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Requirements elicitation practice in the context of national culture

An inquiry with Austrian and Bulgarian practitioners

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Abstract

Requirements elicitation practice in the context of national culture: an inquiry with Austrian and Bulgarian practitioners

Projects, in which software products, services, systems and solutions are developed, all rely on the right requirements to be established. Software requirements are the expression of user wants or needs that have to be addressed, business objectives that have to be met, as well as capabilities and functionality that has to be developed. Meanwhile, practice shows that very often incorrect, unclear or incomplete requirements are established, which causes major problems for such projects. It could lead to budget overruns, missed deadlines and overall failure in worst-case scenarios.

The field of requirements engineering emerged as an answer to these shortcomings, aiming to systematize and streamline the process that establishes requirements. Requirements elicitation is a key component of this process, and one of its starting points. The current thesis attempts to outline best practices in requirements elicitation, as well as what issues, obstacles and challenges are currently faced, and then present this through the lens of national culture. In this way its effects on the practice, if any, could be highlighted and studied further. The way this was achieved was by interviewing practitioners from two nations, which are shown to be culturally different, and then comparing and contrasting the findings. Meanwhile, the validity of those findings was enhanced by comparisons with existing literature.

Even though the findings were not compelling enough to form generalizations or concrete conclusions about the effects of national culture on requirements elicitation, these findings revealed patterns that could be worth exploring further. When it comes to requirements elicitation itself, it was observed to benefit from a structured and systematic approach, and be most effective with one-on-one, instead of group interactions. The main pain points of the process stem from the complexity of communication, but are not always obvious. Practitioners are also advised to carefully plan the gathering of requirements, as the source may not have them readily available, and could even be unclear about what exactly is needed.

Overall, this thesis research could be considered successful in its goal to shed a modicum of light on the issue at hand from a different, underexplored angle. By following a systematic and methodical approach, this research has also been made easier to expand or replicate.

Keywords in English:

Requirements elicitation, requirement gathering, requirements sourcing, software requirements, national culture, Hofstede

Kurzreferat

Praxis der Anforderungsermittlung im Kontext der nationalen Kultur: eine Untersuchung mit österreichischen und bulgarischen Unternehmern

Projekte, in denen Software-Produkte, -Dienste, -Systeme und -Lösungen entwickelt werden, sind alle darauf angewiesen, dass die richtigen Anforderungen festgelegt werden. Software-Anforderungen sind Ausdruck von Benutzerwünschen oder bedürfnissen, die erfüllt werden müssen, von Geschäftszielen, die zu erreichen sind, sowie von Fähigkeiten und Funktionen, die entwickelt werden müssen. In der Praxis zeigt sich jedoch, dass sehr oft falsche, unklare oder unvollständige Anforderungen festgelegt werden. Als Folge davon, entstehen oft große Probleme bei solchen Projekten. Das kann zu Budgetüberschreitungen und verfehlten Termin und, im schlimmsten Fall, zum Scheitern des Projekts führen.

Als Antwort auf diese Problematik entstand Requirements Engineering, das darauf abzielt, den Prozess der Anforderungsanalyse zu systematisieren und zu optimieren. Die Anforderungserhebung ist ein Grundelement dieses Prozesses und einer seiner Ausgangspunkte. In der vorliegenden Masterarbeit wird versucht, die bewährten Methoden bei der Anforderungsermittlung, sowie die dabei entstehenden Probleme, Hindernisse und Herausforderungen zu identifizieren und diese mit Perspektive auf die jeweilige nationale Kultur zu betrachten. Auf diese Weise können Auswirkungen auf die Praxis, falls vorhanden, hervorgehoben und weiter untersucht werden. Dies wurde durch die Befragung von Unternehmern aus zwei kulturell unterschiedlichen Nationen erreicht und durch den Vergleich und die Gegenüberstellung der Ergebnisse. Zusätzlich wurde die Validität dieser Ergebnisse durch Vergleiche mit der vorhandenen Literatur evaluiert.

Obwohl die Resultate nicht ausreichend überzeugend waren, um Generalizierungen oder konkrete Schlussfolgerungen über die Auswirkungen der nationalen Kultur auf die Anforderungsermittlung zu ziehen, zeigten diese Ergebnisse doch Muster auf, die es wert sein könnten, weiter untersucht zu werden. Zur Anforderungserhebung selbst wurde festgestellt, dass sie von einem strukturierten und systematischen Ansatz profitiert und am effektivsten ist, wenn sie unter vier Augen und nicht in Gruppen durchgeführt wird. Die Hauptschwierigkeiten des Prozesses ergeben sich aus der Komplexität der Kommunikation, sind aber nicht immer offensichtlich. Den Unternehmern wird auch empfohlen, die Erhebung der Anforderungen sorgfältig zu planen, da die Ansprechpartner:innen die notwendigen Informationen möglicherweise nicht ohne weiteres zur Verfügung hat und sich sogar nicht im Klaren darüber ist, was genau benötigt wird.

Im Allgemeinen kann die vorliegende Masterarbeit als erfolgreich angesehen werden, da sie das Thema aus einem anderen, bisher wenig erforschten Blickwinkel betrachtet. Durch den systematischen und methodischen Ansatz ist es auch einfacher, diese Forschung zu erweitern oder zu wiederholen.

Keywords in German:

Anforderungsermittlung, Bedarfserhebung ,Softwareanforderungen, Kultur, Hofstede

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List of Abbreviations and Symbols

ICO	Issues, challenges and obstacles
NC	National culture
RE	Requirements elicitation
Ref.	Reference
RQ	Research question

1 Introduction

It's 2022 and the world is embracing digitalization faster than ever before. Digital transformation (a multi-dimensional shift in organizations that is brought about by the adoption of smart digital solutions[1]) is seen by many companies as a key weapon in their battle to stay competitive and to expand their market influence (Vial 2019). The race for innovation creates an increasingly complex technological environment, which companies have to navigate. In this context, requirements elicitation (RE) plays a crucial role in navigating the huge mess of information by extracting the proper requirements for software products and solutions. Simply put, requirements are intended to provide details about the job to be done. They help paint a picture of what the needs are for the solution to be developed, or what the client or contracting party wants as a result. Establishing specific requirements is, therefore, a necessary first step, a foundation for the development of many different types of IT solutions – be it, e.g. a digital product, a machine, or a service. We might be tempted to think of this as a straightforward transfer: ask the client what they need, specify the details, note it down and pass it on. It turns out that various pitfalls lie along the way of obtaining the perfect list of specifications.

In fact, research shows that at least half, if not the majority of software projects fail[2] due to incorrectly established or improperly documented requirements (Paul & Cadle, 2020**,** p.244**;** Wong et al., 2017, p.297**;** Davey & Parker, 2015**;** Wiegers & Beatty, 2013**,** p.4**;** Davey & Cope, 2008, p.1). This includes large-scale projects, where costs and stakes are high. The insights from a sizeable study by McKinsey Global Institute and Oxford University can attest to this. The study found that issues such as lack of clarity on desired outcomes and fluctuating requirements cause "half of all large IT projects [to] significantly blow their budget and deliver less than half the value planned" (Bloch et al., 2012). A few sensible questions that may come to mind are: how is this allowed to happen? How do we know when obstacles to obtaining requirements emerge, and can we even name these obstacles at all? And of course, how can we be better prepared to face these obstacles? These are some of the sparks that ignited curiosity and helped give purpose to the research that underlies this paper.

The current thesis is directed at practitioners who deal with software requirements – be it their collection, specification, documentation, etc. This target audience is assumed to have a broad spectrum of expertise and experience, as well as diverse background in terms of industry and field. All of this was considered while preparing the structure, content and presentation of the information in the following chapters. It should be noted that the focus of this work is not to analyze the procedural aspects of how requirements are gathered and documented, but rather to explore the interactions within the RE process. As will hopefully become clear to the reader, communication is a theme in this paper that underlies a lot of its content, and helps maintain its focus.

[1] https://www.i-scoop.eu/digital-transformation/ (Accessed on 05.01.2022)
[2] failure can also refer to projects that went overtime and/or over budget

1.1 Motivation and background

RE is the process of extracting specific information about the desired properties and functionality of a product, system or service that is to be developed or improved. Since that information often needs to be extracted from other individuals, effective communication and a common ground of understanding are crucial (Palomares et al., 2021**;** Paul & Cadle, 2020**;** Wiegers & Beatty, 2013). Communication encompasses all discourse and correspondence aspects between two or more individuals. It is one of the main instruments that the person in charge of elicitation uses to perform their work. Research into the practice of RE, however, has found that communication is a major locus of trouble when it comes to establishing requirements. Some notable causes are human cognitive limitations, language barrier, knowledge and culture gaps, tacit knowledge and ambiguity of words and phrases (Coughlan et al., 2003; Davey & Parker, 2015; Blais, 2011; Palomares et al., 2021). Other obstacles to efficient requirements acquisition stem from the requirements source – stakeholder, client or user. For instance, they might not know what they want, or what is possible (Blais, 2011**,** p.225; Laporti et al., 2009, p.367; Robertson & Robertson, 2013, p.6) or may not want to cooperate (Hiisilä et al., 2015). Another reason that is cited is the lack of alignment between different business units or teams (Davey & Parker, 2015).

