationship of "Generalization", Distance 3.

In the present application, henceforth referred to as "PRAG-GRAPH", Distances 1, 2 and 3 correspond to the respective values "1", "2" and "3" (y=1, y=2 and y=3) depicted in the generated graphical representation. The "Topic Switch" relation ("New Topic") is assigned value "-1" (Figure 4.4.1).

Fig. 4.4.1. Distances and values between topics.

(Mourouzidis, Floros and Alexandris, 2019)



The starting point of the graphic representation of the spoken interaction depicted in Figure 4.4.1 is point zero (0) in the time frame (x), where (x,y) = (0,0). From point 0 there is an occurrence of two (2) keywords and one "Repetition" relationship between them, represented as value "1" in the y axis (y), where (REP): 1, corresponding to point (1,1) (Mourouzidis et al., 2019).

From the 1st to the 2nd point (x =2) of spoken interaction, the 3rd keyword demonstrates an "Association" relation with the previous, 2nd keyword, represented as value "2" in the y axis (y), where (ASOC): 2, corresponding to point (2,2).

In the 3rd point of spoken interaction, there is one more 4th keyword, and its relation with the previous, 3rd keyword is a "Generalization" relationship, represented as value "3" in the y axis (y), where (GEN): 3, corresponding to point (3,3).

In the 4th point of spoken interaction, the 5th keyword demonstrates a "New Topic" relation with the previous, 4th keyword, represented as value "-1" in the y axis (y), (NEW TOPIC): -1, corresponding to point (4,-1).

Two "Generalization" relations follow in the spoken interaction, where the relation between the 6th keyword and the previous, 5th keyword and the following, 7th keyword is represented as value "3" in the y axis (y), where (GEN): 3, corresponding to points (5,3) and (6,3).

Between the 6th point and the 7 th point there is a "Repetition" relation between keywords, represented as value "1" in the y axis (y), where

(REP): 1, corresponding to point (7,1). The 8th point is related to the previous 7th point with an "Association" relation between keywords, represented as value "2" in the y axis (y), where (ASOC): 2, corresponding to point (8,2).

A sequence of three "Generalization" relations follow in the 9th to 11th point in the spoken interaction, where the relation between the 10th keyword and the previous, 9th keyword and the following 11th and 12th keywords is represented as value "3" in the y axis (y), where (GEN): 3, corresponding to points (9,3), (10,3) and (11,3).

Finally, in the 12th point of spoken interaction, there is one more 13th keyword, and its relation with the previous, 12th keyword is an "Association" relation between them (ASSOC): 2, corresponding to point (12, 2) (Mourouzidis et al., 2019).

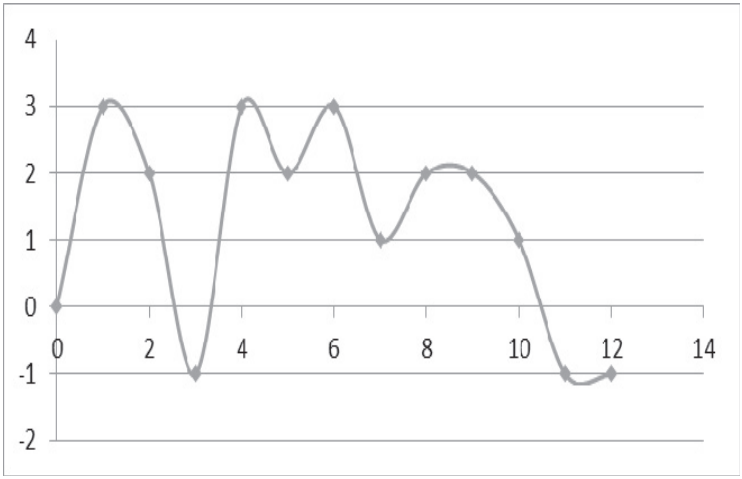
4.4.2.1 Graphic Representation and Relation Type

Dialogue segments typically demonstrate a variety of topic relations, with a characteristic example shown in the above-described Figure 4.4.1 and in Figure 4.4.2. The typical variety of topic relations includes all – or almost all – types of topic relations. Empirical data so far demonstrates a predominance of "Association" relations, a slightly lower occurrence of "New Topic" and "Generalization" relations and a low occurrence of "Repetition" relations. In the following examples (Figures 4.4.2–4.4.6) we present dialogue segments of 12 seconds (12 sec) with 13 word-topics and 12 relations between each word-topic, where x = the instances of keywords within the time frame and y = the relation between two topics (Mourouzidis et al., 2019).

The example in Figure 4.5.2 depicts three (3) "New Topic" relations (NEW TOPIC), corresponding to Distance y= - 1, where there is a switch of topic (where y = -1 and x = {3, 11, 12}). The example in Figure 4.4.2 includes two (2) "Repetition" relations (REP) (where y = 1, και x = {7, 10}), four (4) "Association" relations (ASOC) (where y = 2 and x = {2, 5, 8, 9}) and three (3) "Generalization" relations (GEN), where y = 3 and x = {1, 4, 6}.

Fig.4.4 2. Typical form of generated graphical representation.

(Mourouzidis, Floros and Alexandris, 2019)



- **Graphical Representation of "Repetition" Relations**

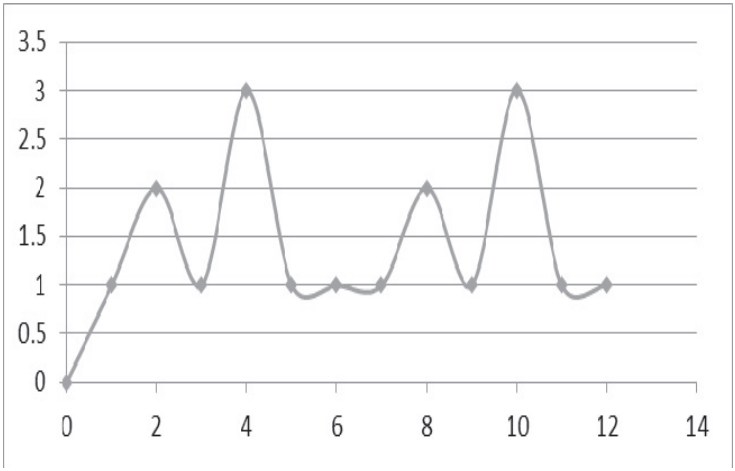
In contrary to the examples presented in Figure 4.4.1 and Figure 4.4.2, a significant predominance of specific types of relations results in the generation of characteristic types of graphical representations. As previously described above, the overall shape of the generated graphical representation is dependent on the most frequently occurring relation types in the discourse structure of the interview or discussion. (Mourouzidis et al., 2019).

A high frequency of "Repetition" relations is presented in Figure 4.4.3, where eight (8) "Repetition" relations are registered with y = 1 και x = {1, 3, 5, 6, 7, 9, 11, 12}. The same topic is repeated between the points in the above-presented x values.

The graphical representation in Figure 4.4.3 demonstrates a development around the value y=1 level.

Fig. 4.4.3. Generated graphical representation with a “Repetition” relation.

(Mourouzidis, Floros and Alexandris, 2019)



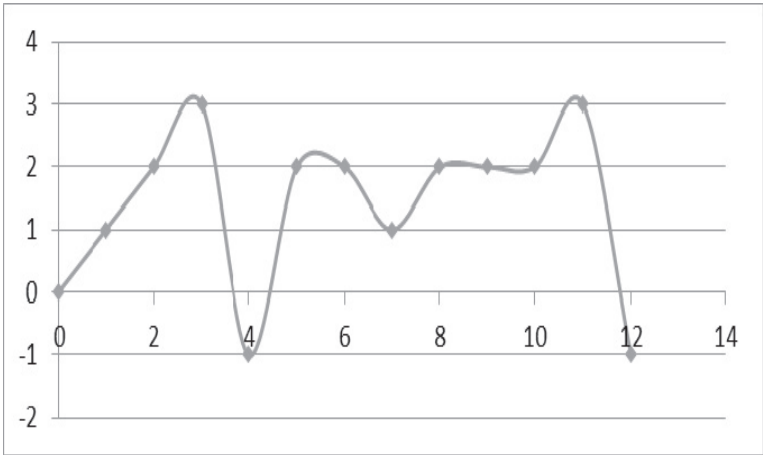
- **Graphical Representation of “Association” Relations**

The generation of a graphical representation of multiple high peaks is illustrated in the example in Figure 4.4.4, corresponding to transcripts of available online interviews. The characteristic plateau-like shape (Mourouzidis et al., 2019) of the peaks in the generated graphical representation is affected by the relatively high percentage of “Association” relations on the value y=2 level. The present example (Figure 4.4.4) depicts twelve (12) relations, several of which are “Association” (ASOC) relations, where y = 2 and x = {2, 5, 6, 8, 9, 10}.

The graphical representation in Figure 4.4.4 demonstrates a development around the value y=2 level.

Fig. 4.4.4. Generated graphical representation with multiple "Association" relations.

(Mourouzidis, Floros and Alexandris, 2019)



- **Graphical Representation of "New Topic" ("Topic Switch")**

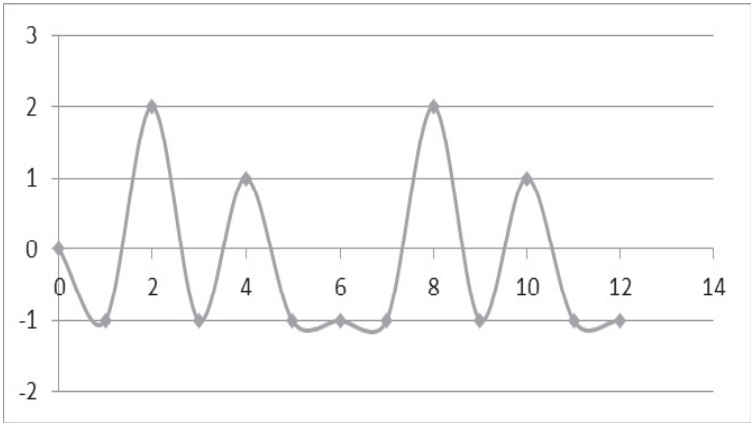
The generation of a graphical representation of many separate sharp peaks is illustrated in the following example in Figure 4.4.5, corresponding to transcripts of available online interviews. In particular, the overall shape of the generated graphical representation is affected by the relatively high percentage of "New Topic" ("Topic Switch") relations, creating a characteristic sequence of sharp peaks (Mourouzidis et al., 2019).

A high frequency of "New Topic" relations is presented in Figure 4.4.5, where eight (8) "New Topic" relations are registered with y =-1, for x = {1, 3, 5, 6, 7, 9, 11, 12}. There is a change of topic between the points in the above-presented x values.

The graphical representation in Figure 4.4.5 demonstrates multiple sharp drops in the value y=-1 level.

Fig. 4.4.5. Generated graphical representation with multiple "Topic Switch" relations.

(Mourouzidis, Floros and Alexandris, 2019)



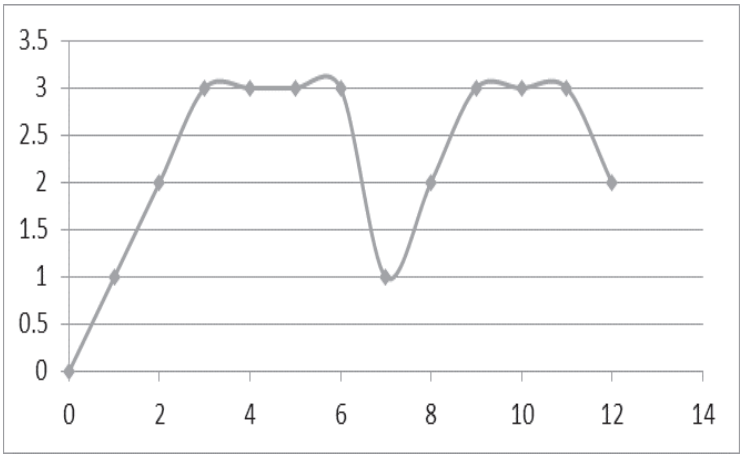
- **Graphical Representation of "Generalization" Relations**

The generation of a graphical representation of characteristically high peaks is illustrated in the example in Figure 4.4.6, corresponding to transcripts of available online interviews. The characteristic high plateau-like shape of the peaks in the generated graphical representation (Mourouzidis et al., 2019) is generated by the relatively high percentage of "Generalization" relations on value y=3 level. The present example (Figure 4.4.6) depicts the following "Generalization" (GEN) relations, where y = 3 and x = {3, 4, 5, 6, 9, 10, 11}, in which the "Generalization" (GEN) relation between topics is repeated seven (7) times.

The graphical representation in Figure 4.4.6 demonstrates a development around the value y=3 level.

Fig. 4.4.6. Generated graphical representation with multiple "Generalization" relations.

(Mourouzidis, Floros and Alexandris, 2019)



- **Detecting Pointers to Speaker Intentions**

The graphical representations and values described above enable the evaluation of the behaviour of Speakers-Participants, depicting possible instances of Lexical Bias (Cognitive Bias) and may also serve to by-pass Confidence Bias of the User-Evaluator of the recorded and transcribed discussion or interview. Furthermore, these graphic representations and values also allow the identification and detection of additional, "hidden" illocutionary acts not restricted to "Obtaining Information Asked" or "Providing Information Asked", as defined by the framework of the interview or discussion (Mourouzidis et al., 2019).

Speech acts performed by one or multiple Speakers-Participants usually involve complex illocutionary acts beyond the defined framework of the interaction. This feature differentiates speech acts in two-party or multiparty discussions or interviews from task-specific dialogues (Tung et al., 2013) and typical collaborative dialogues (Wang et al., 2013; Yang et al., 2012).

As presented in Section 4.1 of the present chapter, in two-party or multiparty discussions or interviews, the illocutionary act (Austin, 1976; Searle, 1969) performed by the Speakers may not be restricted to

"Obtaining Information Asked" or "Providing Information Asked" in the spoken interaction concerned and may involve other or additional intentions regarding the presence of the Speakers-Participants and their role in the interview or discussion. In particular, the illocutionary acts not restricted to "Obtaining Information Asked" or "Providing Information Asked" may be related to one or more categories of speech acts concerning less explicitly expressed Speaker intentions.

These speech acts and their respective illocutionary acts cannot be defined, since they are not explicitly expressed.

However, three frequently detected categories of pointers to implied ("Hidden") Speech Acts are presented, namely the "Presence", "Express Policy" and "Make Impression" pointers. We note that all three Speech Act pointers may be connected to each other and may even occur at the same time. The "Make Impression" Speech Act pointer is distinguished from the other two Speech Act pointers since it is identifiable on the Prosodic-Paralinguistic Level.

- **The "Presence" Pointer:**

The "Presence" (Speech Act) pointer is identified by the Speaker's reluctance to answer questions, avoidance of topics, or a polite or symbolic presence in the discussion or interview but not an active participation.

Besides the Speaker's silence (Silence/No Answer) as response to questions or statements, a "Presence" pointer is signalized by remaining in the same "safe" topic by repeating the same subject ("Repetition") or by introducing a "safer" and more general topic ("Generalization") or a different topic ("New Topic or Topic Switch"). "Presence" Speech Act pointers can be identified by a high frequency of one or more of the above-described relations, especially in combination with instances of no response (Silence/No Answer).

-The "Express Policy" Pointer:

With the "Express Policy" pointer, there is a direct or even blatant expression of opinion or policy.

In this case, the Speaker may persist on discussing the same topic of interest by repeating the same subject ("Repetition") or may try to direct the discussion to the topic(s) of interest by "Topic Switch" ("New Topic").

Unlike the "Presence" pointer, the "Express Policy" pointer is characterized by a higher level of complexity, since it may contain features of the "Presence" Speech Act pointer and features of the "Make Impression" Speech Act pointer. However, in contrast to the case of the

"Presence" pointer, the repeated topic(s) or the topics introduced are all – or almost all – semantically or associatively related. Although, as previously described, the "Express Policy" pointer may be related to the "Make Impression" Speech Act pointer, the "Express Policy" Speech Act pointer does not necessarily entail the creation of tension in the discussion or interview.

-The "Make Impression" Pointer:

With the "Make Impression" Speech Act pointer, the Speaker purposefully creates tension in the interview or discussion.

The "Make Impression" pointer is characterized by any of the features of the "Presence" or "Express Policy" pointer. Additionally, the "Make Impression" pointer can also be distinguished from the previous Speech Act pointers with respect to features in the Prosodic-Paralinguistic Level of one (or all) of the Speakers, including rise of amplitude, prosodic emphasis and other prosodic features, gestures and facial expressions.

- **The "PRAG-GRAPH" Module in the TCIP-Annotation**

In the proposed TCIP-Annotation (Figure 4.4.7), the generation of the "[IMPL]" (Pragmatics) tag at text or passage level, at the end of the transcribed or generated text segment, signalizes the presence of additional, "hidden" illocutionary acts not restricted to "Obtaining Information Asked" or "Providing Information Asked", as defined by the framework of the interview or discussion.

In this case, the "[IMPL]" tag is inserted after the activation of the above-described "PRAG-GRAPH" Module. The User may choose to combine the "[IMPL]" tag with an indication of the "Presence", "Express Policy" or "Make Impression" Speech Act pointer, if applicable.