Even though all of these issues, challenges and obstacles (ICO) are relevant for inquiry, the current thesis paper aims to focus on the ICO stemming from the communication between individuals, or their relationship to one another. Quite often the main point of interest is the requirements source (again, that could be a client, user, stakeholder, or any other contracting party). The reason for this is the central role that these persons play in the conceptualization of the product, for which requirements are gathered. They usually define the product or upgrade, e.g. what it should achieve, do and look like, or how it should work in general. As mentioned in the previous paragraph, this is not always easy to achieve – obtaining an accurate and comprehensive bundle of requirements from the source is allegedly very difficult. Therefore, one of the mechanisms used to reach the goal of the current research was to sketch out the most common ICO to RE that are linked to communication. In this way, the problem could be given a clearer outline.

Alsanoosy et al.'s (2020) paper proved to be a pivotal point for the conception of the current research, as well as a source of inspiration to pursue culture as a key variable in tackling ICO that the practice of RE faces. The paper, which is based on a targeted, systematic literature review, has found that national culture (NC) has a palpable influence on requirements engineering activities. Reportedly, the complexity of both these variables is acknowledged by researchers. At the same time, however, the authors warn that the influence of culture on requirements engineering activities has not been sufficiently studied, either in breadth or in depth. They call for further empirical research into how different cultural contexts affect the requirements engineering process. One of the facets outlined, that is central to studying cultural differences, is communication (Alsanoosy et al., 2020, p.356). Of course, this is not the only relevant aspect that is worth looking into. Other aspects that were identified in this paper were mapped into Hofstede's cultural framework. Interestingly, it is namely evidence from this framework (the six dimensions of NC) that was employed to define the scope of primary data collection for this thesis. The aspect of culture, as it relates to the current research, is explored in Section 3.3.

1.2 Research setting and objectives

The way this paper aims to contribute to the study of RE, including its best practices and ICO, is by offering an intercultural perspective – asking to what extent they usually persist across international borders. This question emerged during a review of literature on requirements, when NC was discovered to have an effect on how requirements are prioritized. Furthermore, as outlined in the previous paragraph, the cultural diversity of actors in requirements engineering does indeed influence the practice. Consequently, what is worthwhile in the approach of the current research is that variables are examined through the lens of NC. More specifically, this paper aims to probe these RE pain points in two different NCs, to see if and/or how they differ. Insights from relevant literature on requirements, RE and NC have been used as a starting point for designing the research and data gathering approach in particular.

Since the software industry is among the fastest growing and developing, not to mention one of the most relevant for RE, it made most sense to focus research efforts and primary data collection there. This is also a specifically recommended research direction by Alsanoosy et al. (2020, p.356). Therefore, when discussing requirements from now on, it is implied that these concern the development and modification of software products, systems and services.

The countries that this research covers are Austria and Bulgaria, as they score significantly different on country culture scales, and at the same time are very similar in terms of population and area size. The difference in cultural values refers to the empirical results from research based on Hofstede's cultural dimensions framework, as well as on the Global Leadership and Organizational Behavior Effectiveness (GLOBE) project. These are discussed in Section 3.3 and are employed in the interpretation and analysis of the collected primary data.

The subjects of the empirical part of this study are practitioners who are tasked with establishing the requirements for software projects. They are the ones who communicate with the requirements source(s) and gather the raw requirements. These practitioners often, but not always, carry job titles like e.g., Business Analyst, Requirements Engineer, Product Owner, Project Manager, including leadership-oriented positions like Team Lead. For the sake of clarity, they will henceforth be collectively referred to as elicitors or practitioners. When referring to the interview participants that contributed to this paper's primary data, the word respondents is also often used.

Another key objective that this thesis paper is guided by, is contributing to the knowledge of how RE is being performed in modern practice. There have been claims, even very recently, that there is a lack of empirical study on the matter. Researchers call for inquiry into "what methods are used in current state-of-practice" and "what the challenges faced by practitioners [are]… that remain to be solved" (Palomares et al., 2021, p.2). The current thesis aims to address this need for up-to-date information, through collecting accounts of practitioners in different companies and industries. The author believes this will not only strengthen this thesis' narrative, but will also help build the context, in which the variable of culture will be considered.

1.3 Research question

With the key concepts in mind, and considering the aim and scope of the thesis paper, the following research question (RQ) has been defined:

- How do cultural differences affect requirements elicitation efforts in Austria and Bulgaria?

To further dissect the matter and help answer the main RQ, several sub-questions were devised:

  - Do practitioners in both countries follow the same elicitation guidelines?
  - Do practitioners in both countries run into the same elicitation obstacles?
  - Which of these elicitation obstacles have to do with the requirements source?
  - Can national cultures theory help make sense of the interview findings?

2 Research methodology

In this chapter, the research methodology will be discussed, including how the research was designed, as well as what mechanisms it utilized to facilitate reaching conclusions and answering the RQs. To ensure coherence, the reasoning behind each methodological choice is provided. This should allow the reader to obtain an understanding of how these choices are connected and follow each other.

2.1 Philosophy and design

As a starting point for designing this research, the object of study in it was considered – requirements sources and how they communicate information to elicitors. At the highest level, from an ontological perspective, this suggests that an objectivist research philosophy in this case is the best guide for the research methodology. Objectivism entails staying away from biases and pre-defined values, and observing social actors, as they exist in a fabric of reality that is irrespective of how we perceive them. What is of particular interest in this current study is how they interact and what drives this interaction. A guiding notion is that there is one common social reality that can be observed and theorized upon (Saunders et al., 2019, p.135). It is important to understand this perspective so that a more detailed look at the interactions between these actors can lead us to new insights. Even more so since this thesis aims to examine its central subject (RE) through the lens of NC.

The researcher acknowledges his influence on the study, both in terms of principles introduced, and scope of questions and themes that guides participants through the interview. However, this influence should not be considered detrimental to the objectivity of the research, since the aforementioned principles and themes are already well-outlined in literature on the subject and generally accepted as standard. For example, a clearly stated assumption preceeded each conversation: establishing the right requirements (in general) and RE as a process (in particular), are key to software development and have substantial implications for the successful outcomes of such projects. At the same time, ICO exist that get in the way of effective RE. It's also worth noting that, while the existence of organizational structures and hierarchies, as well as specific workflows, is considered and factored in the analysis, none of these are in focus. The focus is rather on the individuals' informed viewpoints, as well as how they experience the process.

Following all these considerations, it should be concluded that the paradigm that informs methodological choices for this research project is the one labeled as critical realism:

> *"The philosophy of critical realism focuses on explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events… If you believe that, as researchers, we need to look for the bigger picture of which we see only a small part, you may be leaning towards the critical realist philosophy." (Saunders et al., 2019, p. 147)*

> *"[Critical realism] provides a structured way of thinking about social and organizational problems. It starts with a realist ontology, which recognizes social conditions (such as class or wealth) as having real consequences, whether or not they are observed. It then incorporates a relativist thread, which recognizes that social life both is generated by the actions of individuals, and has an external impact on them." (Easterby-Smith et al., 2015, p.59)*

Having established the research paradigm, it should be stipulated that an inductive approach was used in developing the paper's empirical content. This was necessary due to the essence of the RQ – to answer it, the structure must be derived from the qualitative data, then be analyzed, and constructs extracted to form a (theoretical) conclusion. The choice of an inductive approach also could be considered compatible with the objectivist model that the research followed, and is the logical mechanism for a grounded theory approach (Saunders et al., 2019, p.205**;** Easterby-Smith et al., 2015, p.191).

2.2 Research strategy and methods

Considering the RQs and objectives, it was established that qualitative methods are best used to collect all the data. This is because, despite an objectivist research paradigm, quantitative methods do not fit the needs of this research. Collecting the needed data called for a more interactive and in-depth approach. Furthermore, information that this research needed to obtain, in order to address the thesis' theme and questions, is non-numerical and uncountable in nature. It has more to do with the nature of certain ocurrences than with how frequently they occur – and qualitative data offers an abundance of circumstantial detail (Saunders et al., 2019, p.639**;** Collis & Hussey, 2014, p.52). With that said, the qualitative data analysis presented in Chapter 4 does compare frequencies of occurrence. However, the small number of samples in the datasets that were compared does not warrant a quantitative label, since it utilized only the most primitive mathematical action – counting. These were the main considerations that informed the methodological data collection choice, as well as the choice of research strategy.

Grounded theory as a research strategy neatly fits the objectives and considerations, as one of its intended uses is to comparatively study "the same event or process in different settings" (Easterby-Smith et al., 2015, p.92). It needs to be specified, however, that the approach to grounded theory that was adopted here is the one developed and defined by Corbin and Strauss (2008). It is, in some ways, a departure from the original concept of grounded theory formulated by Glaser & Strauss; at the same time, many fundamentals are true to the original. Most notably, Corbin and Strauss (2008) acknowledge that:

- the approach must be iterative, with data and analysis following each other;
- the coding of data must be systematic and consistent;
- constant comparison of findings is needed;

At the same time, however, they are convinced that:

- insights materialize through conscious scrutiny of the data by the researcher;
- prior literature and findings on the matter should be considered, and not disregarded;

By utilizing grounded theory strategy, possibilities could emerge to gain new insight about possible effects of the NC variable on RE, in addition to finding whether generalizations from existing findings about ICO to effective RE still hold true. Participants were encouraged to produce a more elaborate account of the elicitation process as they see and experience it, including how they interact with requirements sources, and what pitfalls they recall

encountering or observing, as well as a few bits of information on how they perceive their work setting and context. It was possible, with the grounded approach, for themes to emerge from the codes of these accounts, which required, in turn, paying closer attention to how data are shaped, and refining interview questions when needed, before subsequent interviews.