Figure 4.4.7

Transcription Tool Outline	
Speech Signal	
Text	text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]
Speaker Turns and (Basic) Annotation	Speaker A/ annot-text- annot-text- Speaker B/ annot-text- annot-text-
Proposed Annotations	annot-text-[Terms / Complex-Info/ Prosody-Paraling]

Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)		
Input	**(Transcribed) TEXT SEGMENT**	**Activation of "PRAG-GRAPH" Module** **Generation of [IMPL] TAG**

4.5 Annotating Complex Information

In the present chapter, specific categories of indicators of a Speaker's attitude and intentions are described, namely grammatical and semantic features and their relation to the Pragmatic Level and respective Speech Acts. For some categories of these indicators, such as "Gravity" and "Evocative" words, there is a direct link to the Prosodic and Paralinguistic Level. Phonetic-phonological features and prosodic features constitute features of the Prosodic-Paralinguistic Level. As previously described, features in the Prosodic Level and also in the Phonetic-Phonological Level may intensify the semantic content of the word and, in some cases, may resolve ambiguities.

In the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) (Figure 4.5.1), the interactive annotation of the previously described grammatical and semantic features is combined with the option of indicating the respective prosodic features, if applicable, and the insertion of the chosen tags.

For the annotation of complex semantic information (inherently "deep", stressed but not determined by Prosody) and connotative features in "Gravity" or "Evocative" words (Level 2), the insertion of the "[impl]" tag at word level (indicated in bold print in Figure 4.5.1) is proposed. The "[impl]" tag allows additional indication of any prosodic and phonetic-phonological features as additional information.

The generation of the "[IMPL]" tag (upper case) at sentence, passage or text level, at the end of the transcribed text segment processed by the "IMPLY" or the "PRAG-GRAPH" Modules, signalizes the presence of features related to complex information content, including indications of Speaker intentions, attitude and behaviour.

Semantic Information of the "Ambiguity" and "Attitude" category is processed interactively with the activation of the "[SMI]" tag, similarly to the case of terminology presented in Chapter 3.

Figure 4.5.1

Transcription Tool Outline	
Speech Signal	
Text	text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]
Speaker Turns and (Basic) Annotation	Speaker A/ annot-text- annot-text- Speaker B / annot-text- annot-text-
Proposed Annotations	annot-text-[Terms / Complex-Info/ Prosody-Paraling]

Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)		
Input	(Transcribed) TEXT SEGMENT	Activation of "IMPLY" / "PRAG-GRAPH" Modules (Generation of [IMPL] TAG)
Input	word: [SMI] TAG	[SMI] TAG (Activation of SMI–Analysis)
	word: [impl] TAG	**+ Prosodic Features**

CHAPTER FIVE

PROSODIC AND PARALINGUISTIC FEATURES IN SPOKEN POLITICAL AND JOURNALISTIC TEXTS

5.1 Introduction

5.1.1 Processing Paralinguistic Features

In addition to linguistic features, many transcribers include the presentation, analysis and processing of prosodic and paralinguistic features. As presented in Chapter 1, some transcription tools offer the presentation, analysis and processing of gestures and movement, along with linguistic features, including the recording of speaker turns and topics and code switching between languages and dialects.

Prosodic and paralinguistic features are related to the expression of attitude, irony, intention or emotion, with language and culture-specific variations. The observations described in the present chapter focus on two general categories of prosodic and paralinguistic features directly linked to the correct interpretation, transfer and processing of information content of spoken utterances: Prosodic Emphasis (I) and Facial Expressions and Gestures (II).

Since paralinguistic features concern information that is not uttered, the signalization of such information plays an important role in the correct and complete processing of the information content, in compliance with the Gricean Cooperative Principle (Grice, 1975). The Gricean Cooperative Principle is violated if the information conveyed is perceived as not complete (Violation of Quantity or Manner) due to additional information contained in prosodic and paralinguistic features, or even contradicted by prosodic and paralinguistic features (Violation of Quality).

5.1.2 Types of Prosodic and Paralinguistic Features

A differentiation is observed to exist between prosodic and paralinguistic features that influence information content and prosodic and paralinguistic

features that constitute pointers to information content. Furthermore, a third category of prosodic and paralinguistic features constitute information by themselves (Table 5.1.1).

There is an additional distinction between prosodic and paralinguistic features that can be perceived by all Speakers-Participants/Audiences and are usually detected by measurable means and paralinguistic features that are not perceived by all Speakers-Participants/Audiences and are closely related to socio-cultural norms (Table 5.1.1).

Table 5.1.1: Types of Prosodic and Paralinguistic Features

<table>
<tr><td colspan="2">Prosodic Features (for example, prosodic emphasis)
/
Paralinguistic Features (for example, gestures, facial expressions)</td></tr>
<tr><td>influence information content</td><td rowspan="3">perceived by all Speakers-Participants/Audience

not perceived by all Speakers-Participants/Audience</td></tr>
<tr><td>constitute pointers to information content</td></tr>
<tr><td>constitute “stand-alone” information</td></tr>
</table>

5.2 Prosody and Information Content

5.2.1 Prosodic Emphasis and Semantic Content

Prosodic emphasis plays a key role in the prosodic structure of a spoken utterance. Since prosodic emphasis is characterized by a distinctive rise in amplitude, it constitutes a prosodic feature that can be perceived by all Speakers-Participants or members of the Audience.

Additional prosodic features, beyond prosodic emphasis, may express attitude, irony, intention or emotion in spoken utterances. These features are often characterized by language and culture-specific variations and may require special speech signal analysis environments for their correct detection and evaluation. Furthermore, prosodic emphasis can both

influence information content or play the role of a pointer to information content.

Prosody is related to language-specific phonological rules, tone and intonation; language-specific acceptable forms of articulation and expression; and Speaker-related factors (mood, intention and other factors). Prosody may play a decisive role in the meaning of a phrase or sentence, often determining sentence type. However, Prosody may also be related to the semantic content of words. In particular, in some languages, prosodic emphasis in words or expressions may also influence their semantic content.

Previous studies (Alexandris, 2010; Alexandris, 2008) have demonstrated a language-specific differentiation between identified types of word categories where prosodic emphasis does not determine their semantic content and word categories whose semantic content may be determined by prosodic emphasis.

In the first case, the semantic interpretation of the entire phrase or sentence may be determined by the type of element receiving prosodic emphasis, but the semantic content of the emphasized element itself is not affected.

In the second case, the group of word categories whose semantic content may be determined by prosodic emphasis is classified as "Prosodically Determined" words. This category includes spatial and temporal expressions, a subgroup of quantifiers and numericals and a subgroup of discourse particles identified as "politeness markers" (Alexandris and Fotinea, 2004). These word groups were originally identified for the Greek language, but may concern other languages as well.

- **"Prosodically Determined" words**

For spatial and temporal expressions, and for a subgroup of quantifiers and numericals, the presence of prosodic emphasis signalizes an indexical interpretation ("exactly") as opposed to a vague (Schilder and Habel 2001) interpretation or a fixed expression (Alexandris, 2008), where in the latter cases, there is an absence of prosodic emphasis. For example, the numerical or quantificational expression "two" ("d'yo") (Greek) is used in its indexical and literal meaning when it receives prosodic emphasis in the sentence "wait for two minutes", while, in the same sentence without prosodic emphasis, it is perceived as a fixed expression ("wait a moment"):

- "Wait for two minutes(emphasis)" = Wait a little bit
- "Wait for two(emphasis) minutes" = Wait for two minutes.

Prosodic emphasis is used to determine semantic content in languages such as Greek. In this case, the words are "prosodically determined" (Alexandris, 2008).

With regard to spatial and temporal expressions, quantifiers and numericals, in both English and German, prosodic modelling does not influence semantic content. In this case, the indexical interpretation is achieved with the use of the respective expressions or modifiers (adjectives or adverbs), for example, darüber" ("right above") in German and "right above" (modifier "right"). Exceptions, however, do exist in respect of the relationship between prosodic emphasis, semantic content and word category; for instance, in American English the expression "big", if receiving prosodic emphasis, may be equivalent to "really big".

Additional types of language-specific "prosodically determined" words are discourse particles identified as "politeness markers" in Greek: the absence of prosodic emphasis signalizes them as politeness markers, while with the presence of prosodic emphasis they only have the property of discourse particles. Thus, absence of prosodic emphasis in the discourse particles "Tell me ('pite mou)" and "Maybe" ('mipos) signalizes politeness and friendliness: "Tell me ('pite mou), what is the product" and "Maybe ('mipos) you want me to check the kitchen?".

It is also observed that, in a similar way to Greek, the presence of prosodic emphasis on English and German expressions partially equivalent to the "politeness markers" in Greek generates a rather unfriendly effect. For example, prosodic emphasis on the expressions "Tell me", "Please" or "Bitte" ("Please") in German, partially equivalent to the "politeness markers" in Greek, is observed to render them harsh and unfriendly (Alexandris, 2008).[18]

- **"Prosodically Sensitive" words**

The group of word categories where prosodic emphasis may emphasize or intensify, but may not determine the semantic content, is classified as "Prosodically Sensitive" words. This group involves words and expressions such as (1) adjectives expressing quality and (2) adverbs expressing mode perceptible to the senses, used in a literal, non-

[18] The SOPRANO Project, the HEARCOM Project, the ERMIS Project and the AGENT-DYSL Project.

metaphorical way. Characteristic examples with "prosodically sensitive" words (Alexandris, 2008) in English are the following:

- "It was a big(emphasis) truck" = It was a (really) big truck
- "Wow, that was some(emphasis) dessert! = Wow, that was some (very good) desert!"

Paraphrasing "Prosodically Sensitive" words may display variations across languages, if applicable. For example, in Greek, prosodic emphasis on the adjective "round" ("strogi 'lo"-Greek), in the sentence "It was in a round box" signalizes the meaning "truly/par excellence round". Similarly, prosodic emphasis on the adverb "upside down" ("an'apoda"-Greek), for example, in the sentence "I turned it upside down" signalizes the meaning "completely upside down".

- **"Prosodically Independent" words**

The rest of the word categories that are not affected by prosodic emphasis in respect of their semantic content are classified as "Prosodically Independent" words. The presence or absence of prosodic emphasis on words of this category only effects the semantic interpretation of the entire phrase or sentence in which they belong. "Prosodically Independent" words constitute sentence content or phrase content that is emphasized by the Speaker to stress what they consider important in the information content of the uttered sentence or the phrase.

- **The importance of Prosodic Emphasis**

Prosodic emphasis on what is considered important in the information content of utterances is often signalized in transcription processes for various types of research, ranging from the domain of Phonetic-Phonology to Pragmatics, Sociolinguistics and forensic applications. Therefore, the signalization of prosodic emphasis is of particular importance in spoken political and journalistic texts.

5.2.2 "Prosodically Sensitive" Words and Information Content

Special focus is placed on "Prosodically Sensitive" Words, since they occur in different languages and may constitute subtle indicators of a Speaker's intentions, attitude and beliefs.

Furthermore, it may be noted that prosodic emphasis may sometimes contribute to resolving ambiguity in expressions such as multiword compounds, including terminology (Sternefeld, 2006); however, this feature may vary among speakers.

The previously presented "Gravity" words and "Evocative" Words may constitute "Prosodically Sensitive" words, since their semantic content may be stressed with prosodic (sometimes also phonological) features.

The semantic content of the previously presented "Prosodically Sensitive" words may be intensified and can be paraphrased with an adverbial – for example, "very", "really" or "exactly".

The application of prosodic emphasis in task-oriented Human–Computer Interaction (HCI) Systems (and spoken technical texts) illustrates the crucial role of "Prosodically Sensitive" words for the correct and successful communication between the User and the System and, subsequently, also for the correct and successful evaluation and processing of spoken political and journalistic texts. In Human–Computer Interaction (HCI) Systems, the use of prosodic emphasis is related to specific targets concerning the System's successful operation and efficiency. These targets may be categorized as "Directness and Clarity" and "User-friendliness".

5.2.3 Prosodic Emphasis – Insights from Speech Applications

The simulation of human language and behaviour in Speech Applications such as Human–Computer Interaction (HCI) Systems and Spoken Dialogue Systems provides insights for the role of prosodic emphasis in spoken political and journalistic texts.

In particular, the prosodic aspect of spoken words is employed in Spoken Dialogue Systems and HCI, where one of the parties in the spoken interaction is a machine whose spoken output simulates human language and behaviour (Nass and Brave, 2005) and where the issue of speed (the Speed Issue-B) is of crucial importance.

Prosodic emphasis on the appropriate words in the spoken utterance contribute to the comprehensibility and naturalness of the System's spoken output. Specifically, prosodic emphasis in System output contributes to "user-friendliness", "clarity", "accuracy" and "directness" (Hausser, 2006) targeted by HCI and Spoken Dialogue Systems – not only for ensuring User/Customer satisfaction, but also for ensuring efficiency and safety (Cohen et al., 1997). These targets are included in both user-specific and user-independent evaluations of spoken dialogue systems (Williams et al., 2017).

- **Clarity, Directness and Prosodic Emphasis**

Prosodic features related to "Directness and Clarity" mirror speaker behaviour in conversations and interviews where answers or statements are requested. In conversations and interviews, prosodic emphasis is used:

- for confirming the basic content of the Speaker's utterance ("So you **agree** on the sanctions?");
- for directing the Speaker's statement or response towards the specific issue or answer requested ("What about the **sanctions**?");
- for achieving accuracy and directness in the response or statement uttered ("I was against **any** sanctions").

In HCI and Spoken Dialogue Systems, prosodic emphasis is used both for (a) determining the basic content of the Speaker's input, (b) for directing the Speaker's input towards a keyword-specific answer, and (c) for achieving accuracy and directness in the System's output. For example, in the sentence "Please tell us any additional information you wish about the product or about your transaction", the keywords "additional", "product" and "transaction" receive prosodic emphasis for clarity towards the Users and simultaneously direct the User towards obtaining a respective keyword-specific answer – in this case, "product-type" and "transaction-type". Similarly, a "Yes/No" Answer is requested with the use of prosodic emphasis either on "check" or on "thermostat" in the question "Shall I check the thermostat?" (The SOPRANO Project)[19].

Examples from recorded data from the Speech Component of the SOPRANO (European Union) Project[20] are presented in Example 5.2.3.1. In Example 5.2.3.1, prosodic emphasis is indicated in bold. Short pauses are indicated as [Srt-P], and "Task-Related" Speech Acts are presented in parentheses.

[19] The SOPRANO Project: http://www.soprano-ip.org.
[20] The SOPRANO Project: http://www.soprano-ip.org.

Example 5.2.3.1.

Prosodic emphasis in the Speech Component of an HCI system for Elderly Users (for the achievement of the "Directness and Clarity" target).

(Malagardi and Alexandris, 2009)

"Do you wish to [Srt-P] **answer** [Srt-P] the **door**?" (Speech Act: Y/N Question)
"Shall I [Srt-P] **turn** [Srt-P] **on** [Srt-P] the **dishwasher**?"
"The [Srt-P] **tap** is [Srt-P] **running.**" (Speech Act: Inform)
"The [Srt-P] **air-conditioner** is **switched** [Srt-P] **on**."
"**Please** [Srt-P] **take** [Srt-P] your **pill**." (Speech Act: Request)
I [Srt-P] **cannot** [Srt-P] **understand** you. **Please** [Srt-P] **repeat**." (Speech Act: Check)

- **Politeness, Friendliness and Prosodic Emphasis**

The integration of specifications for Spoken Dialogue Systems may facilitate the analysis and processing of spoken political and journalistic texts. Speaker behaviour in conversations and interviews where politeness plays a central role is mirrored in HCI Systems, with the use of prosodic features related to the "User-friendliness" target.

From applications in Spoken Dialogue Systems, it has been observed that "User-friendliness" can be achieved with prosodic emphasis on the previously described "Intention-Behaviour" (IB) verbs (Chapter 4), in this case, expressions related to the User–System Relationship (Alexandris, 2010). In conversations and interviews, expressions related to the User–System Relationship are mirrored in the relationship between the speakers-participants, or the "Speaker-Receiver/Audience" relationship.

Expressions related to the User–System Relationship can be subsumed under the general category of expressions involving the System's or User's positive intention or cooperation and may be related to respective Speech Acts not strictly concerning tasks to be executed (Task-Related dialogues). These Non-Task-Related Speech Acts (Alexandris, 2010) occur in user-friendly Service-Oriented Dialogue Systems, simulating Human–Human interaction (data from the CitizenShield Dialogue System)[21].

[21] Nottas, M., Alexandris, C., Tsopanoglou, A., Bakamidis, S. (2007): A Hybrid Approach to Dialog Input in the CitzenShield Dialog System for Consumer Complaints. In: *Proceedings of HCI 2007*, Beijing China.

In these forms of spoken Dialogue Systems and Human–Computer Interaction (HCI), the System may apologize ("Apologize") or thank the User ("Thank"). Furthermore, the System may explain the failure of a task or procedure ("Justify"), alert the User (especially if the User is disabled, elderly, busy or faces any other form of challenges) ("Attention-alert"), introduce new tasks (Introduce-new-task"), inform the User about delays "Inform-delay") or manage waiting time ("Manage-waiting-time").

We note that most of the expressions related to the User–System Relationship (Usr-Sys-Rel expressions) contain "Intention-Behaviour" (IB) verbs. Examples of these verbs are: "request", "ask", (of "Speech-Behaviour" type), "help", "assist", (of "Benign-Malignant Behaviour" type) and "wish" (of "Feeling-Intention-Attitude" type) (Alexandris, 2010).