With the research strategy outlined, the data collection method can be specified. In order to boost the validity of the obtained bits of information, to cross-reference and to help categorize and more firmly establish the validity of observed themes and patterns, two data collection methods were utilized. This allowed for side-by-side comparisons, achieved through triangulation. The next paragraphs specify how such an endeavor was approached.

Primary data were collected using semi-structured interviews. In this way, richer detail about the respondents' work context could be caught, as well as how they perceive and perform RE. This gives context and more meaning to the collected data. Also, the subject matter might be commercially sensitive, and establishing rapport with the respondent through a tete-a-tete conversation is key (Easterby-Smith et al., 2015, pp.134-135). Furthermore, semi-structured interviews are a good option when the nature of the questions in the study is rather complex and/or manyfold. It has been found that for research such as the current one, buy-in is more readily earned through the transparency and formality of a one-to-one interview, rather than through a survey or questionnaire (Saunders et al., 2019, p.445).

The scope of primary data to be collected was determined by two factors. First, data was collected from participants based in two European countries – Austria and Bulgaria. Second, the participants were those professionals who are tasked with collecting the requirements for software-related projects. The desired sample size was initially estimated to be eight respondents (from different companies) – four from each of the two countries – for eight interviews in total (more details on designing the sample size follow in section 2.3.1.). As a matter of fact, this amount of 8 had just been successfully reached by the end of the phase scheduled for collecting primary data. Of course, the purpose of such a sample size, which is relatively modest, is to be an indication, rather than proof.

This was why, in order to improve the validity of the research's findings, this project was designed to make use of *triangulation* of both data and methodology. Triangulation means cross-examining more than one source of data and/or method of its collection, in order to highlight the touchpoints and similarities, or the lack thereof (Flick, 2014 pp.11-12**;** Saunders et al., 2019, p.218). In this case, secondary data extracted from sources in the literature review allowed findings from the primary data collection stage (interviews) to be compared. Ultimately, this gives a more objective picture, in which the two angles – the established and the observed – are independently considered. The researcher compares these measurements from a neutral perspective. If the themes recognized in the literature review converge with those recognized in the qualitative data, then triangulation helps strengthen the validity of this thesis' findings (Webb et al., 1966, p.3; Creswell, 2014, p.201). If, however, there is a significant divergence between the established and the observed, this in itself would lead to closer scrutiny of the points of variation. This still has the potential to produce relevant insights. After all, the author of this thesis approaches the posed research problem with curiosity rather than conviction, so there is no possibility of a detrimental outcome. In other words, since this research can be considered exploratory, it aims to shed light on the topic, rather than prove a

concept right or wrong. Therein lies the value of employing triangulation as an approach. In the words of Denzin (2012),

> *The use of multiple methods, or triangulation, reflects an attempt to secure an in-depth understanding of the phenomenon in question… The combination of multiple methodological practices, empirical materials, perspectives, and observers in a single study is best understood as a strategy that adds rigor, breadth complexity, richness, and depth to any inquiry (p. 82)*

Furthermore, the strength added to primary and secondary qualitative data that has been bound by triangulation could help build a stable foundation for then introducing the variable of culture to the study, and more accurately gauging its impact.

Regarding the secondary data source, the review of literature, a large part of it was conducted at the initial stage of the project, as a research proposal was being prepared. As a foundation for selecting RE as a thesis focus, a preliminary literature review had been conducted of selected business analysis, requirements engineering and RE literature, along with specific papers of empirical nature that fit the research objectives. The approach, thereafter, was a critical literature review, as described by Easterby-Smith et al. (2015, Chapter 2). Through preparing the research proposal for this thesis, the topic had been identified, as well as the aim and scope of the work, and the information sources: FHV Library, academic paper databases and journal archives that FHV grants access to, as well as other academic sources such as archive.org and Google Scholar. To navigate these vast expanses of information and knowledge, keywords such as the following were generated to narrow down the search: *requirements*, *requirements elicitation*, *requirements engineering*, *elicitation challenges*, *issues*, *gather requirements*, *software requirements*, *national culture*, *organizations,* and others. Using all this, it was possible to generate a body of literature, each piece of which was promptly scanned for relevance and utility. The process was then iterated – with further insights and connections uncovered by reviewing literary sources, the topic, scope, and keywords were continuously revised (Figure 1).

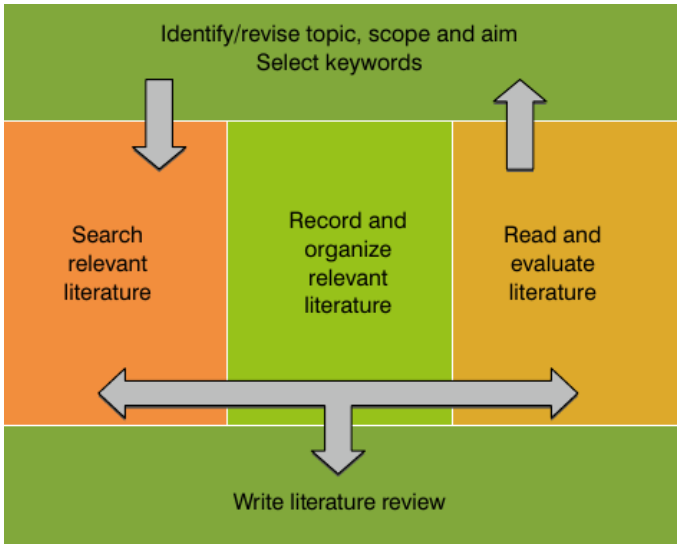

Figure 1: Literature review process

Source: Easterby-Smith et al., 2015, p.17

To ensure the review is systematic and methodical, a concept matrix has been employed for proper tracking of information gathered and marking the relevance and content of the literature

pieces upon their initial scan (Webster & Watson 2002, pp.xvi-xvii). In this way, the available information sources were easier to manage, relevant pieces of literature were highlighted, and the effort was more organized in general, helping avoid confusion. Figure 2 shows an extract of the concept matrix that was prepared and utilized for the purposes of the current research.

#	Year	Article/ *Book*	Concept							
			Elicitation definition	Requirement definition	RE process in detail	Types of knowledge	Elicitation techniques	Suitability of RE techniques	Elicitation issues & challenges	Empirical study results
1	2015	Project Management Institute (PMI) (2015). Business Analysis For Practitioners: A practice Guide	X	X	X		X		X	
2	2020	Paul, D. & Cadle, J. (2020). Business Analysis - Fourth edition		X		X	X	X		
3	2015	International Institute of Business Analysis (IIBA) (2015). A Guide to the Business Analysis Body of Knowledge® v3.0	X	X	X		X			
4	2011	Blais, S. (2011). Business analysis: Best practices for success.	X		X		X	X	X Plus obstacles to getting the good requirements	
5	2021	Palomares, C. et al. (2021). The state-of-practice in requirements elicitation: an extended interview study at 12 companies.	X	RE definition			X		X	X
6	2008	Dieste, O., Juristo N. & Shull, F. (2008) Understanding the customer: What do we know about requirements elicitation?					X	X		X
7	2008	Davey, B.; Cope, C. (2008). Requirements Elicitation - What's Missing? In: Proceedings of the 2008 InSITE Conference,					X	X	X	

Figure 2: An excerpt from the author's literature review concept matrix

2.3 Strategies for data collection and analysis

Next, it is good to elaborate on the strategy that was devised for:

1) The sampling of participants
2) Collecting primary data, as well as
3) Analyzing the qualitative data collected

2.3.1 Sampling

The direction given by the choice of a research strategy and methodology, as outlined so far in Chapter 2, together with the circumstances surrounding the current thesis research, have made it relatively clear how sampling should be done. Here are the main considerations:

- Grounded theory strategy under an objectivist paradigm;
- Qualitative research through semi-structured interviews;
- One researcher with no prior experience in qualitative research;
- Restricted time and monetary budget;
- Research context:
    - two specific geographic locations;

    - participants from a particular field (IT; software development);
    - participants that perform a specific role in the studied process (RE);
- Heterogeneity of participants' industry/business context is desired;

Based on these considerations, it was established that non-probability, purposive sampling will inform sampling size and guide participant selection (Easterby-Smith et al., 2015, pp.82-83; Collis & Hussey, 2014, pp.132,177). To define and determine which respondents excatly should be approached, as well as where to search for them, the author used the findings from the literature review about RE and its sources. This managed to produce a good initial concept of who the potential respondents are. This concept was then affirmed and made more comprehensive through the experience of searching for and approaching potential participants, as well as actually speaking to them in the interviews.

Determining a suitable specific, yet realistic sample size, however, proved more difficult. For positivist research, especially when quantitative data is collected, the general principle is that the chosen sample (size) is meant to represent the wider population. The scope is, therefore, precisely calculated and justified. Interpretivist research, on the other hand, including the current thesis which uses qualitative methods, is more interested in the richness of information discovered, than in the amount of samples studied. As Collis & Hussey (2014) put it, "[interpretivists'] goal is to gain rich and detailed insights of the complexity of social phenomena. Therefore, they can conduct their research with a sample of one." (p.51). Indeed, this is in line with considerations by Saunders et al. (2019) that "for all non-probability sampling techniques[…]the issue of sample size is ambiguous and, unlike probability sampling, there are no rules." (p.315). Academic practice can also be seen to call for "saturation" of the data or information. This means a point where further data collection does not yield much new information or notions. However, the point of data saturation is notoriously difficult to accurately gauge (Saunders et al., 2019, p.315**;** Collis & Hussey, 2014, p.177**;** Guest et al., 2006). Therefore, data saturation was only used as inspiration, regardless of whether or not this elusive aim was achieved. Within the given time constraint, a final sample size of 8 respondents (4 from each country) was achieved. As previously mentioned, this was exactly the number that was planned; 8 respondents was the number quoted as a goal in the research proposal for this thesis.

To maximize the chances for access to respondents, great care was taken in designing invitational texts, consent form and an informational leaflet that not only look and feel professional, but also meet academic standards. These were sent along with personalized requests that include the author's motivations, as well as how the research could be relevant for the participants. Ethical standards (Collis & Hussey, 2014, p.150) and relevant data protection and retention legislation (e.g. EU's General Data Protection Regulation, or GDPR) were upheld and reflected in the leaflet and consent form that were presented to each participant prior to confirming and scheduling the interview. These ethical standards and data protection measures were made clear to potential participants in written form in the *Research information leaflet* (Appendix 1), as well as in the *Participant consent form* (Appendix 2). These include, but are not limited to:

- Full disclosure about the purpose of the research, as well as its objectives and aims;

- Transparency:
    - in terms of what is expected of the respondent as a participant;
    - about what topics would be covered in the interview;
    - about recording of the conversations;
    - about what can and cannot be offered in exchange for participation;
- Pledge for anonymity and confidentiality, as well as for data protection;
- Withdrawing from participation or refusal to participate is possible at any time;

2.3.2 Collection

Preparing for collection

The first step, before undertaking data collection through semi-structured interviews, was preparation. Every detail was considered – including, but not limited to: (1) interview length, (2) interview topics, (3) interview structure, (4) what questions should be asked, as well as (5) whether it should be face-to-face or online.

(1) has implications for all of the rest, and is the factor that respondents are most sensitive to, at least as deemed by the author. This is why, along with (4), it was one of the main considerations. (4) is of particular importance, since it enables inflow of data that is relevant. With these two constraints in mind, and guided by the RQs, a number of notes and draft questions were produced, that began to give shape to what would later become the *Interview guide* (Appendix 3). This guide was used solely by the researcher, and not intended as any official interview structure, but rather, as its name suggests, a guide which makes sure all the topics of interest have been raised in the conversation. This would explain its formatting.

And indeed – the interview guide, according to Weiss (1995) is a useful tool for the interviewer, as it gives a neat overview of the topics that need to be covered in the interviews, helps guide the researcher in the conversation with the respondent, and makes sure that everything that the interviewer wanted to ask, has been asked (p.48). The interview guide contains a list of general topics and themes that should be covered, as well as how questions in the interview could approximately be phrased. It also covers follow-up questions and themes that could be explored if the respondent has more to say on a particular topic. In addition, such a document can boost the transparency and consistency of the research, by highlighting the particular research interests that lie behind the choice of each theme, topic or question. It's interesting to note that the first conducted interview proved effective at testing and improving the interview guide. Indeed, as per Weiss (1995), "a single pilot interview can suggest where a guide is overweighted or redundant and where it is skimpy". He goes on to say that "even with such testing, the guide is likely to undergo modification as more is learned through interviewing about the area of the study.", but also offers specific advice of how the interview guide should look and feel, what it should include and exclude (p.48). Moreover, this practice seems to be an excellent fit to the iterative nature of the grounded theory approach that was followed in the current project.

As for (5), it was the easiest to figure out. Due to the uncertainty that was still felt in the second half of 2021 with regards to whether or not the global pandemic will finally start subsiding from 2022, it was not realistic to plan face-to-face meetings. As the popular saying goes, "better safe than sorry"; and potential respondents would probably feel the same way to begin with.

The added advantages of online interviewing include arrangement flexibility, easier execution and greater convenience for both parties. At the same time, the lack of physical proximity, body language and direct visual contact can subtract from the genuine feel of a live conversation. But again, these were necessary concessions to make in these circumstances.

Finding sources and collecting data

The decision to record the interviews for later transcription has quite possibly preserved as much as possible of this genuine feel of a conversation, a talk, a discussion, and has helped maximise the interviewer's engagement in this conversation. Taking notes instead, would not only disengage the interviewer from the respondent, but would also cost prescious time, pushing the interviews' duration beyond that deemed reasonable. This consideration was shared with the respondents in advance, as it should justify the need for session recording.

To locate respondents that fit the needs of this research, the author of this thesis leveraged his own personal and professional networks, as well as his social media networks (including LinkedIn). The considerations described in 2.3.1 served as a profile that helped select potential respondents. Once a respondent that fits the necessary profile was located and approached, and after they expressed interest in this thesis research, they were sent a brief email invitation to participate that also contained as attachments the *Research information leaflet* (Appendix 1) and the *Participant consent form* (Appendix 2). Also noteworthy is the fact that not every interested party was included as a respondent. On two occasions, the professionals who agreed to participate were quickly found to not actually be involved in RE.

The interviews themselves were held via Microsoft® Teams and Zoom, on a mutually agreed upon date and time. Respondents were originally asked for 45 minutes of their time, but after the pilot interview and then the second interview, it became apparent that roughly 30 minutes should be sufficient time. In addition, this shorter duration potentially makes it easier to attract further respondents. The invitations and forms were updated accordingly for future use. It's good to point out that only the audio of each session was recorded (without video). This audio was recorded with participants' consent, then transcribed virtually into text and anonymized. The main goals for these sessions were to a) gain a richer understanding of the RE process and its pain points from the respondents' point of view and to b) learn something about the contexts, in which RE takes place. For all this to materialize, it is very helpful to get the practitioners' candid resposes and actual experiences. Hence, it was important to design the interview to feel more like a talk, a discussion, a conversation.

NB: The interview transcripts have been thoroughly anonymized, but have not been included as attachments to this thesis. There are two key reasons for this: 1) bolstering anonymity and 2) enhancing the readability of the thesis document – including the interview texts would mean adding 69 extra pages to it, effectively doubling its size. Nevertheless, to ensure academic rigor and transparency, these transcripts have, instead, been made available exclusively to the thesis' reviewing committee.

2.3.3 Analysis

The approach that the author took to analyizing the data is the one described by Saunders et al. (2019) with the term *thematic analysis*. This process helps make better sense of the data,

“identify key themes or patterns”, “produce a thematic description of the data”, as well as “draw and verify conclusions”. It is guided by order and structure, as well as logic, which makes it systematic. At the same time, however, it offers flexibility and ease of application. The first step when undertaking thematic analysis, according to Saunders et al. is developing familiarity with the data (p.651).

In the spirit of grounded theory methodology, data were allowed to tell their own story. Their collection and basic initial analysis were done together in iterations. In this way, (a) themes and patterns could be identified, and (b) focus could be kept within the scope of the RQ (Saunders et al., 2019, p.640-641). The very first interview for this thesis research was followed by reflection and initial analysis of the content. This already led to the first revision of the interview guide and added talking points that enriched the data. For example, following a suggestion by the respondent, a question was added that helps add more work context and a variable of interest – the effect that (switching to) remote work has on elicitation efforts.

Becoming acquainted with the data

This oscillation between gathering the data, transcribing it, and analyzing it, enabled a closeness to that data to be naturally formed. In this way, it could be re-processed a lot easier afterwards, in the final stages of analysis. It could also start giving shape to themes before the time comes to define them. These effects, in turn, helped pinpoint discussion topics in later interviews that are worth elaborating on further. This closeness to the data is not only beneficial – it is, in fact, described in literature as a necessary step before data analysis can begin. It is also a foundation, on which to build one’s analysis. According to Saunders et al. (2019), this familiarization “involves a process of immersion”, and this requires plenty of re-reading. They note that this could also come natuarlly as one is transcribing their interviews (p.652). Easterby-Smith et al. (2015, p.192) add that not only recorded, but also unrecorded information, such as notes and diaries, enables this familiarization.

Indeed, such goals were inadvertently reached through the process of bringing the interview data from an audio to text format. By painstakingly editing the transcript texts while listening to the interviews, a lot of the flavor of each respondent’s account was captured. Both subtle and apparent details can easily be picked up from raw audio, which helped accurately capture the respondent’s statements and separate them in the verbal noise of a fast-paced dialogue.

Utilizing software

These were notable efforts, even despite the fact that raw transcripts of the interviews were generated with the help of softare – in this case, Microsoft® Word. The computer-generated text has the benefit of accurately producing timestamps and separating the two speakers. What was much less reliable and accurate, however, was the text itself. While getting many of the words and phrases right, and therefore saving a lot of time, a substantial amount of editing was still needed in order to transcribe the interviews correctly. Of course, it’s not merely the software that carries the blame. This computer-aided transcription does add a lot of value, and is greatly appreciated. It produces a large amount of the text automatically. What it cannot do, however, (as mentioned earlier) is pick up on the subtle cues or sift through the verbal noise. Furthermore, much of the terminology used cannot be expected to be programmed into the software. In retrospect, these imperfections and the editing effort they prompted, turned

out to be very helpful for the author of this thesis, so as to achieve familiarity with the data, and to better understand what respondents were talking about. Last, but not least, the careful review of each uttered word and phrase ensured that no opportunities were missed to erase and redact any information that could be used directly or indirectly to identify the respondent, therefore ensuring anonymity.