From applications in spoken Dialogue Systems, it has been observed that prosodic emphasis on expressions related to the User–System Relationship contributes to the achievement of "Directness and Clarity" and "User-friendliness" in Service-Oriented Dialogue Systems (for example, the CitizenShield Dialogue System[22] – additional data acquired from European Union projects in Speech Technology for social services and Human–Computer Interaction[23]).

Examples from recorded data from the Speech Component of the CitizenShield Dialogue System[24] are presented in Example 5.2.3.2. In Example 5.2.3.2, Usr-Sys-Rel prosodic emphasis is indicated in italics and Non-Task-Related Speech Acts are presented in parentheses.

[22] Nottas, M., Alexandris, C., Tsopanoglou, A., Bakamidis, S. (2007).

[23] The SOPRANO Project (involving smart environments and services for the General Public, http://www.soprano-ip.org/), the HEARCOM Project (speech technology applications for Users with hearing problems, http://hearcom.eu/main.html), the ERMIS Project (emotionally sensitive HCI systems with Conversational Agents, http://www.image.ntua. gr/ermis/) and the AGENT-DYSL Project (involving speech technology applications and dyslexia, http://www.agent-dysl.eu/).

[24] Nottas, M., Alexandris, C., Tsopanoglou, A., Bakamidis, S. (2007).

Example 5.2.3.2

Prosodic emphasis and politeness/"user-friendliness" in Spoken Dialogue Systems (HCI applications) (for the achievement of the "User-friendliness" target).

(Alexandris, 2010)
(Usr-Sys-Rel prosodic emphasis indicated in italics)

(a) "I am *sorry*" (Non-Task-related Speech Act "Apologize")
(b) "I cannot *understand* your *request*" (Non-Task-related Speech Act: "Justify")
(c) "I will *ask* you a few more questions." (Non-Task-related Speech Act: "Introduce-new-task")
(d) "Do you *wish* to *proceed*?" (Non-Task-related Speech Act: "Manage-waiting-time")
(e) "*Thank you* for your *input*" (Non-Task-related Speech Act: "Thank")
(f) "(Your) *Attention* please" (Non-Task-related Speech Act: "Attention-alert")

Examples of respective expressions receiving prosodic emphasis in HCI applications in English and in German from data received from European Union Projects (i.e. the SOPRANO Project, http://www.soprano-ip.org/) are the words: "sorry", "apologize", (German: "entschuldigen") and "help", "assist", (German: "helfen", "behilflich") (Alexandris, 2010). Prosodic emphasis in elements such as the words described above contributes to "User-friendliness" and enhances their positive connotative aspects.

The User–System Relationship is especially stressed with prosodic emphasis on Usr-Sys-Rel expressions in applications processing pro-drop languages such as (Modern) Greek. In case, the subject is contained as information in the verb's features. Therefore, prosodic emphasis on the verb includes emphasis on the verb's subject. This results in emphasizing both the verb's content and the verb's subject, stressing the role of the Speaker or Receiver in the spoken transaction. If the verb's content concerns a positive intention or cooperation, the utterance has the effect of Positive Politeness (Sifianou, 2001), a direct and spontaneous type of politeness in languages such as Greek. Specifically, in Examples 5.2.3.3 and 5.2.3.4, the utterances become polite if there is prosodic emphasis on the verbs constituting Usr-Sys-Rel expressions "completed" (in Example

5.2.3.3) and "ask" (in Example 5.2.3.4) and there is no prosodic emphasis on the numerical expression "one" and the adverbs related to quantity "additional" and "one more" (constituting "Prosodically Determined" or "Prosodically Sensitive" expressions in Greek). Examples 5.2.3.3 and 5.2.3.4 are cases in which prosodic emphasis on Usr-Sys-Rel expressions may be friendly in Greek but too harsh and authoritative in English and in German. For example, in the examples directly translated from Greek (the CitizenShield Dialogue System)[25], "You have obviously finished with your additional input" (Example 5.2.3.3) and "I will ask you one more time" (Example 5.2.3.4) may seem too direct or even rude in English and in German.

Examples 5.2.3.3–5.2.3.5 are **c**haracteristic examples of language-specific prosodic features concerning "Prosodically Sensitive" words for the languages and language pairs English, German and Greek as a pro-drop language.

Example 5.2.3.3

Prosodic emphasis and politeness/"user-friendliness" in Spoken Dialogue Systems (HCI applications) (for the achievement of the "User-friendliness" target).

(Alexandris, 2010)
(Usr-Sys-Rel prosodic emphasis indicated in italics)

Pro-drop language: "Obviously *you-completed* (talking about) additional input"

i. English: You have obviously *finished* with your additional input
ii. German: Sie sind offensichtlich mit Ihrer zusätzlichen Eingabe *fertig*

[25] Nottas, M., Alexandris, C., Tsopanoglou, A., Bakamidis, S. (2007): A Hybrid Approach to Dialog Input in the CitzenShield Dialog System for Consumer Complaints. In: *Proceedings of HCI 2007*, Beijing China.

Example 5.2.3.4

Prosodic emphasis and politeness/"user-friendliness" in Spoken Dialogue Systems (HCI applications) (for the achievement of the "User-friendliness" target).

(Alexandris, 2010)
(Usr-Sys-Rel prosodic emphasis indicated in italics)

Pro-drop language: "Will you-(object) *I-ask* one-more time"
i. English: I will *ask* you one more time
ii. German: Ich werde Ihnen noch ein Mal *fragen*

We note that in English and in German, the addition of the adverbial "now" and "gleich" (German: "(right) now") seems to soften any harsh effect. In contrast, in the Greek example, friendliness does not appear to be affected by the presence or absence of the adverbial "now" (΄tora) (Example 5.2.3.5).

Example 5.2.3.5

Prosodic emphasis and politeness/"user-friendliness" in Spoken Dialogue Systems (HCI applications) (for the achievement of the "User-friendliness" target).

(Alexandris, 2010)

a. English:
   i. I will ask you some more questions
   [Neutral]
   ii. I will ask you some more questions *now* (Adverb)
   [Conversational]

b. German:
   i. Ich werde Ihnen einige weitere Fragen stellen
   [Neutral]
   ii. Ich werde Ihnen *gleich* (Adverb) einige weitere Fragen stellen
   [Conversational / Friendly]

c. Greek (Alexandris, 2010):
   i. Θα σας κάνω μερικές ερωτήσεις ακόμα
   = I will ask ("make") you some more questions
   ii. Θα σας κάνω *τώρα* (adverb – "now") μερικές ερωτήσεις ακόμα = I will ask ("make") you some more questions *now* [Neutral]

   iii. *Τώρα* (adverb-– "now") θα σας κάνω μερικές ερωτήσεις ακόμα = I will ask ("make") you some more questions *now* [Neutral]

5.2.4 Integrating Prosodic Emphasis in Processing Tools for Spoken Political and Journalistic Texts

The above-presented observations in relation to the practical applications of spoken technical texts and task-oriented Human–Computer Interaction (HCI) Systems assist in the analysis and evaluation of information content in spoken political and journalistic texts.

In particular, the above-presented prosodic features employed in achieving "user-friendliness" in Human–Computer Interaction (HCI) Systems and Spoken Dialogue Systems provide insights into understanding and analysing speaker behaviour in conversations and interviews, especially where non-native speakers of a language and/or an international audience are concerned.

Speakers-Participants may aim to demonstrate politeness for reasons of displaying professional behaviour and common courtesy, for expressing respect or even for creating a friendly situational context, enabling answers to questions and allowing the expression of opinions.

Since language-specific prosodic features may be perceived differently by native speakers of different languages, their correct analysis and processing (for speech applications, translation or evaluation purposes) is of crucial importance. The option of indicating the respective prosodic features, in this case prosodic emphasis ([emph]) (Figure 5.2.1), with the insertion of the chosen tags is included in the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation), (Figure 5.2.1).

In addition to its operation on transcribed spoken texts, the proposed TCIP-Annotation option may also, in some cases, be activated for the processing of spoken messages.

The interactive property of the proposed TCIP-Annotation allows the User to decide on the possible use and type of tags for prosodic features,

according to the natural language and language-specific features concerned. In this case, the annotation of "Prosodically Sensitive" words is activated according to the type of natural language processed.

In particular, word categories such as "Intention-Behaviour" (IB) verbs can be signalized with automatic or interactive processes with WordNets or specially constructed lexicons. Alternatively, the signalization can be entirely manual, possibly in combination with the construction of specialized databases of "Prosodically Sensitive" words for research and development purposes.

Figure 5.2.1

<table>
<tr><td colspan="4">Transcription Tool Outline</td></tr>
<tr><td>Speech Signal</td><td colspan="3"> 
</td></tr>
<tr><td>Text</td><td colspan="3">text- text- text- text- text- text- text- text- text- text- text- -
[& Machine Translation Option]</td></tr>
<tr><td>Speaker Turns and (Basic) Annotation</td><td colspan="3">Speaker A/ annot-text- annot-text-
Speaker B/ annot-text- annot-text-</td></tr>
<tr><td>Proposed Annotations</td><td colspan="3">annot-text-[Terms / Complex-Info/ Prosody-Paraling]</td></tr>
<tr><td colspan="4">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)</td></tr>
<tr><td>Input</td><td>Prosodic Features

[emph]</td><td>Choice of Tags</td></tr>
</table>

5.2.5 "Prosodically Sensitive" Words: Connecting the Semantic Level with the Prosodic Level

Since the Prosodic and Paralinguistic Level (III) constitutes an essential element of spoken political and journalistic texts, a direct link between information content of spoken utterances and Prosody is manifested by the existence of "Prosodically Sensitive" words, at least in the natural languages presented (Table 5.2.1): The previously described language-specific "Prosodically Sensitive" words constitute a link between the Semantic Level and the Prosodic Level (Figure 5.2.2).

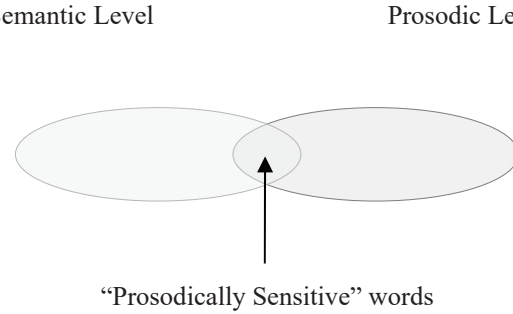
For the natural languages presented, "Prosodically Sensitive" words include the general categories of "Gravity" Words and "Evocative" Words illustrated in Chapter 4 and the "Intention-Behaviour" (IB) Verbs, more dependent on natural language grammar and parameters: categories of adjectives expressing quality and adverbs expressing mode**.**

However, additional types of "Prosodically Sensitive" words may be identified in future investigations both in the natural languages presented and in other natural languages and language families.

Table 5.2.1

"Prosodically Sensitive" words:
With grammatical and semantic features retrievable from Resources (Resources –C):
- adjectives expressing quality - adverbs expressing mode - "Intention-Behaviour" (IB) Verbs
Other categories:
- "Gravity" Words - "Evocative" Words

Figure 5.2.2



5.2.6 Prosodic Emphasis, Style and Tone

In contrast to the above-described connection between information content of spoken utterances and Prosody, there are cases in which the effect of prosodic emphasis may be influenced or even cancelled by other linguistic and paralinguistic elements. A typical case is the overall style and tone of the speaker's utterance, a factor characterizing speaker behaviour.

Although prosodic emphasis plays a key role in the information content and prosodic structure of a spoken utterance, the appropriate tone of voice of the utterance plays the final and decisive role both in respect of its comprehensibility and its effect on the Receiver or Audience.

The feature of "style" and/or "tone", expressing attitude, irony, intention or emotion in spoken language, constitutes a prosodic feature that is usually language- and culture-specific. It is not a prosodic feature that can be perceived by all speakers and is closely-related to socio-cultural norms.

Furthermore, special speech signal analysis environments are required for the correct detection and evaluation of prosodic features related to "style" and/or "tone". For example, the features "style" and "tone" may be related to the overall speed or amplitude of a spoken utterance, an intensification of particular phonetic elements in words (or phrases) or other distinct features in the articulation of words (or entire utterances), such as nasalization.

Depending on the type of features detected and the context of their natural language, "style" and "tone" may influence information content or may play the role of a pointer to information content.

The analysis of these prosodic features is included in the research domains of Phonetics-Phonology and Sociolinguistics, requiring the measurement and analysis of speech signal data and statistical information. Transcriptions from spoken political and journalistic texts may provide empirical data for the research domains of Phonetics-Phonology and Sociolinguistics and, in some cases, even for research and development in Human–Computer Interaction (HCI) systems.

As previously described, the speaking style and acceptable tone of voice in spoken utterances may vary according to culture and language-type. For example, in some languages a characteristically vivid and expressive tone is maintained in many types of transactions and related speech acts, such as in spoken Italian. In other languages, such as spoken German, in a considerable number of transactions, a "matter-of-fact" tone is preferred.

In the case of user modelling for the requirements of Human–Computer Interaction (HCI) Systems in the service sector, at least for the languages and their native speakers in Europe, HCI systems developers have to find a balance between a tone associated with reliability, responsibility and, in some task-types, even authority while, at the same time, user-friendliness (the "User-Friendliness" target) and naturalness must be preserved. This is a necessary process for languages such as Greek, where "Positive Politeness" markers integrated in the prosodic modelling process prevent a tone associated with reliability and responsibility from being perceived as authoritative and rude by Greek native speakers (Alexandris and Fotinea, 2004).

On the other hand, some languages, such as the so-called "BBC-English" or "Queen's English" in British English appear to have some "pre-defined" ("model", "prototype") varieties in tone and style balancing the above-described characteristics.

The acceptable tone of voice is, therefore, language-specific, directly related to socio-cultural factors.

Prosodic features such as "style" and "tone" underline the nature and complexity of spoken political and journalistic texts, namely that the distinction between features of their content and structure may not always be clearly outlined.

Since acceptable tone of voice is language-specific and directly related to socio-cultural factors, the general framework property of the proposed Annotation for Terms, Complex Information and Prosody (TCIP-

Annotation) allows the user to add any distinctive prosodic features related to "style and tone" for evaluating the spoken input and to make decisions with respect to its processing.

5.3 Gestures – Movement and Facial Expressions

5.3.1 Information and Perception

Socio-cultural factors in spoken journalistic and political texts are also related to elements of the Paralinguistic Level such as gestures, movement and facial expressions. In addition to Prosody, the Paralinguistic Level (Prosodic and Paralinguistic Level - III) is directly related to the information content of spoken utterances, constituting an essential element of spoken political and journalistic texts. Gestures, facial expressions and movement may influence the meaning of a spoken phrase, sentence or text in the Media.

As in the case of Prosody, the use of gestures, facial expressions and movement is mostly related to language-specific acceptable forms of expression. Additionally, for these elements of the Paralinguistic Level, their use is also related to Speaker-related factors such as mood, intention, and other characteristics related to the individual Speaker.

Facial expressions, gestures, and movement as paralinguistic elements may either (I) constitute information content in spoken utterances or may (II) play the role of pointers to information. In the first case (I), facial expressions, gestures and movement can (a) complement the information

content of spoken utterances or may constitute (b) "stand-alone" information by themselves.

In the first case, the gesture, facial expression or movement may either complement or contradict the semantic content of a spoken utterance.

Here, it may be noted that gestures, facial expressions and movement influencing or contradicting information content may create complications in applications such as Sentiment Analysis (Opinion Mining), even if they are domain-specific (Poria, 2017).

A gesture, facial expression or movement influencing information content may be paraphrased with the conjunction "and", where the semantic content of a spoken utterance is complemented or emphasized, or with the conjunction "but", where the semantic content of a spoken utterance is contradicted.

However, paraphrasing a gesture, facial expression or movement influencing information content can often be problematic: In many cases, the differentiation between a facial expression, a gesture or movement as paralinguistic feature influencing information content or constituting a pointer to information content is closely related to sociolinguistic features and to socio-cultural norms.

A typical example of paralinguistic elements related to sociocultural norms is an accompanying text (German) next to an image referring to "the apology of an official, (in spite of which) the worker's trade unions demand more" (presented online, Sat.1 Television Network (Germany), 2009, names and images withheld). In the image, the official's hands are most probably expressing his pensive mood or concentration on a particular issue. However, the placement of the hands is similar to the position of the hands during prayer in Western Europe (Catholic and Protestant Christian Church) and a plea for forgiveness (apology) of sins: a reference to the apology expressed by the official.

5.3.2 Interpretation of Facial Expressions, Gestures and Movement

Language-specific parameters and socio-cultural norms are reflected by the various interpretations of facial expressions and gestures-movements as common paralinguistic features in spoken political and journalistic texts, underlining or determining the meaning of a spoken utterance in the Media.

An example of a commonly occurring facial expression in the Media is the raising of (both) eyebrows. The raising of eyebrows – in different language communities – may mean, for example: "I am surprised"

[and/but this surprises me], "I am listening very carefully", "What I am saying is important" or "I have no intention of doing otherwise", among other interpretations. The interpretation "What I am saying is important" (Example 5.3.2.1 c) is perceived as a facial expression that may constitute a pointer to information content, while the interpretation "I am surprised" [and/but this surprises me] (Example 5.3.2.1 a) is perceived as a facial expression that may influence information content or may even constitute information by itself. The interpretations "I am listening very carefully" and "I have no intention of doing otherwise" (Examples 5.3.2.1 b and d) may be perceived as a "standalone" type of information which can be independent of linguistic information.

Another example of a commonly occurring paralinguistic feature in the Media is a slight raising of the hand outward. In particular, a slight raising of the hand outward from the level of the chest with the palm of the hand slightly tilted upward may mean "Wait a second" [and/but wait], "Let me speak" [and/but let me speak], "I disagree with this" [and/but I disagree] or "Stop what you are doing", among other interpretations. The interpretations "Wait a second" [and/but wait], "Let me speak" [and/but let me speak], "I disagree with this" [and/but I disagree] (Examples 5.3.2.2 a, b and c) are perceived as gestures that may influence information content or may even constitute information by themselves. The interpretation "Stop what you are doing" (Example 5.3.2.2 d) may be perceived as an information type that is independent from linguistic information, a "standalone" type of information.

Example 5.3.2.1
Facial expression: Raising of (both) eyebrows.

(a) "I am surprised" [and/but this surprises me]
(b) "I am listening very carefully"
(c) "What I am saying is important"
(d) "I have no intention of doing otherwise"

Example 5.3.2.2
Gesture: Slight raise of hand outward.

(a) Wait a second" [and/but wait]
(b) "Let me speak" [and/but let me speak]
(c) "I disagree with this" [and/but I disagree]
(d) "Stop what you are doing"

5.3.3 Gestures – Movement and Facial Expressions as Pointers to Information Content or as Standalone Information

As indicated above, gestures, facial expressions and movement may complement information content or constitute standalone information in a spoken utterance. Paralinguistic features may constitute information (a) accompanying the Speaker's spoken utterance, as an indication of emotions or intentions. In this case, the paralinguistic feature may be referred to as a pointer to information content (A - Pointer).

Paralinguistic features constituting pointers to information content complement the semantic content of a spoken utterance. In some cases paralinguistic features may even constitute "ironic" pointers to information content by contradicting and invalidating the semantic content of a spoken utterance. Furthermore, paralinguistic features constituting pointers to information content may also function as pointers to the content of the previous utterance or of the utterance that is about to follow.

For example, the facial expression of the raising of eyebrows with the interpretation "I am surprised" [and/but this surprises me] may function as the Speakers "comment" at the end of the spoken utterance in the sense of "and (indeed) / but (however) this surprises me". The slight raise of the hand outward with the interpretation "Let me speak" [and/but let me speak] may function as the Speakers "signal" to an upcoming produced spoken utterance in the sense of "Let me speak: I want to say the following: […]".

On the other hand, information conveyed by gestures and movement may (b) constitute a "standalone", separate piece of information, corresponding to a separate, unspoken utterance (B-Stand-Alone).

Paralinguistic features referred to as "standalone" information play the role of a separate signal. In this case, the gesture, facial expression or movement concerned does not complement spoken information but it substitutes for spoken information.

Regarding transcription, translation and other forms of processing, paralinguistic features constituting pointers to information content (A-Pointer) may be indicated either:

(i) with adaptations in the transcription and/or translation (for example, the insertion of modifiers or explanatory elements) or
(ii) with the insertion of a respective tag appended to the transcription of the spoken utterance (for example, [and/but this surprises me]).

If applicable, the Translator's/Processor's decision may concern the possibility of adding modifiers (for example, "stressing his words", "with a characteristic gesture") or other linguistic means to accentuate or to clarify the Speaker's intention.

Paralinguistic features referred to as "standalone" information (B-Stand-Alone) may require the insertion of an additional utterance as a separate segment in the text constituting the transcription (and/or translation). In this case, the insertion of a separate message or response [Message/Response] to the transcription does not correspond to a transcribed text segment but is inserted as an additional feature.

Therefore, in the previously presented examples, the raising of eyebrows with the interpretation "I am surprised" [and / but this surprises me] may be either be indicated as [I am surprised], as a pointer to information content (A-Pointer), or as [Message /Response: I am surprised], as a substitute of spoken information, a "standalone" paralinguistic feature (B-Stand-Alone). The alternative interpretations of

the paralinguistic feature (namely, “I am listening very carefully”, “What I am saying is important” or “I have no intention of doing otherwise”) can be indicated with the tags “[I am listening], [Please pay attention], [No] and [Message /Response: I am listening], [Message /Response: Please pay attention], [Message /Response: No]” respectively.

The insertion of the respective type of tag or message depends on whether the facial expressions constitute “Pointer” (A) or “Stand-Alone” (B) paralinguistic features (Example 5.3.3.1 and Example 5.3.3.2).

Example 5.3.3.1

(a) “I am surprised”
[and/but this surprises me] [I am surprised]
(A - “Pointer” to information)

[Message/Response: I am surprised]
(B - “Stand-Alone” information)

(b) “I am listening very carefully”
[I am listening]
(A - “Pointer” to information)

[Message/Response: I am listening]
(B -“Stand-Alone” information)

(c) “What I am saying is important”
[Please pay attention]
(A - “Pointer” to information)

[Message/Response: Please pay attention]
(B -“Stand-Alone” information)

(d) “I have no intention of doing otherwise”:
[No]
(A - “Pointer” to information)

[Message/Response: No]
(B -“Stand-Alone” information)

Example 5.3.3.2

Generated messages for annotated facial expressions:

(a) Annotated facial expression: << raising eyebrows>>
[Message/Response: I am surprised]

(b) Annotated facial expression: << raising eyebrows>>
[Message/Response: I am listening]

(c) Annotated facial expression: << raising eyebrows>>
[Message/Response: Please pay attention]

(d) Annotated facial expression: << raising eyebrows>>
[Message/Response: No]

Similarly, the slight raise of the hand outward with the interpretation "Wait a second" [and/but wait] may either be indicated as [Stop. Wait], as a pointer to information content (A-Pointer), or as [Message/Response: Stop. Wait.], as a substitute of spoken information, a "standalone" paralinguistic feature (B-Stand-Alone). The alternative interpretations of the paralinguistic feature (namely, "Let me speak", "I disagree with this" or "Stop what you are doing") can be indicated with the tags "[Let me speak], [No], [Stop] and [Message/Response: Let me speak], [Message/Response: No], [Message/Response: Stop]" respectively.

The insertion of the respective type of tag or message depends on whether the gestures constitute "Pointer" (A) or "Stand-Alone" (B) paralinguistic features (Example 5.3.3.3 and Example 5.3.3.4).

Example 5.3.3.3

(a) "Wait a second"
[and/but wait]
(A - "Pointer" to information)

[Message/Response: Stop. Wait.]
(B -"Stand-Alone" information)

(b) "Let me speak"
[and/but let me speak]
(A - "Pointer" to information)

[Message /Response: Let me speak]
(B -"Stand-Alone" information)

(c) "I disagree with this"
[and/but I disagree]
(A - "Pointer" to information)

[No] [Message/Response: No]
(B -"Stand-Alone" information)

(d) "Stop what you are doing"
[Stop]
(A - "Pointer" to information)

[Message/Response: Stop]
(B -"Stand-Alone" information)

Example 5.3.3.4

Generated messages for annotated gestures:

(a) Annotated gesture: << raising hand down & outward>>
[Message/Response: Stop. Wait.]

(b) Annotated gesture: << raising hand down & outward>>
[Message/Response: Let me speak]

(c) Annotated gesture: << raising hand down & outward>>
[Message/Response: No]

(d) Annotated gesture: << raising hand down & outward>>
[Message/Response: Stop]

- **Annotation of Facial Expressions and Gestures**

Language- and culture-specific facial expressions, gestures and movement are difficult to integrate as information types in transcribed spoken texts. As previously described, these paralinguistic features are a typical example of the nature and complexity of spoken political and journalistic texts where a clear distinction between features of their content and structure for subsequent processing is not always possible.

The proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) enables the efficient processing of facial expressions, gestures and movement complementing information content or constituting "standalone" information in a spoken utterance. This is feasible due to the interactive property of the proposed TCIP-Annotation, allowing the User to evaluate the spoken input and make decisions with respect to its processing. The possibility of interactive evaluation and processing is of crucial importance regarding the paralinguistic features of facial expressions, gestures and movement, due to their close relation to sociolinguistic features and socio-cultural norms.

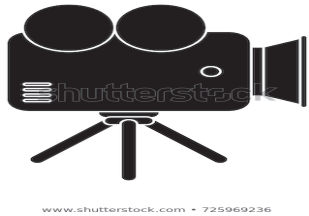
In the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) (Figure 5.3.1), the interactive annotation of the previously described prosodic features is combined with the option of indicating the respective paralinguistic features ([facial-expr: type], [gesture: type], Figure 5.3.1), if applicable, and the insertion of the chosen tags, for example "[facial-expr: eyebrow-raise]" and "[gesture: low-hand-raise]".

The insertion of the respective tags allows the insertion/generation of the appropriate messages, according to the parameters of the language(s) and the speaker(s) concerned.

With the indication of paralinguistic features as socio-cultural factors in incoming texts and with the visibility of all information content, including information not uttered, the proposed TCIP-Annotation option may also be used for compiling annotated empirical data for research and/or for the development of Natural Language Processing (NLP) and Human–Computer Interaction (HCI) applications, as (initial) training and test sets or for Speaker (User) behaviour and expectations. These

applications include Machine Translation and Opinion Mining/Sentiment Analysis) as well as Human–Computer Interaction (HCI) and Human–Robot Interaction (HRI).

Figure 5.3.1

<table>
<tr><td colspan="4">Transcription Tool Outline</td></tr>
<tr><td>Video</td><td colspan="3">  </td></tr>
<tr><td>Speech Signal</td><td colspan="3">  </td></tr>
<tr><td>Text</td><td colspan="3">text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]</td></tr>
<tr><td>Speaker Turns & Annotation</td><td colspan="3">Speaker A/ annot-text- annot-text-
Speaker B/ annot-text- annot-text</td></tr>
<tr><td>Proposed Annotations</td><td colspan="3">annot-text-[Terms / Complex-Info/ Prosody-Paraling]</td></tr>
<tr><td></td><td colspan="3">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)</td></tr>
<tr><td></td><td>Input</td><td>Paralinguistic Features
[facial-expr: type]
[gesture: type]</td><td>Choice of Tags</td></tr>
<tr><td></td><td></td><td colspan="2">[Inserted Message]</td></tr>
</table>

5.4 Prosodic and Paralinguistic Features as Pointers to Information Content

5.4.1 Signalizing Key Information

The previously described relations between the level of Semantics and the level of Prosody and Paralinguistic features describe their function as elements complementing information content or constituting "stand-alone" information in a spoken utterance.

As described above, prosodic and paralinguistic features constituting pointers to information content (Pointers-A) may also function as pointers to the content of the previous utterance or of the utterance that is about to follow. An additional function of prosodic and paralinguistic features constituting pointers to information content is their use for the signalization of key-information in spoken utterances as well as for the signalization of key-elements indicating tension in political discussions and interviews.

In the context of the headline news reports in the Media (Headline News) and the respective "explicit" Speech Act types "Announcement", "Description", "Declaration" and "Expression" (Alexandris and Fotinea, 2004) presented in Chapter 3, prosodic emphasis and other types of paralinguistic elements may also signalize key-information in spoken utterances.

In particular, different types of prosodic and paralinguistic features may function as pointers to the key-information content (i) within an uttered phrase or sentence or as pointers to the information content (ii) of the utterance that is about to follow which constitutes key-information (Alexandris and Fotinea, 2004). The type of paralinguistic element signalizing key-information in utterances of spoken political and journalistic texts is related to the type of ("explicit") Speech Act in headline news reports and the respective Speaker type. It is noted here that the "Announcement" Speech Act is mostly performed by journalists (anchor-men and correspondents); the "Description" Speech Act is performed by all speakers and rarely by politicians; the "Declaration" Speech Act is mostly performed by politicians, professionals and government officials; and the "Expression" Speech Act is usually limited to speakers that are neither journalists nor politicians.

The identified types of paralinguistic elements signalizing key-information in spoken political and journalistic texts are: (1) prosodic emphasis of the key-word (EMPH) or (2) a short pause (PAUSE) or (3)

exclamations typical of hesitation (HESIT) – such as "Ah", "Eh" and "Ih" – (transcribed as [AH], [EH] and [IH]) before key-information is uttered.

Prosodic emphasis ("Emphasis" – EMPH) is mostly observed for signalizing key-information in the "Announcement" Speech Act performed by journalists in headline news reports (Table 5.4.1).

Exclamations typical of hesitation ("Hesitation" – HESIT) are mostly observed as markers signalizing key-information in the "Description" Speech Act (performed by journalists and non-trained speakers in headline news reports) (Table 5.4.1); in the "Declaration" Speech Act (performed by politicians, professionals and government officials in headline news reports) (Table 5.4.1); and in the "Expression" Speech Act (Table 5.4.1).

The short pause (PAUSE) as a paralinguistic element signalizing key-information is observed in the "Declaration" Speech Act usually performed by the respective speaker categories, namely politicians, professionals and government officials (Table 5.4.1).

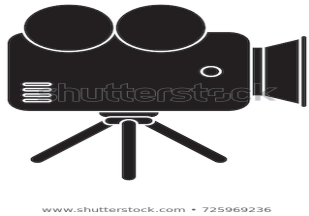
Table 5.4.1 Paralinguistic elements signalizing key-information in headline news reports

	Announce	Describe	Declare	Express
Journalist-Anchor	EMPH			
Journalist-Correspondent	EMPH	HESIT		
Politician			PAUSE HESIT	
Non-Trained Speakers: Officials, Professionals			PAUSE HESIT	HESIT PAUSE
Non-Trained Speakers: General Public		HESIT		HESIT EMPH

The above-presented paralinguistic features can be signalized with the respective special annotation (Figure 5.4.1), as included in the annotation options of the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation). The interactive annotation of the previously described prosodic features as pointers to key-information

can be included in the annotation options of the transcription tool or integrated in post-processing procedures, following transcription and basic annotation.

Figure 5.4.1

<table>
<tr><td colspan="4">Transcription Tool Outline</td></tr>
<tr><td>Video</td><td colspan="3">  </td></tr>
<tr><td>Speech Signal</td><td colspan="3">  </td></tr>
<tr><td>Text</td><td colspan="3">text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]</td></tr>
<tr><td>Speaker Turns & Annotation</td><td colspan="3">Speaker A/ annot-text- annot-text-
Speaker B/ annot-text- annot-text-</td></tr>
<tr><td>Proposed Annotations</td><td colspan="3">annot-text-[Terms / Complex-Info/ Prosody-Paraling]</td></tr>
<tr><td></td><td colspan="3">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)</td></tr>
<tr><td></td><td>Input</td><td>[EMPH]
[HESIT]
[PAUSE]</td><td>Choice of Tags</td></tr>
</table>

5.4.2. Silence as Information

An additional element constituting a pointer to information is a Speaker's silence. Silence cannot complement spoken information. Also, silence does not constitute ("stand-alone") information by itself, since silence is perceived as "No input". However, in languages such as Mandarin Chinese, "Silence" constitutes a form of answer and related information.

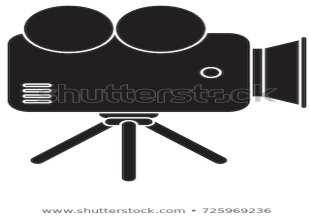
In general, it has been observed that there is a tendency for native Mandarin Chinese speakers to express themselves "economically", making implicit statements, often with limited syntactic information, including the omission of syntactic elements in the Chinese language. This tendency often results to lexical ambiguity, especially when translation or machine translation procedures are concerned. In the light of the above-described tendency, "Silence" is considered an effective way of showing "modest behaviour" as "speaking aloud can obviously betray (the Speaker's) weakness" (Du et al., 2017). Silence as a form of behaviour in conversation is also related to the tendency of native Mandarin Chinese speakers to seldom take the role of the dialogue pace-setter and to play a more passive role. According to the statistical data, Chinese scholars find that most Chinese speakers seldom lead the conversation in SKYPE-based international communication (Zhao and Liu, 2012).[26]

In Human–Computer Interaction (HCI) applications for spoken language, phenomena such as "Silence" are signalized and managed by a specially designed template-agenda controlling the interaction, namely the input and output of the Users-Participants (Alexandris, 2013; Du et al., 2017). This strategy is based on practices signalizing, controlling and registering user-input in Spoken Dialogue Systems in the Service Sector (e.g. Call Centres, Floros and Mourouzidis, 2016).

Similarly to the above-presented paralinguistic features, a speaker's silence can be signalized with the respective separate message (SILENCE), as included in the annotation options of the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) (Figure 5.4.2).

[26] Zhao, C. R., Liu, R. Q. (2012) An exploration on distance English oral test – An empirical study on English oral test through web phone Skype. In: Modern Educational Technology, 22(2), pp 95–98

Figure 5.4.2

Transcription Tool Outline	
Video	
Speech Signal	
Text	text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]
Speaker Turns & Annotation	Speaker A/ annot-text- annot-text- Speaker B/ annot-text- annot-text-
Proposed Annotations	annot-text-[Terms / Complex-Info/ Prosody-Paraling]
	Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)
	[Inserted Message: SILENCE]

5.4.3 Signalizing Points of Tension in Spoken Interviews and Discussions

Paralinguistic elements such as prosodic emphasis may constitute pointers not only to semantic information but also to pragmatic information, including conflict.