Speaking of software, it must be stated that, both the preparation of the qualitative data obtained through the interviews, and its analysis, were done via the MAXQDA computer-assisted qualitative data analysis software. Access to the software was granted by the AppsAnywhere platform that FHV provides to students for internal use. This has helped avoid excessive financial burdens on this thesis, while still preserving operational quality.

Coding the data

The second step when performing thematic analysis, after becoming well-acquainted with the data, is categorizing it. In the context of qualitative research, and especially when using a grounded approach, this is called *coding*.

Coding involves labeling the data by assigning *codes* to particular pieces of text, or audio or video excerpts, or images. These codes are single words or short phrases that bestow a literal or symbolic characteristic to the piece of data, thereby condensing its meaning and making it easier to work with (Saldaña, 2016, p.4). Since purely textual data were utilized here, it should be specified that a code can be assigned to any length of text – from a few to several hundred words. These labels are meant to condense and represent a particular part of the text, and to associate different pieces of data that carry the same, or similar meanings. All this makes the dataset more comprehensive and prepares it for the next stage of analysis – recognizing patterns and devoping themes (Collis & Hussey, 2014, p.162**;** Easterby-Smith et al., 2015, p.194**;** Saunders et al., 2019, p.653).

But how does one come up with those codes? How does one know what code is right?

The codes themselves can come either from literature – what is referred to as *a priori* codes, or can be directly sourced from the data, like is the case in the current research (Saunders et al., 2019, p.655). This approach was not chosen arbitrarily, but on purpose – as Collis & Hussey (2014) point out, “grounded theory requires the discovery and creation of codes from interpretation of the data” (p.179). The same or similar views are also shared by Easterby-Smith et al. (2015, p.191) and Miles et al. (2014, p.86), among others.

Saunders et al. (2019) help us distinguish between these contrasting approaches by looking at whether the research is approached inductively or deductively. They note that with an inductive approach (as was taken in the current paper), the RQ can be a helpful guide to forming proper codes, and figuring out, in general, which data to even code (p.653). This means that even though the research method, research approach, and the RQ all serve to guide the extraction of codes from the data, as well as their naming and definiton, it is ultimately up to the researcher to decide which specific data segments to code, and how to name, define and categorize the codes.

Organizing and categorizing the codes

As the data are labeled and the list of codes grows, these require categorization so as not to end up as a long and untidy list. Grouping codes into categories helps in a number of ways:

- makes the analysis process easier to manage (Collis & Hussey, 2014, p.179)
- organizes, condenses and consolidates data and allows patterns to form (Miles et al., 2014, p.31**;** Saldaña, 2016, p.10)
- helps identify concepts and themes that enhance the researcher's understanding of what is being studied (Easterby-Smith et al., 2015, p.192)

Examples are given below of how the author generated and marked the codes in MAXQDA (Figure 3) and then later organized and categorized them in Microsoft® Excel (Figure 4).

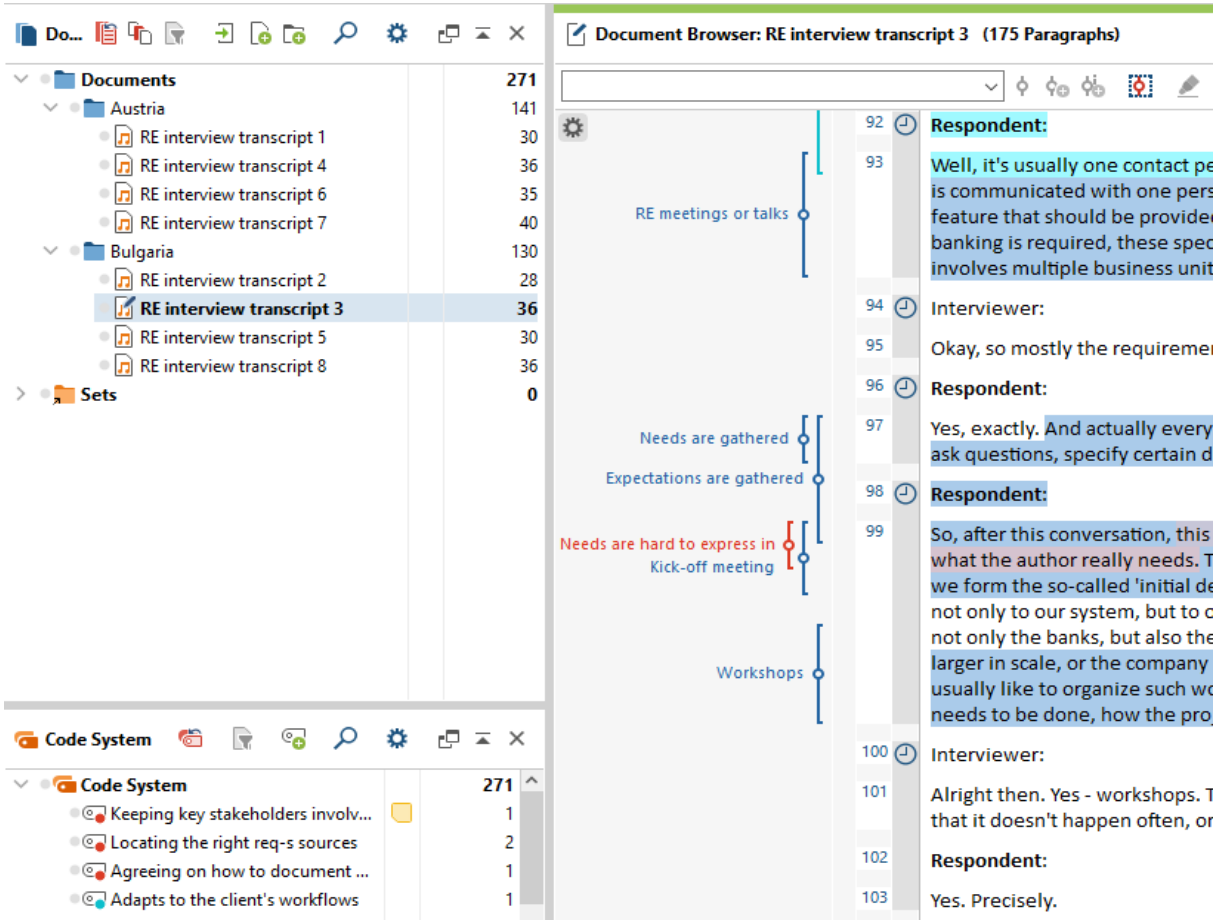

Figure 3: Coding in MAXQDA

	A	B	C	D	E	F	G	H	I	J	K	L
1	#1	#2	#3	#4	#5	#6	#7	#8	Set	Code	Freq	Description
50						x			C	High vs. low-quality req-s document	1	
51		x							C	No RE methodology	1	The requirements management process is highly frexible and var
52							x		C	Always start with functional req-s	1	Establish what task needs to be completed first, before trying to
53		x	x			x	x		C	Kick-off meeting	4	At the start of the project, everyone meets and gets to know wl
54			x						D	Adapts to the client's schedule	1	"usually I adapt to their schedule. They are the leading party in term
55					x		x		D	Working together towards a common goal	2	Pointed or hinted to the importance of working together with the
56	x			x	x	x	x		D	Requirements source is internal	5	The requirements source is internal from the
57		x	x			x	x		D	Requirements source is external	4	The requirements source is most often external fror
58	x		x						D	Know in advance who the req-s source is	2	
59		x		x	x	x	x		D	Deduce who the req-s source(s) are	5	Knowing which stakeholder to contact for RE is "like an internal feel
60						x			D	Requirements come in writing	1	The client sends their requirements digitally in writing, and then conversatic
61	x								E	Unhappy from lack of involvement	1	The respondent feels they are not able to see the whole picture when it
62	x								E	Talking vs. drawing	1	Perceived difference in expression between the German-
63	x						x		E	Language barrier	2	Comes from differences in 1) language mastery levels or 2) wh
64	x	x	x	x	x		x		E	Communication issues	6	Challenges, obstacles and issues that could stem from comm
65							x		E	Weak confirmation	1	Not having written evidence of confirmation could l
66	x		x				x		E	Knowledge gap as RE obstacle	3	Differences in professional/educational background c
67				x		x			E	Knowledge gap issue can be avoided	2	
68		x	x						E	Internal (client) disagreement	2	Disagreement internally between stakeholders, as an o
69		x							E	Internal (client) resistance	1	"Internal resistance" from stakeholders that are non-fri
70			x	x	x	x	x		E	They don't know what they want/need	5	

Figure 4: Tracking, sorting and categorizing codes in Microsoft® Excel

To support analysis, preliminary categories were devised, which serve to group the codes and make the list more legible and easier to work with. These groups or categories were named *sets* – this is the same term used in MAXQDA, and the same approach to grouping was used there.

A further mechanism was added to help with analysis: a frequency counter (column K in Figure 4). This simple formula that counts how frequently a certain code appears can be useful in that it can highlight patterns of its own and make it easier to group and compare codes and themes. It should be specified, however, that analysis itself is not based on frequency of codes alone.