As described in the previous chapter (Chapter 4), in spoken discussions and interviews, the illocutionary act (Searle, 1969; Austin, 1962) performed by the Speaker concerned may not be restricted to "Obtaining Information Asked" or "Providing Information Asked", and other or additional intentions regarding presence and role in the interaction may be involved. For example, a Speaker may focus on (purposefully) creating tension in the interaction, on emphasizing opinion (or the policy of the network concerned) or on consistently avoiding the topics addressed and not sharing any information, demonstrating a mere presence in the discussion or interview.

Paralinguistic elements such as prosodic emphasis can assist in locating and signalizing locating points of possible tension and/or conflict between Speakers-Participants. This is especially helpful in discussions and interviews containing larger speech segments, where there is a specific agenda and a defined protocol in turn-taking (in contrast to spontaneous turn-taking, among other turn-taking forms (Taboada, 2006; Wilson and Wilson, 2005; Sacks et al., 1974)). In this case, phenomena signalizing conflict occurring in multiparty-discussions or interactions with small speech segments – such as avoidance, switching of topic (Alexandris et al., 2015) or interruptions – are less common.

Points of possible tension and/or conflict between Speakers-Participants can be referred to as "hotspots" (Alexandris, 2019).

In spoken dialogues concerning complex interactions between Speakers-Participants – as in the case of spoken journalistic texts – there are aspects that can be evaluated by semi-automatic or interactive procedures, targeting to by-pass Cognitive Bias (of the Evaluator), and there are aspects that can be evaluated by interactive procedures, targeting to register Cognitive Bias (of the Speakers-Participants). The process described here is henceforth referred to as the "HOT-SPOT" Module.

In the case of discussions and interviews containing larger speech segments, the identification of the speaker's intentions and "hidden" speech act-illocutionary act detection follows a process locating points of possible tension and/or conflict between Speakers-Participants. In points of possible tension and/or conflict between Speakers-Participants, Cognitive Bias can either be by-passed or registered.

Cognitive Bias is by-passed by signalizing and counting the points of possible tension and/or conflict between Speakers-Participants, henceforth referred to as “hot spots”. The signalization of “hot spots” is based on the violation of the Quantity, Quality and Manner Maxims of the Gricean Cooperativity Principle (Grice, 1975). Cognitive Bias is registered by comparing the content of the Speaker turns in the signalized “hot spots” and assigning a respective value.

In a discussion or interview, “hot spots” concern speech segments where there is a recognition of speaker turns, namely a switch between Speaker 1 and Speaker 2 by the Speech Recognition module of the System/transcription tool. Even if Speakers-Participants display calm and composed behaviour, the signalization of multiple “hot spots” indicates a more argumentative than collaborative interaction.

A “hot spot” (Alexandris, 2019) consists of pair of utterances of both speakers, namely a question-answer pair or a statement-response pair or any other type of relation between speaker turns. In the case of automatic detection (Alexandris, 2019), the first 60 words of the second speaker’s (Speaker 2) utterance are processed (approximately 1–3 sentences, depending on length, with an average sentence length of 15–20 words (Cutts, 2013)) and the last 60 words of the first speaker’s (Speaker 1) utterance are processed (approximately 1–3 sentences, depending on length).

The speaker turns are extracted to a separate template for further processing, containing not only the detected segments but also the complete utterances consisting of both speaker turns of Speaker 1 and Speaker 2.

Example 5.4.3.1

Signalization of multiple “hot spots” in a spoken text segment.

Spoken text (Overview):

(S1/S2 = Speaker1/Speaker 2)

Speaker turns in a transcription tool:

Speaker1 / [text]
Speaker 2 [text]
--- {…}
Speaker 1 / [text] **[hot-spot-1]**
Speaker 2 [text] **[hot-spot-1]**
--- {…}
Speaker 1 / [text]
Speaker 2 [text]
--- {…}
Speaker 1 / [text] **[hot-spot-2]**
Speaker 2 [text] **[hot-spot-2]**
--- {…}
Speaker 1 / [text] **[hot-spot-3]**
Speaker 2 [text] **[hot-spot-3]**
--- {…}
Speaker 1 / [text]
Speaker 2 [text]
--- {…}
Speaker 1 / [text] **[hot-spot-4]**
Speaker 2 [text] **[hot-spot-4]**
--- {…}
Speaker 1 / [text]
Speaker 2 [text]
--- {…}
Speaker 1 / [text] **[hot-spot-5]**
Speaker 2 [text] **[hot-spot-5]** --- {…}

Prosodic emphasis is included in the conditions related to "hot spot" identification (Alexandris, 2019). Specifically, for a segment of speaker turns to be automatically identified as a "hot spot", at least two of the following three conditions (1), (2) and (3) must apply to one or to both of the Speaker's utterances:

(1) "Additional, modifying features: In one or in both speakers' utterances in the segment of speaker turns, there is at least one phrase containing (a) a sequence of two adjectives (ADJ ADJ) or (b) an adverb and an adjective (or more adjectives) (ADV ADJ) or (c) two adverbs (ADV ADV). These forms of adjectival or adverbial phrases are detectable with a POS Tagger (for example, the Stanford POS Tagger)" (Alexandris, 2019).

(2) "Reference to the interaction itself and to its participants with negation. In one or in both speakers' utterances, the subject of the sentence containing the negation is "I" or "you" ((I/You) "don't", "do not", "cannot") (a) and in the verb phrase (VP) there is at least one speech-related or behaviour verb-stem referring to the dialogue itself (b) (for example, "speak", "listen", "guess", "understand"). This applies to parts of speech other than verbs (e.g. "guessing", "listener") as well as to words constituting parts of expressions related to speech or behaviour ("conclusions", "words", "mouth", "polite", "nonsense", "manners"). The different forms of negation are detectable with a POS Tagger. The respective words and word categories may constitute a small set of entries in a specially created lexicon or may be retrieved from existing databases or WordNets" (Alexandris, 2019).

(3) "Prosodic emphasis and/or Exclamations. (a) Exclamations include expressions such as such as "Look", "Wait" and "Stop". As in the above-described case (2), the respective words and word categories may constitute a small set of entries in a specially created lexicon or may be retrieved from existing databases or WordNets. (b) Prosodic emphasis, detected in the speech processing module, may occur in one or more of the above-described words of categories 1a, 1b, 1c, 2a and 2b or in the noun or verb following (modified by) 1a, 1b and 1c" (Alexandris, 2019).

Conditions (1) and (2) are directly or indirectly related to flouting of Maxims of the Gricean Cooperative Principle (Grice, 1975). In condition (1), the Speaker violates the Maxim of Quantity in the Gricean Cooperative Principle.

Specifically, in 1a, 1b and 1c, there is extra information added to the basic content of the utterance consisting of the necessary information required to fulfil the Maxim of Quantity of the Gricean Cooperative Principle ("Do not make your contribution more informative than is required").

Condition (2) implies a violation of the Gricean Cooperative Principle in respect to the Maxim of Quality ("1. Do not say what you believe to be false", "2. Do not say that for which you lack adequate evidence", Grice, 1975) and/or in respect to the Maxim of Manner (Submaxim 2. "Avoid ambiguity", Grice, 1975) in the utterance of the previous Speaker.

In the case of 2a and 2b, the Speaker perceives a violation of the Gricean Cooperative Principle by the previous Speaker. Here, in 2a and 2b, the content of the Speaker's utterance refers to the dialogue itself, mostly functioning as a comment, and is not limited to the current topic in question. The content of the previous Speaker's utterance is considered to be unacceptable, ambiguous, false or controversial by the Speaker (Alexandris, 2019).

In an average time of discussions and interviews containing larger speech segments in the Media (30–45 minutes), the benchmark for evaluating a significant degree of tension in a discussion is signalized by multiple "hot spots" detected and not sporadic occurrences of "hot spots". Thus, 1–2 "hot spot" occurrences in the longer speech segments in question (30–45 mins) signalizes a low degree of tension. A significant degree of tension in a 30–45 minute discussion or interview is reflected by at least 4 detected "hot spots" (3 hot spots constitutes a marginal value).

A typical example of a dialogue with many detected points of possible tension and/or conflict between Speakers-Participants is an approximately 32-minute interview with seven (7) registered "hot spots" (Example: BBC – British Broadcasting Corporation: HARDtalk interview by journalist Stephen Sackur on 16th April 2018, name of interviewee withheld).

In a semi-automatic procedure of "taking the temperature" of a transcribed dialogue, the number of detected points of possible tension and/or conflict between Speakers-Participants is measured and calculated in relation to the duration of the discussion or interview in the Media (Alexandris, 2019).

Specifically, the benchmark for evaluating a significant degree of tension concerns the calculation of the duration of discussion/interview (for example, 35 mins) and the number of "hot spots" detected (SPEECH SEGMENT-count) in Speaker turns. The defined benchmark (Y) for evaluating Speaker behaviour is the number of minutes divided by the number of identified speech segments signalized as "hot spots", which

should be less than 10 if the above-described minimal number of at least 4 detected "hotspots" is calculated. For example, the acceptable values are "8.75", "7" or, ideally, "5" (for a file of 35 minutes) versus unacceptable values of "17.5" or "11.6" (for a file of 35 minutes).

For dialogues with long speech segments, the "Tension" benchmark with a value of "Y" (or "Tension (Y)"), Y = wav file length in minutes (duration of interview) divided by (÷) the number of "hot spot" signalized speech segments and Y should be less than 10. For example, in a 35-minute interview with 5 detected "hotspots", the value is 7. In this example, the value is below the "Tension" benchmark (Y < 10) and, therefore, the interview is considered to contain several points of possible tension and/or conflict between Speakers-Participants (Alexandris, 2019).

The "HOT-SPOT" Module with the generated points of tension and/or conflict and related benchmarks contributes to an evaluation of Speakers-Participants behaviour and intentions during the interaction.

The behaviour and Cognitive Bias of (i) Speakers-Participants is evaluated in relation to the values of the "Relevance (X)", "Tension (Y)" and "Collaboration (Z)" benchmarks. However, the same benchmarks may be used (ii) for evaluating the Cognitive Bias–Confidence Bias of the user-evaluator of the recorded and transcribed discussion or interview.

In the annotation options of the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation), the [IMPL] tag for text segments at passage or text level presented in Chapter 4 signalizes the presence of a "hot spot" as a feature related to complex information content, including implied information, intentions, attitude and behaviour.

The "[IMPL]" tag is generated after the activation of the above-described "HOT-SPOT" Module (Figure 5.4.3). The "[IMPL]" tag is inserted if the "HOT-SPOT" Module signalizes a significant degree of tension and uncollaborative behaviour between the Speakers-Participants and the presence of pointers to additional, "hidden" speech acts-illocutionary acts performed.

It may, finally, be noted that spoken dialogues concerning complex interactions between Speakers-Participants are not limited to spoken journalistic texts. As the variety and complexity of spoken HCI (and HRI) applications increases, speech acts performed by one or multiple Users-Participants, even by the System (or Robot) itself, may often involve speech acts-illocutionary acts beyond the predefined framework of a task-oriented dialogue, particularly in systems with emotion recognition, virtual negotiation, psychological support or decision-making.

Figure 5.4.3

<table>
<tr><td colspan="4">Transcription Tool Outline</td></tr>
<tr><td>Video</td><td colspan="3">  </td></tr>
<tr><td>Speech Signal</td><td colspan="3">  </td></tr>
<tr><td>Text</td><td colspan="3">text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]</td></tr>
<tr><td>Speaker Turns & Annotation</td><td colspan="3">Speaker A/ annot-text- annot-text-
Speaker B/ annot-text- annot-text-</td></tr>
<tr><td>Proposed Annotations</td><td colspan="3">annot-text-[Terms / Complex-Info/ Prosody-Paraling]</td></tr>
<tr><td></td><td colspan="3">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)</td></tr>
<tr><td></td><td>Input</td><td>(Transcribed) TEXT SEGMENT</td><td>Activation of “HOT-SPOT” Module

Generation of [IMPL] TAG</td></tr>
</table>

5.4.5 Texts as Pointers to Paralinguistic Elements: Improving Transcribed Texts

The connection between linguistic and prosodic-paralinguistic features is typical of various types of texts in literature and poetry (We note the alliteration and resonance in the works of William Shakespeare). In literature and poetry, spoken texts of the past may be "reconstructed" with the aid of the linguistic elements chosen by the writer or poet.

Written texts may contain pointers to prosodic and paralinguistic elements constituting information content in a Speaker's spoken utterance, including indications of emotions or intentions. These pointers may be linked to the information content of the original spoken text, in particular, they can be linked to information conveyed by prosody which can, in turn, imply any information conveyed by gestures and movement.

On the other hand, any prosodic and paralinguistic elements constituting a "stand-alone", separate piece of information may be very difficult to retrieve from a written text.

A characteristic example of a text providing pointers to prosody, gestures and movement is the case of a speaker reciting an ancient text, where paralinguistic features are absent and their role has to be re-introduced.

In the reciting of the Chorus from the "Persians" of Ancient Greek tragedian Aeschylus ("The Persians" By Aeschylus, written 472 B.C.E., Chorus of Persian Elders, who compose the Persian Council of State), there is an alternation of "intense" phrases containing more prosodic (and pointers to paralinguistic) elements and "neutral" phrases. The Speaker makes full use of alliteration and resonance in the words, phrases and sentences of the ancient text. For example, the "[s]" phoneme is stressed in the phrase "p`asa g$^{h}$`ar isch`is Asiatog$^{h}$en`es" (πᾶ̲σα-γὰρ ἰσχὺς Ἀ̲σιατογενές) (Example 5.4.5.1) to emphasize the words "all" (p`asa) "power" (isch`is) and "Asia" (Asia-) referring to the Persian Empire. Prosodic emphasis is placed on adjectival and adverbial modifiers, certain conjunctions and words playing a main role in the semantic content of sentences, such as "Xerxes" (Xerxes the Great, the fifth king of kings of the Achaemenid dynasty of Persia).

In some words and phrases, the semantic content is stressed with characteristic types of prosodic (and pointers to paralinguistic) elements. For example, in the phrase "feeling (generated from) inside" (θυμός εσωθέν) (Example 5.4.5.2), the Speaker uses a lower amplitude to describe the internal boiling feeling.

It may, finally, be observed that the alternation of "intense" and "neutral" phrases results in the impression of periodicity and oscillation. The impression of periodicity and oscillation may have been reflected in the movements and expressive gestures of the Chorus.

The Speaker's recitation is perceived as remarkably expressive. However, this expressivity is derived from the full use of the information in the written ancient text of Aeschylus, both from a phonetic-phonological aspect and from a syntactic aspect, in combination with the semantic content. Perceived expressivity contributes to text comprehension, functioning as a bridge between the content of the ancient text of the past and the broad public and/or international audience of the present.

- **Improving Transcription**

In a similar manner, in written/transcribed texts, complex information-"non-neutral" content of the Grammatical and Semantic Features categories described in the present chapter, especially "Gravity" and "Evocative" words, may be used for the evaluation and/or improvement of the transcription or for the "(re)construction" of a spoken text from its written/transcribed form.

Transcribed texts may be compared against the original video or wav files, and any additional information detected in prosodic and paralinguistic elements can be integrated into the upgraded transcriptions.

Furthermore, as described in the above-presented example of the ancient text, some types of complex information–"non-neutral" content and/or the accumulation of complex information–"non-neutral" content in specific points of the text may imply any information conveyed by gestures and movement.