As Saunders et al. (2019) remark in the context of thematic analysis, “a theme is a broad category incorporating several codes that appear to be related to one another and which indicates an idea that is important to your research question.”, but “a theme may also be a single code which indicates an idea that assumes general importance to your research question and is therefore elevated to become a theme.” (p.657). Therefore, counting frequency was used as only one of the analysis perspectives.

Emergence of themes

Further to these steps, a natural continuation is the emergence of themes. This was again technically approached using Excel, as the *themes* structure could begin to take shape – see Figure 5.

	A	B	C	D
1	Set	Theme	Code	Description
66	C	RE as a team effort	Multiple people gather the requirements	It's not only the respondent that gathers requirements for any given project, but usually it's a team effort
67	C	RE outlier	Respondent only gathers	The respondent only gathers the requirements, and usually does not play a role in their documentation or management
68	D	Project/process circumstances	Adapts to the client's schedule	"usually I adapt to their schedule. They are the leading party in terms of at which times would be possible to meet"
69	D		Adapts to the client's workflows	-
70	D		Requirements source is internal	The requirements source is internal from the respondent's perspective
71	D		Requirements source is external	The requirements source is most often external from the respondent's perspective
72	D		Requirements come in writing	The client sends their requirements digitally in writing, and then conversations with them are mainly for clarification purposes
73	D	Stakeholder analysis	Know in advance who the requirements sources are	-
74	D		Deduce who the requirements source(s) are	Knowing which stakeholder to contact for RE is "like an internal feeling" and depends on the project circumstances
75	D	Directly eliciting	Direct contact with the client	The respondent directly elicits the requirements from their source
76	D	Indirectly eliciting	No direct contact with client	The respondent indirectly elicits requirements
77	D	Strategic cooperation	Working together towards a common goal	Pointed or hinted to the importance of working together with the counterparty to achieve the desired result
78	E	Communication-related ICO	Talking vs. drawing	Perceived difference in expression between the German-speaking world and the Asian world
79	E		Language barrier	Comes from differences in 1) language mastery levels or 2) what meaning is assigned to a specific term
80	E		Difficulties in understanding each other	-
81	E		Difficulty in clearly expressing needs	The requirements source has an idea of what they want, but for whatever reason cannot express it in a clear way
82	E		Weak confirmation	Not having written evidence of confirmation could lead to problems down the line
83	E		Knowledge gap as RE obstacle	Differences in professional/educational background can lead to lack of comprehension
84	E		Knowledge gap issue can be avoided	-
85	E		Unclear or incomplete requirements	-

Figure 5: Discovering and tracking themes in Microsoft® Excel

Bringing it all together

Saldaña (2016, p.14), through constructing a concise model, eloquently portrays the relationship between codes, categories and themes, and how the typical qualitative analysis process could produce informed statements and theoretical propositions. Moreover, the spirit of inductive reasoning and analysis is precisely captured through depicting a flow from the specific to the general. This model is quoted in Figure 6. It was used as an inspiration for how the primary data, collected for this thesis, was organized, managed and analyzed.

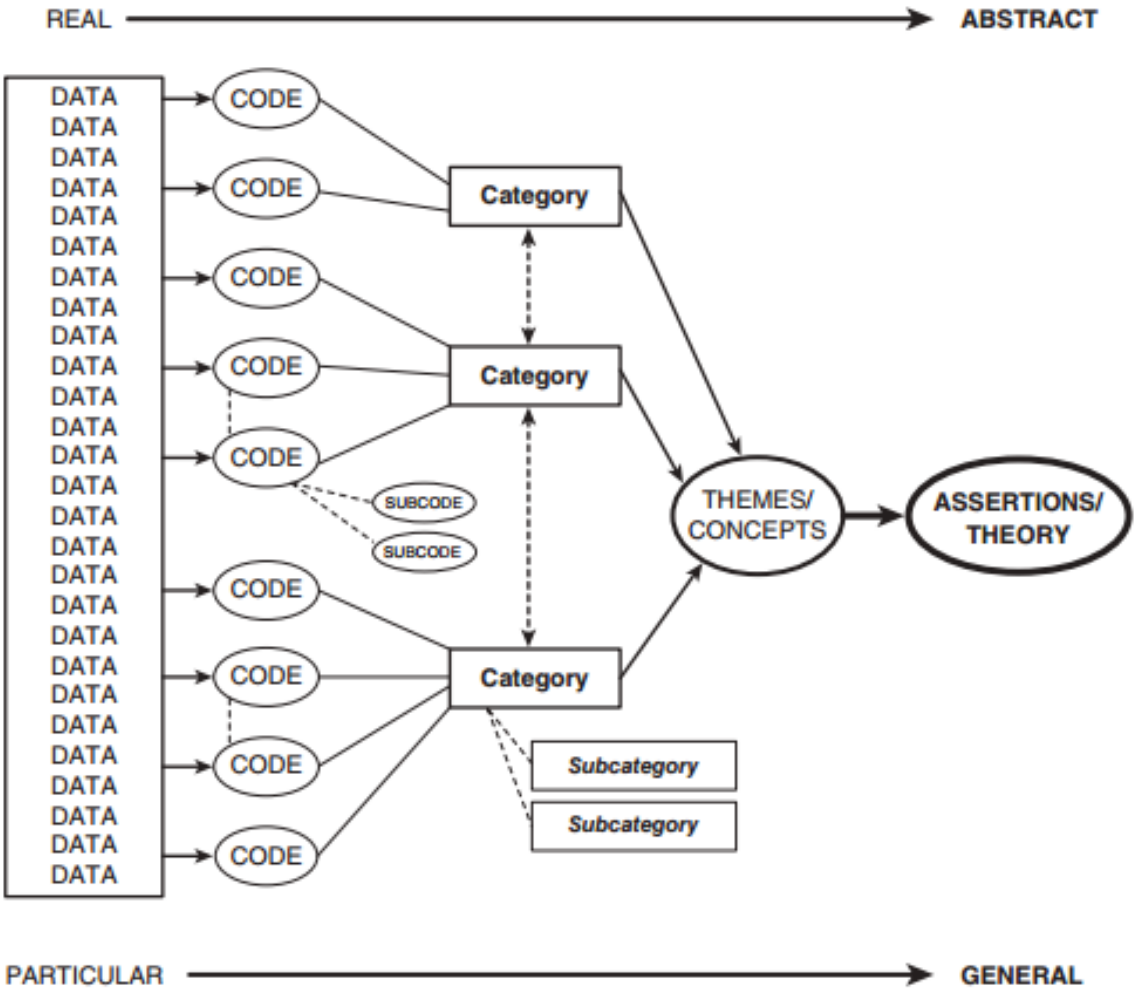

Figure 6: A streamlined codes-to-theory model for qualitative inquiry

Source: Saldaña, 2016, p.14

3 Literature review

This chapter establishes the focal points of the research in order to paint its background. Firstly, the key themes, mechanisms and processes that constitute the practice of RE are introduced and described. Looking at the fundamental role of requirements in software development, and why it can be tricky to gather them, provides a foundation for understanding the topical relevance of this master's thesis. Then, looking at the pain points of RE practice demonstrates the thesis' practical relevance. Finally, the concept of NC is introduced, along with its multitude of facets, represented through theoretical frameworks such as the six Hofstede culture dimensions. The insights gathered in this section of the thesis are essential components in constructing a means to tackle the RQs posed in Section 1.3. The literature in this section was mainly sourced from the FHV library, including the journal databases it gives access to, as well as open research portals such as Semantic Scholar and Google Scholar. To find relevant literature, common research methods and techniques like keywords and laddering[3] were employed.

3.1 Requirements – their role, importance and extraction

To be able to introduce the main object of study in this thesis – RE – some context is needed. Section 3.1 is dedicated to requirements, as they are the centrepiece of this paper; and any talk about RE risks not being sufficiently objective if such key discussion elements and their environment are not clearly defined. Environment in this case refers to the scope of use – the software and services industries, as opposed to e.g. manufacturing or production.

3.1.1 Requirements as a foundation for software development

When conceptualizing a new product, system, service, or solution in general, the first questions that naturally come to mind are along the lines of "what does [X] need to do?", "what is the purpose of [X]?" or from another perspective – "what do we need?". Every solution serves at least one specific purpose and has to conform to any number of criteria, standards and needs. Making sure all this is considered and (properly) recorded is vital for the solution's chances of success (Paul & Cadle, 2020**;** Young, 2004). This is where requirements come in – they are the unit of measure when accounting for needs and conditions that the product must fulfil.

Definition

A single universal definition of requirement as a term is difficult to compile due its use in many different industries. With the scope of this paper already having been outlined, however, a couple of useful definitions can be established:

The field of business analysis considers a requirement to be a feature, condition, or capability that the product, system, or service needs to provide in order to satisfy a formal agreement (Paul & Cadle, 2020, p.243**;** International Institute of Business Analysis (IIBA), 2015, p.15; Project Management Institute (PMI), 2015, p.5)**.** IIBA's BABOK® (Business Analysis Body Of

[3] In this case, laddering is used to refer to the use of a book or article's sources as further leads

Knowledge, v3, 2015) further adds the insight that requirements point in the direction of where value should be sought.

Similarly, in software engineering, a requirement is described as:

> *"A condition or capability (1) needed by a user to solve a problem or achieve an objective [and/or] (2) that must be met or possessed by a system or system component to satisfy a contract, standard, specification or other formally imposed document" (IEEE, 1990, p.62)*

Most simply put, requirements show what functionality is needed to satisfy stakeholder needs.

Requirements are in their nature an intersection and common point of interest for all stakeholders in a project (Wiegers & Beatty, 2013). Requirements serve as both a foundation and a guideline for software development (Young, 2004**;** Wiegers & Beatty, 2013), as well as business analysis (Paul & Cadle, 2020**;** PMI, 2015), among other fields. With this in mind, it's easy to understand the importance of requirements and of being careful how they are identified and documented.

3.1.2 Types of requirements

With the essence and principle of the requirement concept having been laid out, it should be noted that clear distinction must be made between different forms of requirements. This is so the elicitor tasked with extracting requirements information can understand what exactly is sought, what the requirement's context is, and who should be approached for this kind of information. Categorizing the requirements also helps the elicitor to check them for completeness and later validate them as a group (Paul & Cadle, 2020**;** Young, 2004; Wiegers & Beatty, 2013).

Categorization of requirements is not straightforward, however. Here, the point of view must be considered. For example, Table 1 shows the types of requirements from the business analysis perspective, alongside the software engineering perspective. It appears that there generally is a common understanding of how types of requirements are different in nature, and a relative consensus between business and IT in this regard. The only major contrast in how the two factions group requirements comes from the focus on the technical aspect of solutions in systems software engineering, which is to be expected.

Category	Description	Business Analysis	Software Engineering
Business Requirement	High-level needs/objectives/issues/opportunities of the customer or organization	**X**	**X**
Business Rule	A defining or constraining policy/guideline/standard/regulation that is the origin of software requirements		**X**
Stakeholder/User Requirement	The needs of stakeholders or stakeholder groups; a prerequisite for business requirements	**X**	**X**
Solution Requirement – Functional	The behavior or capability of a product/solution under specific conditions	**X**	**X**

Solution Requirement – Nonfunctional Table 1: Types of requirements	Environmental conditions, under which the product/solution must remain effective. Properties/characteristics it must exhibit, or constraints it must respect	**x**	**x**
Transition Requirement	Temporary capabilities needed to transition from one state to another state – e.g., training and data conversion	**x**	
System Requirement	A top-level requirement for a product that contains multiple subsystems, which could be all software or software and hardware		**x**
Feature	One or more logically related system capabilities that provide value to a user and are described by a set of functional requirements		**x**
Constraint	A restriction that is imposed on the choices available to the developer for the design and construction of a product		**x**

Table 1: Types of requirements

Sources: Paul & Cadle, 2020; Ingeno, 2018; IIBA, 2015; PMI, 2015**;** Young, 2004**;** Wiegers & Beatty, 2013

3.1.3 Obtaining the requirements

Understanding the nature of requirements and how to categorize them is useful, but the next logical question would likely be where exactly to get them from. The sources for requirements are clients, stakeholders or any other parties that are relevant to the project or business. Requirements are acquired through a process, which includes what some experts call gathering (Podeswa, 2010**;** Young, 2004). Others, meanwhile, are careful to warn that this is only partially correct: gathering seems to imply that requirements are already present and formulated in the minds of stakeholders, and that obtaining it is just a matter of asking or negotiating. In reality, one cannot and should not expect stakeholders to have requirements ready. What they do usually have is wants and needs – and even those they sometimes find difficult to clearly express (Paul & Cadle, 2020**;** Ingeno, 2018; PMI, 2015**;** Wiegers & Beatty, 2013). The holistic term for the process of obtaining requirements information from stakeholders is (requirements) elicitation. The use of the word elicitation illustrates the investigative nature of this information-seeking process. Requirements must often be uncovered, extracted, or even deduced from the person or group, and this is a proactive, creative and cooperative process.

3.1.4 Managing the requirements

Uncertainty and change are characteristic of the reality of modern business. As the global business environment shifts and develops, with market conditions and regulations changing, business needs are consequently evolving (Paul & Cadle, 2020; Wiegers & Beatty, 2013). Since requirements are closely linked to business needs, they also undergo changes. This is sometimes referred to as requirements volatility (Young, 2004**;** Wiegers & Beatty, 2013), but in general it is considered part of the broader change management process (Paul & Cadle, 2020; PMI, 2015**;** Young, 2004**;** Wiegers & Beatty, 2013). When it comes to requirements, the actions to keep them well-documented, cohesive, and current are collectively called

requirements management. While change does not imply trouble, such is likely to follow the project if changes are not being properly tracked, aligned, and accounted for. In a 2014 report, PMI (2015, p.2) revealed that “poor requirements management practices are the second leading cause of project failure”.

The exact components of a requirements management process vary between industries, project structures and the context of the solution being studied or developed. With that said, enough similarities exist on a higher level for an example structure to be shown for demonstrative purposes; the whole process will not be discussed in detail, as it would exceed the scope of the current thesis. Figure 7 below represents such a requirements management structure. It displays what Wiegers & Beatty (2013) perceive to be the essential requirements management activities in software development, organized in four main groups.

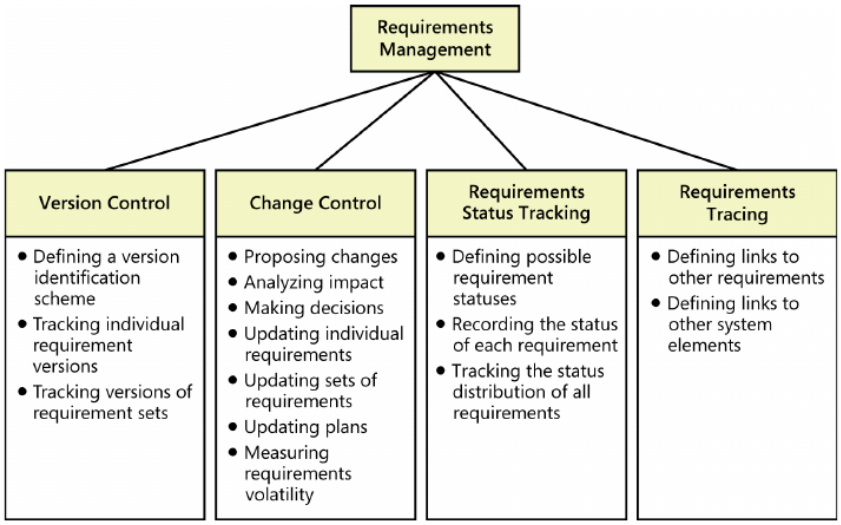

Figure 7: Core activities of requirements management

Source: Wiegers & Beatty, 2013, p.458

The maintenance of requirements could, of course, be carried out manually on text or spreadsheet files. However, as with many other processes, specialized software exists that is integrated with other functionalities like document generation, modeling, versioning, etc. (IIBA, 2015; PMI, 2015). Furthermore, proper requirements maintenance and traceability is indispensable as a foundation for RE activities.

In terms of the context, in which requirements activities are carried out, the existence of several different methodologies for software development should be noted. These describe the “life cycle” of the software system being developed (Neill & Laplante, 2003, p.42; Saeedi & Visvizi, 2021, p.3) and are sometimes referred to simply as “approaches” to software development (Petersen & Wohlin, 2010, p.1). These methodologies also guide the way requirements are managed and used, but for RE interactions (elicitor-source) they do not carry much significance. For instance, the choice of methodology could govern how often requirements are gathered, as well as from whom they are gathered, but does not affect the end goal of a RE session. This is why just the two leading software development methodologies will be given a mention here, for the sake of objectivity and contextualization.

The Waterfall methodology is characteristic with its focus on fully completing each step of the development process, before continuing to the next one (Ingeno, 2018, p.30). This is shown below in Figure 8. Consequently, Waterfall is described as a “linear” and “plan-driven” approach. One of its few notable strengths is its effectiveness when coordinating work on a big project between multiple teams. Overall, however, this methodology can only shine “in all those (rare) cases when all functional and non-functional requirements are clear, well-understood, and predictable”. (Saeedi & Visvizi, 2021, p.3).

Agile, on the other hand, is the more commonly used methodology nowadays – probably (as its name suggests) due to its flexibility, among other things. This flexibility comes from the incremental nature of the development life cycle. Like Waterfall, Agile also means working in steps. However, the Agile dynamic is completely different. The software is built in stages, with each stage being evaluated based on immediate feedback, so that adjustments can be made. Each stage is an iteration of the cycle (Figure 8), where further requirements are being addressed and can be tested (Ingeno, 2018, pp.32-34, Saeedi & Visvizi, 2021, pp.3-4).