Example 5.4.5.1

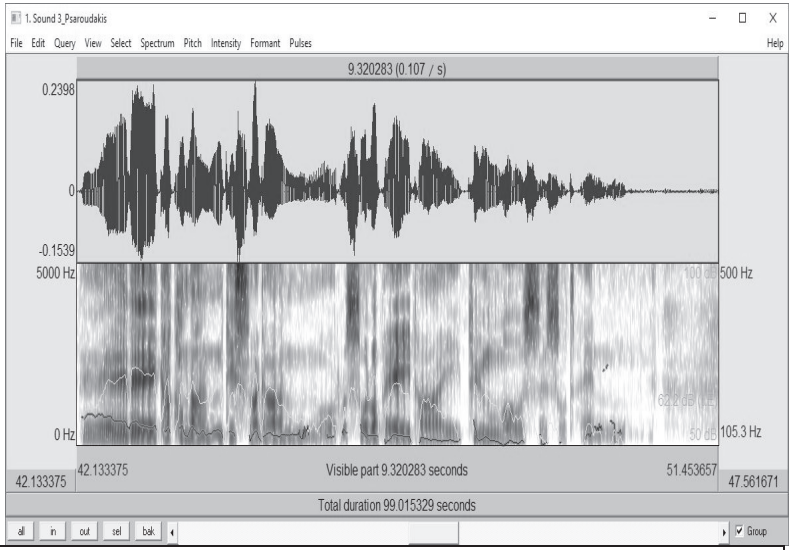
Transcription of spoken text from “The Persians” By Aeschylus, (written 472 B.C.E.): Chorus of Persian Elders, who compose the Persian Council of State. [184]

πᾶ͟σα γὰρ ἰ͟σχὺς Ἀ͟σιατογενὴς οἴχωκε, [57:24]
πᾶ͟σα γὰρ ἰ͟σχὺς Ἀ͟σιατογενὴς οἴχωκε, (Written text)
{ stressed phrase } for all her force / Hath Asia (sent) (Translation**)
πᾶ͟**σ**α-γὰρ ἰ͟**σ**χὺς Ἀ͟**σ**ιατογενές **ό**κωκε, (Spoken text) all because force of-Asia
Comments: The word «πάσα» is uttered with a slight exhaling and slight lowering of amplitude. The phoneme [s] is stressed in the words «πάσα», «ισχύς» and «Ασιατογενής», emphasizing alliteration. Emphasis on the vowel of the stressed syllable in the word «οίχωκε» and rise in amplitude**.**

**The MIT Internet Classics Archive, Translation by Robert Potter http://classics.mit.edu/Aeschylus/persians.html

Example 5.4.5.2

Transcription of spoken text from "The Persians" By Aeschylus, (written 472 B.C.E.): Chorus of Persian Elders, who compose the Persian Council of State. [184]



ἤδη κακόμαντις ἄγαν ὀρσολοπεῖται θυμὸς ἔσωθεν. [51:45]
ἤδη κακόμαντις ἄγαν ὀρσολοπεῖται θυμὸς ἔσωθεν. (Written text)
{neutral phrase} ***{stressed phrase}*** my soul presaging ill / Swells in my tortured breast (Translation**)
έδ^{d}ε κακομάντις-αγάν *ὀ**ρ**σολοπέϊταϊ* θthυμὸς-εσωθέν. (Spoken text) already (with) very ill-omen exhaling feeling(heart) from-inside
Comments: The word «ήδη» is uttered with a light sigh and slight lowering of amplitude. The phoneme [r] is stressed in the word «ορσολοπείται» and the entire word «ορσολοπείται» is uttered like a groan, followed by a slight lowering of amplitude until the end of the phrase («έσωθεν»).

**The MIT Internet Classics Archive, Translation by Robert Potter http://classics.mit.edu/Aeschylus/persians.html

5.5 Conclusions and Processing Tools

The previously presented prosodic and paralinguistic features are, to a certain extent, language-specific and are often dependent on sociolinguistic and sociocultural factors. Information at the Prosodic and Paralinguistic Level (III) is one of the above-stated basic factors (presented in Chapter 2) contributing to the complexity of spoken political and journalistic texts.

- **Annotating Information not Uttered and Combining Semantic Content with Prosody**

In the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation), (Figure 5.5.1), the annotation of prosodic and paralinguistic features enables the indication of their functions either (a) as elements complementing information content, (b) as elements constituting pointers to information content or (c) constituting "stand-alone" information in a spoken utterance.

The distinctive types of annotation of prosodic and paralinguistic features allow the User to make decisions with respect to their evaluation and processing as additional types of information in spoken input, especially with respect to information that is not uttered.

The annotation of information that is not uttered by Speakers-Participants provides the necessary conditions for its further processing for translation and/or analysis, especially if an international audience is concerned.

In the proposed TCIP-Annotation framework, linguistic information may be presented parallel to prosodic and paralinguistic features (Figure 5.5.2). Therefore, information content of spoken utterances concerning any relations between the level of Semantics and the level of Prosody and Paralinguistic features may be signalized with the distinctive types of annotation shown in the present chapter (Chapter 5) and in the previous chapter (Chapter 4).

As a general conclusion, it may be noted that the TCIP-Annotation framework facilitates the in-depth analysis and processing of the information content of spoken utterances. Complex information–"non-neutral" content retrieved from the in-depth analysis and processing of spoken texts contributes to the complete and correct evaluation and transfer of information content to recipients-audience in the international public and its implementation in multilingual applications.

- **Complex Information as Empirical Data for Applications**

As described in the present chapter, the annotation of prosodic and paralinguistic features in the proposed TCIP-Annotation framework may also serve for compiling annotated empirical data for research and/or for the development of Natural Language Processing (NLP) and Human–Computer Interaction (HCI) or even Human–Robot Interaction (HRI) applications as (initial) training and test sets or for Speaker (User) behaviour and expectations.

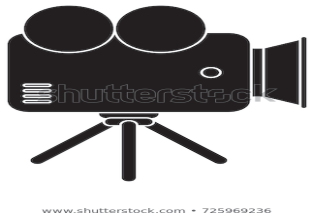
Empirical data allowing the visibility of all information content, including information not uttered, may also possibly be used in statistical models or neural networks/Deep Learning models and may enrich Machine Translation and Opinion Mining/Sentiment Analysis approaches or other applications (Figure 5.5.3).

- **Other Applications of Accessing Information not Uttered**

Furthermore, it may be observed that complex information–"non-neutral" content, detected from the analysis of spoken political and journalistic texts, may facilitate other types of accessing and processing information not "visible" or not uttered. These processes include the extraction of information concerning intentions and beliefs in Information Extraction and Information Retrieval applications and the "reconstruction" of spoken texts, as demonstrated in the cases of ancient texts (Thucydides-"Peloponnesian War", Aescylus "Persians").

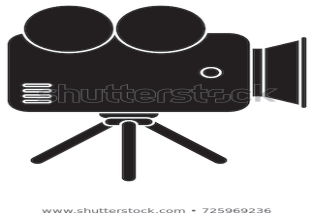
.

Figure 5.5.1

<table>
<tr><td colspan="4">Transcription Tool Outline</td></tr>
<tr><td>Video</td><td colspan="3">  </td></tr>
<tr><td>Speech Signal</td><td colspan="3">  </td></tr>
<tr><td>Text</td><td colspan="3">text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]</td></tr>
<tr><td>Speaker Turns & Annotation</td><td colspan="3">Speaker A/ annot-text- annot-text-
Speaker B/ annot-text- annot-text-</td></tr>
<tr><td>Proposed Annotations</td><td colspan="3">annot-text-[Terms / Complex-Info/ Prosody-Paraling]</td></tr>
<tr><td></td><td colspan="3">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)</td></tr>
<tr><td></td><td>Input</td><td>Prosodic Features

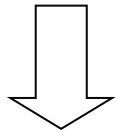
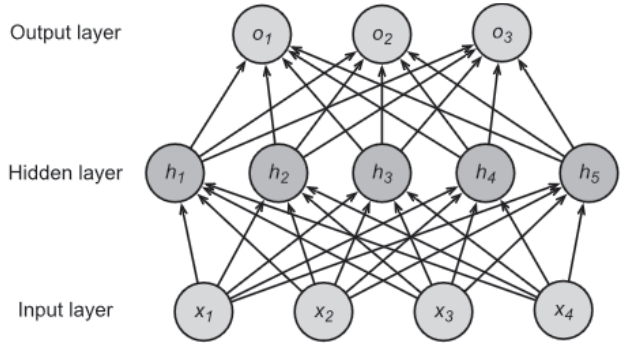
Paralinguistic Features</td><td>Choice of Tags</td></tr>
</table>

Figure 5.5.2

<table>
<tr><td colspan="4">Transcription Tool Outline</td></tr>
<tr><td>Video</td><td colspan="3"> 
</td></tr>
<tr><td>Speech Signal</td><td colspan="3"> 
</td></tr>
<tr><td>Text</td><td colspan="3">text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]</td></tr>
<tr><td>Speaker Turns & Annotation</td><td colspan="3">Speaker A/ annot-text- annot-text-
Speaker B/ annot-text- annot-text-</td></tr>
<tr><td>Proposed Annotations</td><td colspan="3">annot-text-[Terms / Complex-Info/ Prosody-Paraling]</td></tr>
<tr><td></td><td colspan="3">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation)</td></tr>
<tr><td></td><td>Input</td><td>Linguistic Features</td><td>[SMI] (activated)
[IMPL] (generated)</td></tr>
<tr><td></td><td></td><td>Linguistic & Prosodic Features</td><td>[impl]
& Prosody Tags</td></tr>
<tr><td></td><td></td><td>Prosodic Features

Paralinguistic Features</td><td>Prosody Tags / Paralinguistic Tags & <Messages>
[IMPL](generated)</td></tr>
</table>

Figure 5.5.3

<table>
<tr><td colspan="2">Transcription Tool Outline</td></tr>
<tr><td>Speech Signal</td><td> 
</td></tr>
<tr><td>Text</td><td>text- text- text- text- text- text- text- text- text- text- [& Machine Translation Option]</td></tr>
<tr><td colspan="2">Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation: Visibility in Corpora-Empirical Data)</td></tr>
<tr><td colspan="2"> 
Possibility of application in Neural Network[27]
 
</td></tr>
</table>

[27] Image from: http://d2l.ai/chapter_multilayer-perceptrons/mlp.html#hidden-layers

CHAPTER SIX

CONCLUSIONS

The present approach and analysis focused on the correct and complete evaluation, transfer or processing of information content of spoken political and journalistic texts while "respecting" the nature and complexity of the spoken input. The nature and complexity of spoken political and journalistic texts involves a variety of elements and factors, especially if an international public is concerned.

The presented analysis and strategies target the visibility of information implied and/or information not uttered and the visibility of Speaker intentions and attitude in spoken political and journalistic texts (Target 1). At the same time, the creation of a general framework targets correct and efficient analysis and/or processing (A) by human evaluators, analysts or translators and (B) by Natural Language Processing (NLP) applications, including Machine Translation and Data Mining (Opinion Mining/Sentiment Analysis) (Target 2). Both targets also aim at the accessibility of information content and the correct information transfer for non-native Speakers and/or an international audience (Target 3).

- **Challenges of Processing Spoken Political and Journalistic texts**

Due to their typical and distinctive features, spoken political and journalistic texts constitute text types that pose challenges for their evaluation, processing and translation. These features include socio-linguistic and socio-cultural elements, non-domain-specific content that may encompass several domains and, possibly, various types of target audiences – including the international community.

The features of spoken political and journalistic texts may result in complications with respect to the correct comprehension, interpretation and transfer of their information content, especially when two or more languages are involved. This challenge is of particular importance considering that information content and its perception by the recipients is often related to Cognitive Bias.

It should, additionally, be considered that one of the main challenges in applications processing spoken texts is the signalization and visualization of information that is mostly not uttered. This issue is of particular significance in Natural Language Processing (NLP) applications, including Machine Translation and Data Mining (Opinion Mining/Sentiment Analysis).

The correct and efficient processing of spoken political and journalistic texts is dependent on two basic parameters, namely the multi-domain content and the efficient use of existing tools and resources for machine translation and transcription. As discussed in Chapter 2, existing tools and resources do not cover the entire range and peculiarities of spoken political and journalistic texts, especially if the factors of non-native speakers and an international audience are taken into consideration.

- **Proposed Processing Approach**

Wth respect to the above-stated parameters, a general framework, the "three level" processing approach, is proposed for the correct and efficient processing of various types of spoken political and journalistic texts and their analysis. The general framework allows the implementation of a variety of automatic or interactive procedures, depending on text content and issues encountered.

Spoken journalistic texts may be processed with respect to three different levels, corresponding to different types of complexity and levels of analysis. The "three level" processing approach, in the form of the Interactive Annotation for Terms, Complex Information and Prosody (TCIP tool), targets the visibility of all features and respective information content of the spoken political and journalistic texts. Visibility of all information content ensures processability of all information content. Specifically, the proposed Interactive Annotation for Terms, Complex Information and Prosody (TCIP-Annotation) provides access to the multiple facets of information in spoken political and journalistic texts and targets to by-pass or limit possible complications in the evaluation, analysis and processing of the spoken input.

The proposed approach and the implemented strategies are based on the Gricean Cooperative Principle (Grice, 1975) in the Speech Acts involved, in combination with three basic factors, namely the Audience (I), the Pragmatic Level (II) and the Prosodic and Paralinguistic Level (III). The three factors concerned correspond to the different processing levels of the above-described processing approach.

The strategies involved in the general framework aim to facilitate the correct and efficient analysis and/or processing by human evaluators, analysts or translators and also to facilitate processing and evaluating information not directly accessible with most Natural Language Processing tools.

- **Factors in Processing Spoken Political and Journalistic texts**

The Audience Factor (I), presented in Chapter 3, concerns the multiple domains of spoken political and journalistic texts and the (international) public's varied levels of knowledge with respect to terminology. Spoken journalistic and political texts often contain complex information and terminology from more than one specialized domain, resulting in ambiguities and other complications in (machine) translation and other types of processing. The interactive process activated in the TCIP-Annotation tool targets accuracy – of crucial importance in spoken journalistic texts.

The factor of complex and implied information in spoken political and journalistic texts is related to the Pragmatic Level (II) (Chapter 4). Complex and implied information often contains indications of a Speaker's attitude and intentions, related to language-specific parameters and socio-linguistic and socio-cultural elements. If an international audience is involved, this type of information may also include combinations of features from the native language and the foreign/ "international" language spoken.

Additionally, several types of word categories considered as complex information in spoken political and journalistic texts are linked to the level of Prosody. Access to these complex types of information, not easily detected by most available applications, is facilitated with the proposed approaches in the TCIP-Annotation framework, as described in Chapter 4.

The processing of complex and implied information included the presentation of strategies and solutions enabling the detection, evaluation and processing of information not directly accessible with most Natural Language Processing tools, such as Cognitive Bias, and the visualization of the degree of neutrality of a written or spoken journalistic text by the use of percentages, the visualization of Speaker behaviour and Speaker intentions by the use of graphs, and the visualization of information content of paralinguistic features by the use of messages.

The information content of spoken utterances is linked to the Prosodic and Paralinguistic Level, since prosodic and paralinguistic features may influence or complement information content or may constitute pointers to

information content. The factor of the Prosodic and Paralinguistic Level (III), constituting an essential element of spoken political and journalistic texts, is presented in Chapter 5. The link between information content at the Linguistic Level and information content at the Prosodic and Paralinguistic Levels is supported by the proposed "three level" processing approach, in the form of the TCIP Annotation framework.

- **Visibility of Information Content, Processability and Issues for Further Investigation**

As previously discussed, the analysis and strategies presented target the visibility of the complex features of spoken political and journalistic texts, which include implied information and connotative features not evident at word level, information at the Prosodic-Paralinguistic Level and information not uttered. The achieved visibility of all types of the information content in the above-analysed levels ensures the processability of all information content of spoken political and journalistic texts.

Visibility of all information content facilitates its processing in Natural Language Processing (NLP) applications, including Machine Translation and Data Mining (Opinion Mining/Sentiment Analysis, Information Extraction, Information Retrieval and other Data Mining applications).

Although most applications process word groups and word sequences with the use of neural networks, the complexity of the content of spoken political and journalistic texts requires annotated corpora, at least as initial training and test sets. Therefore, the output and results from the approaches presented may contribute to the further development of NLP applications.

The strategies presented may constitute an onset for the further development of tools and strategies for the visualization of pragmatic information, enriched with more multilingual and cross-cultural data as well as by possible differentiations between situational contexts. The presented approaches may contribute to providing data for Speaker (User) behaviour and Speaker (User) expectations. This is of particular importance in dialogue modelling in Human–Computer Interaction (HCI), and even in Human–Robot Interaction (HRI) applications, especially if the users are the international public.

The possibility of a full or partial automation of the presented interactive processes may constitute an issue for further investigation. Since the strategies presented focus on English as an international language and on other European Languages with comparable issues and linguistic phenomena, an additional issue for further investigation is the

possible integration or adaptation of the presented strategies within applications processing mostly Non-European Languages.

REFERENCES

1. Agazeynali, Zahra and Agha Hosseini Hossein. 2009. "A Comparison Between "Kenayeh" and Irony". *Kavoshnameh*, Fall 2008-Winter 2009, Volume 9, Number 17: 95 -127.
2. Alexandris, C. 2019. Evaluating Cognitive Bias in Two-Party and Multi-Party Spoken Interactions. In: *Proceedings of the Symposium Interpretable AI for Well-being: Understanding Cognitive Bias and Social Embeddedness co-located with Association for the Advancement of Artificial Intelligence 2019 Spring Symposium (AAAI-Spring Symposium 2019) March 25-27, 2019*, Stanford University, Palo Alto, CA.
3. Alexandris, Christina. 2018. "Measuring Cognitive Bias in Spoken Interaction and Conversation: Generating Visual Representations". In *Beyond Machine Intelligence: Understanding Cognitive Bias and Humanity for Well-Being*, *Proceedings from the AAAI Spring Symposium*, *Technical Report, SS-18-03, Stanford University*, 204-206. Palo Alto, CA: AAAI Press**.**
4. Alexandris, Christina. 2018. "Interactive Multilingual Aspects of Complex Information Transfer and Information Processing in Transcribed Spoken Journalistic Texts". In *Proceedings of the International Conference in Society and Languages in the Third Millennium, Communication, Education, Translation*, *Moscow, May 2018*, 10-21. Moscow: RUDN University, Institute of Law.
5. Alexandris, Christina. 2015. "Signalizing and Predicting Turn-Taking in Multilingual Contexts: Using Data from Transcribed International Spoken Journalistic Texts in Human–Robot Interaction". In *Turn-Taking and Coordination in Human–Machine Interaction, Papers from the AAAI Spring Symposium, Technical Report SS-15-07, Stanford University*, 71-74, Palo Alto, CA: AAAI Press.
6. Alexandris, Christina, Konstantinos Mylonakis, Stefanos Tassis, Marios Nottas and George Camborakis. 2017. "Implementing a Platform for Complex Information Processing from Written and Spoken Journalistic Data". In *Human–Computer Interaction, HCII 2017, LNCS Lecture Notes in Computer Science*, edited by Masaaki Kurosu, 549–558. Heidelberg: Springer.
7. Alexandris, Christina, Marios Nottas and George Cambourakis. 2015. "Interactive Evaluation of Pragmatic Features in Spoken Journalistic Texts". In *Human–Computer Interaction, Users and Contexts*, *LNCS Lecture Notes in Computer Science*, Vol. 9171, edited by Masaaki Kurosu, 259-268. Heidelberg: Springer.

8. Alexandris, Christina. 2014. “Accessing Cause-Result Relations and Diplomatic Information in Ancient “Journalistic” Texts with Universal Words”. In *Human–Computer Interaction, Advanced Interaction Modalities and Techniques, Lecture Notes in Computer Science*, Vol. 8511, 2014, edited by Masaaki Kurosu, 351-361. Heidelberg: Springer.
9. Alexandris, Christina. 2013. *Managing Implied Information and Connotative Features in Multilingual Human–Computer Interaction*. Hauppauge, New York, NY: Nova Science Publishers.
10. Alexandris, Christina. 2012. “User Interface Design for the Interactive Use of Online Journalistic Texts and Ancient 'Journalistic' Texts for the International Public”. In *Proceedings of the International Conference on Applied and Theoretical Systems Research* (*ATISR) 2012, Taipei, Taiwan*.
11. Alexandris, Christina. 2010. “English, German and the International “Semi-professional” Translator: A Morphological Approach to Implied Connotative Features”. *Journal of Language and Translation*, Vol. 11, 2, Sejong University, Korea: 7- 46.
12. Alexandris. Christina. 2010. “Speech Acts and Prosodic Modeling in Service-Oriented Dialog Systems”. In: *Computer Science Research and Technology*, 3-11. Hauppauge, New York, NY: Nova Science Publishers.
13. Alexandris, Christina. 2009. “A Speech-Act Oriented Approach for User-Interactive Editing and Regulation Processes Applied in Written and Spoken Technical Texts”, In *Human–Computer Interaction. HCI Intelligent Multimodal Interaction Environments*, Vol. 2, LNCS_5611, 2009, edited by Masaaki Kurosu, 645-653. Heidelberg: Springer.
14. Alexandris, Christina. 2008. “Word Category and Prosodic Emphasis in Dialog Modules of Speech Technology Applications. In *Proceedings of the 2nd ISCA Workshop on Experimental Linguistics, ExLing2008*, Athens, Greece 5-8.
15. Alexandris, Christina and Stavroula-Evita Fotinea. 2004. “Reusing Language Resources for Speech Applications involving Emotion”. In *Proceedings of the 4th LREC Conference*, Vol.IX, 1383-1386. Lisbon, Portugal.
16. Alhamzi, Mustafa. 2015. “On Verbal Irony in Arabic: A Relevance Theory Perspective*”. Journal of Literature, Languages and Linguistics,* Vol.16, 2015: 33-38.
17. Arockiaraj, Charles M. 2013. “Applications of Neural Networks In Data Mining”, *International Journal Of Engineering And Science*, Vol.3, Issue 1 (May 2013): 8-11.
18. Austin, John Langshaw. 1962. *How to Do Things with Words*. Cambridge: Harvard University Press.
19. Austin, John Langshaw. 1976. *How to Do Things with Words*. 2nd ed., edited by Urmson. J.O. and Sbisà, M, 1976. Oxford, UK: Oxford University Press.
20. Berridge, G. R., Alan James and Sir Brian Barder. 2003. *A Dictionary of Diplomacy*. 2nd ed. New York, N. Y.: Palgrave Macmillan.

21. Burchardt, Aljoscha, Vivien Macketanz, Jon Dehdari, Georg Heigold, Jan-Thorsten Peter and Philip Williams. 2017. "A Linguistic Evaluation of Rule-Based, Phrase-Based, and Neural MT Engines". *The Prague Bulletin of Mathematical Linguistics*, No. 108, 2017: 159–170. doi: 10.1515/pralin-2017-0017.
22. Busch, Albert and Oliver Stenschke. 2008. *Germanistische Linguistik, Eine Einfuehrung*. 2nd ed. Tuebingen, Germany: Gunter Narr.
23. Carlson, Lynn, Daniel Marcu and Mary Ellen Okurovsky. 2001. "Building a Discourse-Tagged Corpus in the Framework of Rhetorical Structure Theory". In *Proceedings of the 2nd SIGDIAL Workshop on Discourse and Dialogue*, *Eurospeech 2001, Denmark*.
24. Cho, Kyunghyun, Bart van Merrienboer, Caglar Gulcehre, Dzmitry Bahdanau, Fethi Bougares, Holger Schwenk and Yoshua Bengio. 2014. "Learning Phrase Representations using RNN Encoder–Decoder for Statistical Machine Translation". In *Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing (EMNLP) Doha, Qatar*, 1724–1734. Association for Computational Linguistics-ACL.
25. Cohen, Philip R., Michael Johnston, David McGee, Sharon Oviatt, Jay Pittman, Ira Smith, Liang Chen and Josh Clow. 1997. "Quickset: Multimodal Interaction for Distributed Applications". In *Proceedings of the 5th ACM International Multimedia Conference*, 31-40, New York, NY: ACM Digital Library.
26. Crawley, Richard. 1903. *Thucydides' Peloponnesian War*. London: J.M. Dent and Co. Translated by Richard Crawley.
27. Cutts, Martin. 2013. *Oxford Guide to Plain English*. 4th ed. Oxford, UK: Oxford University Press.
28. Davis, Mayumi. 2000. "Verbal Irony in Cross-Cultural Perspective: Japanese ESL Students and American Students". M.A. Thesis, Ball State University, Dept. of English.
29. Desblache, Lucile, (ed.). 2001. *Aspects of Specialised Translation*. Paris: La Maison du Dictionnaire.
30. Dietterich, Thomas G. 2017. "Steps Toward Robust Artificial Intelligence". AAAI Presidential Address, *AI Magazine*, Vol. 38, No. 3, Fall 2017.
31. De Silva, Robert. 2006. "Explicitation in Media Translation: English Translation of Japanese Journalistic Texts". In *Proceedings of the 1st Portuguese Translation Conference*, Caparica, Portugal, 2006.
32. Dorna, Michael and Susanne J. Jekat. 2004. "Maschinelle und computergestützte Übersetzung". In *Computerlinguistik und Sprachtechnologie: Eine Einführung*, 2nd ed., edited by Kai-Uwe Carstensen, Christian Ebert, Cornelia Endriss, Susanne Jekat, Ralf Klabunde , 565 -573. Heidelberg: Spektrum.
33. Du, Jiali, Christina Alexandris, Dimitrios Mourouzidis, Vasilios Floros and Antonios Iliakis. 2017. "Controlling Interaction in Multilingual Conversation Revisited: A Perspective for Services and Interviews in

Mandarin Chinese". In *Lecture Notes in Computer Science* LNCS 10271, edited by Masaaki Kurosu 573–583. Heidelberg: Springer.

34. Elsen, Hilke. 2011. *Grundzüge der Morphologie des Deutschen*. Berlin: De Gruyter.
35. Floros, Vasilios and Dimitrios Mourouzidis. 2016. "Multiple Task Management in a Dialog System for Call Centers". Master's thesis, Department of Informatics and Telecommunications, National University of Athens, Greece, 2016.
36. Gayral, Françoise, Nathalie Pernelle and Patrick Saint-Dizier. 2000. "On Verb Selectional Restrictions: Advantages and Limitations". In *Lecture Notes in Artificial Intelligence*, Nr. 1835, edited by D.N. Christodoulakis, 57-68. Berlin: Springer.
37. Gerzymisch-Arbogast, Heidrun. 2003. "Interkulturelle Missverständnisse in Text und Translation. Einige Überlegungen am Beispiel des Englischen und Deutschen", In *Übersetzen, Interkulturelle Kommunikation, Spracherwerb und Sprachvermittlung - das Leben mit mehreren Sprachen.* Festschrift für Juliane House zum 60. Geburtstag. *Zeitschrift für Interkulturellen Fremdsprachenunterricht* [Online], 8 (2/3), 2003: 40-51.
38. Ghazala, Hasan. 2007. "Touching upon the translation of the style of irony (English-Arabic)". *Babel*, Volume 53, Issue 1, Jan 2007: 22 – 31.
39. Grice, Herbert Paul. 1989. *Studies in the Way of Words*. Cambridge, MA: Harvard University Press.
40. Grice, Herbert Paul. 1975. "Logic and conversation". In *Syntax and Semantics*, Vol. 3. edited by Cole, P., Morgan, J. New York, NY: Academic Press.
41. Hatim, Basil. 1997. *Communication Across Cultures: Translation Theory and Contrastive Text Linguistics*. Exeter, UK: University of Exeter Press.
42. Hausser, Roland. 2006. A *Computational Model of Natural Language Communication, Interpretation, Inference and Production in Database Semantics*. Berlin: Springer.
43. Hedderich, Michael A. and Dietrich Klakow. 2018. "Training a Neural Network in a Low-Resource Setting on Automatically Annotated Noisy Data". In *Proceedings of the Workshop on Deep Learning Approaches for Low-Resource NLP*, *Melbourne, Australia*, 12–18. Association for Computational Linguistics-ACL.
44. Hilbert, Martin. 2012. "Toward a Synthesis of Cognitive Biases: How Noisy Information Processing Can Bias Human Decision Making". *Psychological Bulletin*, Vol 138(2) 2012 (March): 211-237.
45. Hyde, Filippo. 2012. "Prepositional Pitfalls in German and How to Avoid Them*"*. In *About com Guide.* http://german.about.com/od/vocabulary/a/PrepPitfalls.htm (09/05/2012).
46. Ilić, Biljana Mišić and Milica Radulović. 2015. "Commissive and Expressive Illocutionary Acts in Political Discourse". *Lodz Papers in Pragmatics*, Volume 11, Issue 1: 19–49.
47. Jones, Trevor (ed.). 1978. *The Oxford-Harrap Standard German-English Dictionary: Volume 3: L-R*. Oxford, UK: Oxford University Press.

48. Jurafsky, Daniel and James H. Martin. 2008. *Speech and Language Processing, an Introduction to Natural Language Processing*, *Computational Linguistics and Speech Recognition*. 2nd ed. Prentice Hall series in Artificial Intelligence, Upper Saddle River, NJ: Pearson Education.
49. Jurafsky, Daniel and James H. Martin. 2010. *Speech and Language Processing, An Introduction to Natural Processing Computational Linguistics and Speech Recognition*. Contributing writers: Kehler A., Linden, K. V., Ward, N. Englewood Cliffs, NJ, USA: New Prentice Hall.
50. Katz, Mara H. 2015. "Politeness theory and the classification of speech acts." *Working Papers of the Linguistics Circle of the University of Victoria*, 25(2): 45–55.
51. Kheirandish, Mehdi S. and Najmeh Dorri. 2013. "Array of allusion and its position in the Persian speech". J. Life Sci. Biomed. 3(2): 107-111.
52. Koehn, Philipp. 2010. *Statistical Machine Translation*. New York, NY: Cambridge University Press.
53. Kontos, John, Ioanna Malagardi, Christina Alexandris and Maria Bouligaraki. 2000. "Greek Verb Semantic Processing for Stock Market Text Mining". In *Lecture Notes in Artificial Intelligence*, Nr. 1835, edited by D.N. Christodoulakis, 395-405. Berlin: Springer.
54. Kurz, Horst. 2007. "Mastering Genders in German". Lecture Notes, Georgia Southern University, Department of Foreign Languages, Statesboro, GA, USA, January 17, 2007: http://class.georgiasouthern.edu/german/grammar/gr-gend2.htm (03/09/2012).
55. Lehrndorfer, Anne. 1996. *Kontrolliertes Deutsch: Linguistische und Sprachpsychologische Leitlinien für eine (maschinell) kontrollierte Sprache in der technischen Dokumentation*. Tübingen, Germany: Gunter Narr Verlag.
56. Leicht, Jerome and Michael Ruppel. 2009. "Anleitung fuer das Gas-Brennwertgeraet CerapurComfort". In *Fachzeitschrift 'technische kommunikation*', 31 Jahrgang, 6/2009: 28.
57. Lewis, James R. 2009. "Introduction to Practical Speech User Interface Design for Interactive Voice Response Applications, IBM Software Group, USA." Tutorial T09 presented at HCII 2009 San Diego, CA, USA.
58. Lewis, James R. 2010. *Practical Speech User Interface Design*. Oxford: CRC Press, Taylor and Francis.
59. Li, Xiang. 2008. "Irony Illustrated: A Cross-Cultural Exploration of Situational Irony in China and the United States". *Sino-Platonic Papers*, 184 (October, 2008).
60. Liu, Bing. 2012. *Sentiment Analysis and Opinion Mining*. San Rafael, CA: Morgan & Claypool.
61. Loaiza, Francisco, Steve Wartik, John Thompson, Dale Visser, Edward Kenschaft. 2014 "The Best of All Possible Worlds: Applying the Model Driven Architecture Approach to a JC3IEDM OWL Ontology Modeled in UML". In *Proceedings of the 19th International Command and Control*

Research and Technology Symposium, 19th ICCRTS, *Alexandria, VA, June 16-19, 2014*, 1-20.

62. Ma, Jian-jun. 2010. "A comparative analysis of the ambiguity resolution of two English-Chinese MT approaches: RBMT and SMT". *Dalian University of Technology Journal*, 31(3): 114-119.
63. Malagardi, Ioanna and Christina Alexandris. 2009. "Verb Processing in Spoken Commands for Household Security and Appliances". In *Universal Access in Human–Computer Interaction*. Vol. 6, LNCS_5615, edited by Constantine Stephanidis, 92-99. Heidelberg: Springer.
64. Marcu, Daniel. 1999. "Discourse trees are good indicators of importance in text". In *Advances in Automatic Text Summarization*, edited by Mani, I. and Maybury, M., 123-136. Cambridge, MA: The MIT Press.
65. Matsumoto, Naoko, Hirotada Ueda, Tatsuya Yamazaki and Hajime Murai. 2009. "Life with a Robot Companion Video Analysis of 16-Days of Interaction with a Home Robot in a "Ubiquitous Home" Environment". In *Human–Computer Interaction*, Part II, HCII 2009, LNCS 5611, edited by J.A Jacko, 341—350. Heidelberg: Springer.
66. Mausam, Michael Schmitz, Stephen Soderland, Robert Bart and Oren Etzioni. 2012. "Open language learning for information extraction". In *Proceedings of EMNLP-CoNLL 2012 -Joint Conference on Empirical Methods in Natural Language Processing and Computational Natural Language Learning*, 523–534. Association for Computational Linguistics - ACL.
67. Mel'ˇcuk, Igor Mel'ˇ and Leo Wanner. 2008. "Morphological mismatches in machine translation". *Mach Translat*, 22:2008: 101–152.
68. Mourouzidis, Dimitrios, Vasilios Floros and Christina Alexandris. 2019. "Generating Graphic Representations of Spoken Interactions from Journalistic Data". In *Lecture Notes in Computer Science LNCS*, , HCII 2019, LNCS 11566, edited by Masaaki Kurosu, Springer, 559–570. Basel, Switzerland: Springer.
69. Mylonakis, Konstantinos. "Processing and extracting complex information in written and spoken journalistic data and historic (ancient) texts". Masters thesis, Department of Informatics and Telecommunications, National and Kapodistrian University of Athens, Greece, 2016.
70. Nass**,** Clifford and Scott Brave. 2005. *Wired for Speech: How Voice Activates and Advances the Human–Computer Relationship.* Cambridge, MA: MIT PRESS.
71. Nolan, Brian. 2017. "Computing the meaning of the assertive speech act by a software agent". *Journal of Computer-Assisted Linguistic Research*, 1: 20-39.
72. Noubours, Sandra and Matthias Hecking. 2012. "Automatic Exploitation of Multilingual Information for Military Intelligence Purposes". *Military Comm. and Information Technology: A Trusted Cooperation Enabler,* Vol. 1, 2012: 265-280.
73. Nottas, Marios, Christina Alexandris, Anastasios Tsopanoglou, and Stelios Bakamidis. 2007. "A Hybrid Approach to Dialog Input in the CitzenShield

Dialog System for Consumer Complaints". In *Proceedings of HCII 2007, Beijing, Peoples Republic of China.*

74. Paltridge, Brian. 2012. *Discourse Analysis: An Introduction*. London: Bloomsbury Publishing.
75. Pan, Yuling. 2000. "Politeness in Chinese Face-to-Face Interaction". *Advances in Discourse Processes Series* Vol. 67.
76. Poria, Soujanya, Erik Cambria, Devamanyu Hazarika, Navonil Mazumder, Amir Zadeh and Louis-Philippe Morency. 2017. "Context-Dependent Sentiment Analysis in User-Generated Videos". In *Proceedings of the 55th AnPnual Meeting of the Association for Computational Linguistics*, *Vancouver, Canada, July 30 - August 4, 2017*, 873–88. Association for Computational Linguistics - ACL. https://doi.org/10.18653/v1/P17-1081
77. Ralli, Angela. 2013. *Compounding in Modern Greek*. Heidelberg: Springer-Verlag.
78. Ralli, Angela. 1989. "Compounds in a Transfer-based Machine Translation System". *Glossologia* 7-8: 117-130.
79. Sacks, Harvey, Emanuel A. Schegloff and Gail Jefferson. 1974. "A simplest systematics for the organization of turn-taking for conversation". *Language*, Vol. 50: 696-735.
80. Schilder, Frank and Christopher Habel. 2001. "From temporal expressions to temporal information: Semantic tagging of news messages". In *Proceedings of the workshop on Temporal and spatial information processing*, Vol. 13. Association for Computational Linguistics – ACL.
81. Searle, John R. 1969. *Speech Acts: An Essay in the Philosophy of Language*. Cambridge, MA: Cambridge University Press.
82. Searle, John R. 1976. "A classification of illocutionary acts". *Language in Society,* Vol. 5, Issue 1: 1-23.
83. Shah, Kashif, Selcuk Kopru and Jean-David Ruvini. 2018. "Neural Network based Extreme Classification and Similarity Models for Product Matching". In *Proceedings of NAACL-HLT 2018, New Orleans, Louisiana, June 1 - 6, 2018*, 8–15. Association for Computational Linguistics-ACL.
84. Sifianou, Maria. 2001. *Discourse Analysis. An Introduction*. Athens: Leader Books.
85. Smart, John. 2006. "SMART Controlled English", In *Proceedings of the 5th International Workshop on Controlled Language Applications (CLAW 2006), Cambridge, MA, USA, August 12 2006,* 1-9.
86. Stede, Manfred, Maite Taboada and Debopam Das. 2017. "Annotation Guidelines for Rhetorical Structure". Manuscript, University of Potsdam and Simon Fraser University, March 2017.
87. Sternefeld, Wolfgang. 2006. *Syntax, Eine morphologisch motivierte generative Beschreibung des Deutschen*. Volume 1, Tuebingen, Germany: Stauffenburg,
88. Taboada, Maite. 2006. "Spontaneous and non-spontaneous turn-taking". *Pragmatics*, Vol.16 (2-3): 329-360.
89. Tang, Yi-jie and Hsin-Hsi Chen. 2014. "Chinese Irony Corpus Construction and Ironic Structure Analysis", In *Proceedings of COLING*

2014, the 25th International Conference on Computational Linguistics: Technical Papers, *Dublin, Ireland, August 23-29 2014*, 1269–1278.

90. Tassis, Stefanos and Antonios Iliakis. 2015. "Processing Military Terminology in the UNL System and in Multilingual Applications". Masters thesis, Department of Informatics and Telecommunications, National and Kapodistrian University of Athens, Greece, 2015.
91. Trofimova, Ira. 2014. "Observer Bias: An Interaction of Temperament Traits with Biases in the Semantic Perception of Lexical Material". *PLoS ONE* 9(1): e85677.
92. Tung, Tony, Randy Gomez, Tatsuya Kawahara and Takashi Matsuyama. 2013. "Multi-party Human–Machine Interaction Using a Smart Multimodal Digital Signage". In *Human–Computer Interaction. Interaction Modalities and Techniques, Lecture Notes in Computer Science*, Vol. 8007, 2013, edited by Masaaki Kurosu, 408-415, Heidelberg, Germany: Springer.
93. Turcato Davide and Fred Popowich. 2003. "What is Example-Based Machine Translation?" In *Recent Advances in Example-Based Machine Translation. Text, Speech and Language Technology*, Vol 21, edited by Carl, M. and Way, A., Dordrecht: Springer.
94. Uchida, Hiroshi, Meiying Zhu and Tarcisio G Della Senta.1999. *The UNL, A Gift for Millennium*. The United Nations University, Institute of Advanced Studies UNU/IAS, Tokyo, Japan.
95. Uchida, Hiroshi, Meiying Zhu and Tarcisio G Della Senta. 2005. *Universal Networking Language*. The UNDL Foundation, Tokyo, Japan.
96. Valavani, Christina. 2019. "Analysis and Processing of German Multi-word Financial Terms in Bilingual and Multilingual Applications". Doctoral Thesis, Department of German Language and Literature, National and Kapodistrian University of Athens, Greece, 2019.
97. Valavani, Christina and Christina Alexandris. 2015. **"**Deutsch als Fachsprache: Analyse und Verarbeitung Wirtschaftlicher Terminologie in Bilingualen Ressourcen und Systemen Maschineller Übersetzung**"**. Oral Presentation at Conference "Erster Kongress der Griechischen Gesellschaft für Germanistische Studien: Turns und kein Ende: Aktuelle Tendenzen in Germanistik und Komparatistik", Athens, 2015.
98. Valavani, Christina, Christina, Alexandris, Stefanos Tassis and Antonios Iliakis. 2015. "Processing Specialized Terminology in Multilingual Applications: An Interactive Approach", In *Proceedings of the 17th International Conference on Human–Computer Interaction HCII 2015*, Los Angeles CA, USA, 2015, 662 – 668. Heidelberg: Springer.
99. Venizelos, Eleftherios. 1940. *Thoukudidou Istoriai: Kata Metaphrasin Eleutheriou Benizelou*. [*Thucydides' History: translated by Eleftherios Venizelos*], D. Caclamanos, ed.. Two Vols. Oxford, UK: Oxford University Press.
100. Vijay, Deepanshu, Aditya Bohra, Vinay Singh, Syed Sarfaraz Akhtar and Manish Shrivastava. 2018. "A Dataset for Detecting Irony in Hindi-English Code-Mixed Social Media Text". In *Proceedings of 4th Workshop*

on Sentic Computing, Sentiment Analysis, Opinion Mining, and Emotion Detection (EMSASW 2018), Co-located with the 15th Extended Semantic Web Conference 2018 (ESWC 2018), Heraklion, *Greece, June 4, 2018,* 38-46.

101. Wang, Hongmei, Ava Gailliot, Douglas Hyden and Ryan Lietzenmayer. 2013. "A Knowledge Elicitation Study for Collaborative Dialogue Strategies Used to Handle Uncertainties in Speech Communication While Using GIS". In *Human–Computer Interaction, Lecture Notes in Computer Science* 8007, edited by Masaaki Kurosu, 135-146. Heidelberg, Germany: Springer.
102. Wang, Xing, Zhaopeng Tu, Deyi Xiong and Min Zhang. 2017 "Translating Phrases in Neural Machine Translation". In *Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing 2017 (EMNLP 2017), Copenhagen, Denmark, September 7–11, 2017*, 1421–1431. Association for Computational Linguistics- ACL.
103. Wardhaugh, Ronald 1992. *An Introduction to Sociolinguistics*. 2nd ed. Oxford, UK: Blackwell, 1992.
104. Werthmann, Antonina and Andreas Witt. 2014. "Maschinelle Übersetzung - Gegenwart und Perspektiven". In *Translation and Interpretation in Europe*, edited by Gerhard Stickel, 79-103. Frankfurt am Main: Lang.
105. West, James L. 2009. "Building the Culturally Aware Combat Airman: How Effective is Pre-Deployment Training for Air Force Air Advisors?". Academic Research Paper, Air Command And Staff College, Air University, Maxwell Air Force Base, Alabama, USA.
106. Wiegers, Karl E. and Joy Beatty. 2013. *Software Requirements*, 3rd ed. Redmond, WA: Microsoft Press.
107. Wilks, Yorik and Dan Fass. 1992. "The Preference Semantics Family*". Computers Math. Applications*, Vol. 23, No. 2-5: 205-221.
108. Williams, Jason D., Kavosh Asadi and Geoffrey Zweig. 2017. "Hybrid Code Networks: practical and efficient end-to-end dialog control with supervised and reinforcement learning". In *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics*, *Vancouver, Canada, July 30 - August 4, 2017,* 665–677. Association for Computational Linguistics –ACL.
109. Wilson, Margaret and Thomas P. Wilson. 2005. "An oscillator model of the timing of turn taking". *Psychonomic Bulletin and Review* 2005:12 (6): 957-968.
110. Wojcik Richard H. and Heather Holmback. 1996. "Getting a Controlled Language Off the Ground at Boeing". In *Proceedings of CLAW– 1996, Leuven, Belgium*, 22–31.
111. Wu, Yonghui , Mike Schuster, Zhifeng Chen, Quoc V. Le, Mohammad Norouzi, Wolfgang Macherey, Maxim Krikun, Yuan Cao, Qin Gao, Klaus Macherey, Jeff Klingner, Apurva Shah, Melvin Johnson, Xiaobing Liu, Łukasz Kaiser, Stephan Gouws, Yoshikiyo Kato, Taku Kudo, Hideto Kazawa, Keith Stevens, George Kurian, Nishant Patil, Wei Wang, Cliff Young, Jason Smith, Jason Riesa, Alex Rudnick, Oriol Vinyals, Greg

Corrado, Macduff Hughes and Jeffrey Dean. 2016. “Google's Neural Machine Translation System: Bridging the Gap between Human and Machine Translation”. arXiv: 1609.08144 [cs.CL]. https://arxiv.org/abs/1609.08144.

112. Xue, Ping, Stephen Poteet, Anne Kao, David Mott, Dave Braines, Cheryl Giammanco, Tien Pham. 2012. “Information Extraction Using Controlled English to Support Knowledge-Sharing and Decision-Making”, In *Proceedings of the 17th International Command and Control Research and Technology Symposium, 17th ICCRTS*, *Fairfax, VA, USA, June 19-21, 2012*, 1-18.
113. Yang, Zhaojun, Gina-Anne Levow, and Helen Meng. 2012. “Predicting User Satisfaction in Spoken Dialog System Evaluation With Collaborative Filtering.” *IEEE Journal of Selected Topics in Signal Processing*, Vol. 6, Issue: 8, 2012 (December): 971 – 981.
114. Yu, Zhiwen, Zhiyong Yu, Hideki Aoyama, Motoyuki Ozeki, Yuichi Nakamura. 2010. “Capture, Recognition, and Visualization of Human Semantic Interactions in Meetings”. In *Proceedings of PerCom*, *Mannheim, Germany*.
115. Zeldes, Amir. 2016. "rstWeb - A Browser-based Annotation Interface for Rhetorical Structure Theory and Discourse Relations". In *Proceedings of NAACL-HLT 2016 System Demonstrations*, *San Diego, CA*, 1-5. ACL Anthology.
116. Zhao Chun-rong and Yong-quan Liu. 2012. “An exploration on distance English oral test- An empirical study on English oral test through web phone Skype”. *Modern Educational Technology*, 22 (2): pp 95-98.
117. Constine, Josh. 2016. https://techcrunch.com/2016/05/23/facebook-translation/ Facebook ditches Bing, 800M users now see its own AI text translations.
118. Madhavan, Radhika. 2018. https://www.techemergence.com/machine-translation-14-current-applications-and-services (July 31st 2018).
119. Metz, Cade. 2017. https://www.wired.com/2017/05/facebook-open-sources-neural-networks-speed-translations/, 05.09.17 Facebook’s New AI Could Lead to Translations That Actually Make Sense, Cade Metz.
120. Protalinski, Emil. 2019. https://venturebeat.com.cdn.ampproject.org/c/s/venturebeat.com/2019/08/16/google-open-sources-live-transcribes-speech-engine/amp/ (August 18 2019).
121. Rajan, Danny. 2017. Interview Jun 17, 2017, https://www10.giscafe.com/video/SDL-Government-S.-Danny-Rajan-CEO/411334/media.html
122. Statt, Nick. 2019. https://www.theverge.com/2016/9/27/13078138/google-translate-ai-machine-learning-gnmt (September 27th, 2016).
123. Zhou, Sharon, Andrey Kurenkov and Abigail See. 2018. Putting AI News In Perspective. Has AI surpassed humans at translation? Not even close! Neural network translation systems still have many significant issues which make them far from superior to human translators:

https://www.skynettoday.com/editorials/state_of_nmt, Skynet Today, July 25, 2018.
124. ABBYY FineReader (Software): https://www.abbyy.com/finereader/
125. The AGENT-DYSL Project: http://www.agent-dysl.eu/
126. The Alpheios Project: http://alpheios.net/
127. Andovar (Software): https://www.andovar.com
128. Annotation Graph Toolkit (AGTK): http://agtk.sourceforge.net/
129. Anvil Software transcription tool: http://www.anvil-software.de/
130. Anvil Video Annotation Research Tool: http://www.anvil-software.org/
131. Bank of Finnish Terminology in Arts and Sciences of the University of Helsinki :https://tieteentermipankki.fi/wiki/Termipankki:Project
132. Canopy Speak (Software): https://withcanopy.com/speak/
133. DM (Digital Mappaemundi) (Software): https://schoenberginstitute.org/dm-tools-for-digital-annotation-and-linking/
134. Dragon Speech Recognition Software: https://www.nuance.com/dragon.html
135. eDiplomat Global Portal for Diplomats, Glossary of Diplomatic Terms: http://www.ediplomat.com/nd/glossary.htm
136. eLaborate (Software): http://elaborate.huygens.knaw.nl/
137. The ERMIS Project: http://www.image.ntua. gr/ermis/
138. European Industrial Relations Dictionary: https://www.eurofound.europa.eu/observatories/eurwork/industrial-relations-dictionary
139. European Judicial Network website: https://www.ejn-crimjust.europa.eu/ejn/
140. EuroParl corpus (European Parliament Proceedings Parallel Corpus: http://statmt.org/europarl/
141. EXMARaLDA (System): http://www.exmaralda.org/en/
142. Express Scribe Transcription Software: http://www.nch.com.au/scribe/index.html
143. French and Latin Diplomatic Terms By Mark Nichol: https://www.dailywritingtips.com/french-and-latin-diplomatic-terms/
144. German Terminology Association (Deutscher Terminologie-Tag e.V. – DTT): http://dttev.org/
145. Glossary of Nautical Terms: English – Spanish, Spanish – English, English – French, French – English,
English – Italian, Italian – English.
Approved and Released by: Dal Bailey, DIR-IdC United States Coast Guard Auxiliary Interpreter Corps http://icdept.cgaux.org/, 6/29/2012
146. GlobalLink (Software): http://translations.com/globallink/products/globallink_modules.html
147. Google Live Transcribe: https://www.android.com/accessibility/live-transcribe/
148. The HEARCOM Project: http://hearcom.eu/main.html
149. The "ili" voice translator: https://iamili.com/us/
150. InqScribe (Software): https://www.inqscribe.com/

151. Inter-Active Terminology for Europe – IATE: http://iate.europa.eu
152. iTranslate Voice 2 (Software): http://itranslatevoice.com/
153. The KantanMT Machine translation system: https://www.kantanmt.com/
154. The Lingua Custodia Machine Translation system: http://www.linguacustodia.finance/en/homepage/
155. Lionbridge Translation Workspace: https://geoworkz.com/
156. The Mars Odyssey Mission: https://mars.nasa.gov/odyssey/multimedia/images/
157. Mars, Common Surface Features: https://en.wikipedia.org/wiki/Common_surface_features_of_Mars
158. Mikros Apoplous (in Greek) (Corpus): http://www.mikrosapoplous.gr/thucy/vivlia/vivlio8.htm
159. The MIT Internet Classics Archive, Translation by Richard Crawley: http://classics.mit.edu/Thucydides/pelopwar.mb.txt
160. The MIT Internet Classics Archive, Translation by Robert Potter: http://classics.mit.edu/Aeschylus/persians.htm
161. OPUS (Corpus): http://opus.nlpl.eu/
162. Oral History Metadata Synchronizer (OHMS): http://www.oralhistoryonline.org
163. Pilot (Software), Waverly Labs: https://www.waverlylabs.com/company/
164. Portal for the Greek Language, Centre for the Greek language: www.greeklanguage.gr
165. Praat (Software): http://fonsg3.hum.uva.nl/praat/
166. Recogito 2 (Software): http://recogito.pelagios.org/
167. Sat.1 Television Network (Germany): https://www.sat1.de
168. SDL Government (Software): http://www.sdlgov.com/
169. SETIMES2 (Corpus): http://opus.nlpl.eu/SETIMES2.php
170. Skype Translator: https://www.skype.com/en/features/skype-translator/
171. The SOPRANO Project: http://www.soprano-ip.org
172. Standish Typing Services Transcriptions: https://standishtyping.com/
173. The Stanford Log-linear Part-Of-Speech Tagger: http://nlp.stanford.edu/software/tagger.shtml
174. SentimentBuilder (Software): http://sentimentbuilder.com/
175. SYSTRAN Machine translation system: http://www.systransoft.com/lp/machine-translation/
176. Textgrabber (ABBYY) (Software): http://www.textgrabber.pro/en/
177. Trados Machine translation system: https://www.sdltrados.com
178. Transcriber 1.4.2: http://trans.sourceforge.net/en/presentation.php, Copyright (C) 1998-2008, DGA
179. Visualsubsync Transcription and Subtitling tool: Visualsubsync: www.visualsubsync.org
180. UM-Corpus: A Large English-Chinese Parallel Corpus: http://nlp2ct.cis.umac.mo/um-corpus/
181. The Universal Networking Language: http://www.undl.org
182. The United Nations Parallel Corpus: https://conferences.unite.un.org/uncorpus

183. WordNet: https://wordnet.princeton.edu/
184. Voice of Stylianos Psaroudakes, Assistant Professor in Ancient Hellenic Music, in collaboration with Prof. Anastasia Georgaki, Department of Music Studies, National and Kapodistrian University of Athens.