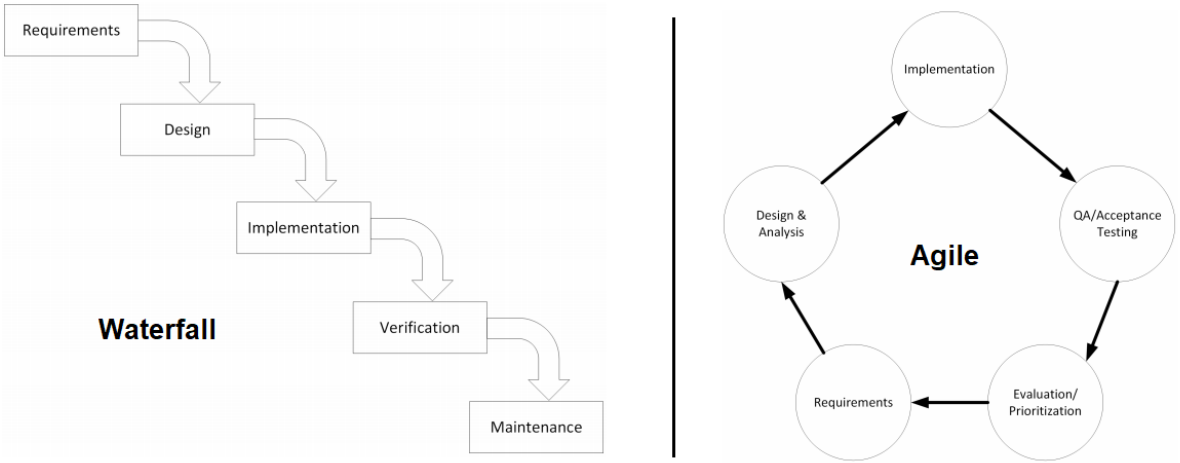

Figure 8: Waterfall vs. Agile development methodologies

Source: Ingeno, 2018, pp.30-34

3.2 Requirements elicitation

Next, it’s time to discuss the issue at hand. To reiterate what it means to elicit requirements, it has to do with obtaining key insights about what functionality exactly is expected to be achieved – in this case, by the software solution. These insights have to be arrived at by extracting information that resides elsewhere (externally to you). Most often, that information is contained within individuals or groups of people. These could be executives in the company, external clients, customers or users, or any people in-between who could be called stakeholders. In this paper, all these are collectively referred to as requirements sources.

On the outside, the notion of getting information by meeting and talking with requirements sources may sound like a simple and straightforward process. The challenge, however, does not lie with getting the information. It lies with getting comprehensive, useful and productive information. As was already established, many of the problems linked with requirements materialize only after the production stage has started. This is why RE efforts should be kept

in focus. Some organizations use “iterative requirements process” to do this – it allows the product team to stay on top of changes as requirements are updated (Robertson & Robertson, 2013, Chapter 14).

3.2.1 Importance of the requirements elicitation process

> *“One of the keys to building software successfully is proper requirements engineering, including knowing how to effectively elicit requirements from stakeholders. Knowing the requirements for the software is crucial to designing an appropriate solution.” (Ingeno, 2018, p.75)*

The process of RE revolves around extracting requirements information from stakeholders, users, domain experts or other sources, including documents. The information extracted typically serves to enable and facilitate one of two, or even both:

- development or upgrade of a product, system, service, or other functional piece of IT;
- identifying a business problem or reasons to approach a business opportunity;

In this way, the results from RE constitute the main input for business analysis and software development work (Ingeno, 2018; IIBA, 2015; PMI, 2015**;** Wiegers & Beatty, 2013). This fact, in itself, already indicates the importance of carrying out proper requirements elicitation and management – both from a business and from an IT perspective. Indeed, empirical findings support this notion:

1) “Various studies suggest that errors introduced during requirements activities account for 40 to 50 percent of all defects found in a software product” (Davis, 2005, as cited in Wiegers & Beatty, 2013, p.4);
2) PMI cited an own 2014 study, which revealed that “’Inaccurate requirements gathering’ was reported by 37% of organizations as a primary cause of project failure.“ (PMI, 2015, p.2)
3) The 2013 (Fernández & Wagner, 2013, p.6), the 2014/2015 (Kalinowski et al., 2016, pp.10-11), 2014/2015 (Wagner et al., 2017, p.2314) surveys of NaPiRE[4] conducted in Germany (2013), in Austria and Brazil (2014/2015), and in 10 different countries across 3 continents (2014/2015), respectively, highlighted “incomplete and/or hidden requirements” as the most critical requirements engineering problem;
4) A study by Sethia & Pillai (2014), yet again from 2014, found causality where RE issues negatively impact project performance;

3.2.2 A systematic and methodical approach

As previously mentioned, the RE process is more than just collecting requirements by talking with a relevant party. It also includes cataloguing, analyzing, and consolidating the project’s requirements. Furthermore, it’s a proactive and collaborative process that includes helping the stakeholder clearly define their needs, or the problem or opportunity they perceive. For

[4] Naming the Pain in Requirements Engineering (NaPiRE) project: http://www.re-survey.org/#/home (Accessed on 12.08.2021)

example, they might be aware there is a problem, but still not know its nature; or they might be passionate about a feature they need implemented, but not able to word it properly for use as a requirement (Cadle et al., 2014; PMI, 2015). To address this, Blais (2011, pp.69-70) and later Robertson & Robertson (2013, Chapter 5) invite us to think of the elicitation process not as requirements extraction, but rather as information collection. In this way, Blais and Robertson & Robertson liken it to investigative work. The information gathered, they argue, can then be analyzed, and distilled so that requirements and their interrelationships emerge. In this way additional, auxiliary information, which is relevant can be uncovered, that could otherwise with precisely targeted questions be unreachable.

While there are different angles to approaching the challenge of eliciting requirements, there is a principle that seems to stand out – optimal results call for a systematic and methodical approach to elicitation and analysis (Robertson & Robertson, 2013, pp.7,68). One of the signs pointing to this is the investigative methodology that was just discussed. The verb investigate in itself implies a systematic approach[5]. Another sign is the iterative nature of the RE process, and requirements engineering in general. Elicitation is not a phase, but rather an ongoing initiative (Paul & Cadle, 2020; IIBA, 2015; Wiegers & Beatty, 2013). In the course of elicitation and analysis, additional questions could be raised and rifts in knowledge could appear. This information gap needs to be closed through further elicitation sessions. The iterative nature of the RE process is visible from Figure 9. This is proposed by Wiegers & Beatty (2013), who portray the process as cyclical, and consisting of elicitation, analysis and specification.

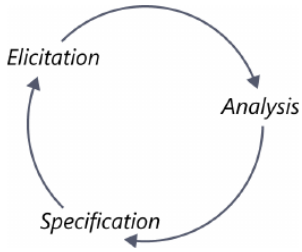

Figure 9: The cyclic nature of requirements elicitation, analysis, and specification

Source: Wiegers & Beatty, 2013, p.120

Finally, the way RE activities are planned is a testament to their systematic and methodical approach. Blais (2011), PMI (2015) and Young (2004), for instance, propose the creation of an elicitation plan, which aims to help the analyst (a) develop a vision for what exactly they want to get in terms of information, (b) choose proper elicitation techniques depending on the circumstances, and (c) give structure to their elicitation efforts. As another example, Wiegers & Beatty (2013) propose a structured plan for each elicitation endeavor that includes both its input and output – see Figure 10.

[5] Investigate definition by Merriam-Webster: https://www.merriam-webster.com/dictionary/investigate

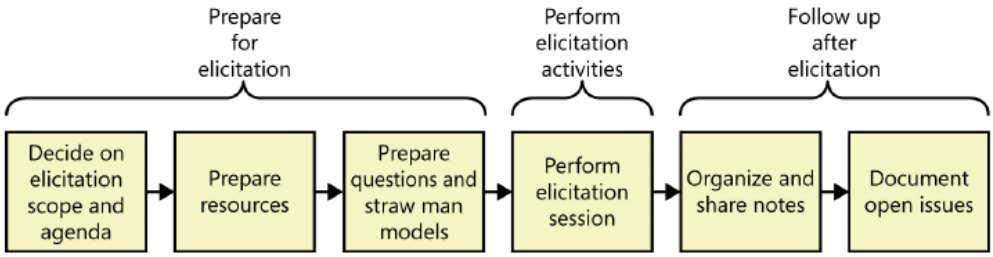

Figure 10: Activities for a single requirements elicitation session

Source: Wiegers & Beatty, 2013, p.120

Milošević & Martinelli (2015, p.85), meanwhile, give a very good example of what a (requirements) elicitation plan could specifically look like. Such a plan, they argue, is of utmost importance for the success of requirements gathering efforts for any particular project. It helps give an overview of planned activities, contact people and suitable elicitation methods. In this way, it makes it easier to avoid missing something important. It also offers incrased visibility and traceability, and facilitates task coordination. This example elicitation plan is shown in Figure 11. Of course, depending on the project, the level of detail in such a plan will vary.

PROJECT ELICITATION PLAN

Project Name: Highlands **Rev #:** 1.0 **Date:** 22 April 2016

REQUIREMENTS AUTHORS & KEY CONTRIBUTORS

Primary Authors: Simon B., Phillip C., Christine H.

Key Contributors: Carry M., Nesli S., Carl W.

INTRODUCTION

Problem Statement:

ELICITATION STRATEGY & PROCESS

Strategy and Process: *Group interviews with three key customers, followed by series of prototype reviews, and a direct observation of end users at five sites*

LIST OF STAKEHOLDERS

Stakeholder's Name	Current Role	Elicitation Technique	Desired Outcome
Jim Johnson	Medical Provider	Group Interview	Feedback on key features

SCHEDULE & RESOURCES

Item	Estimated Schedule	Resources	Range of Uncertainty
Group Interviews	5 weeks	Jim, Sury, Pat	+2 weeks

ASSUMPTIONS & RISKS

Risk	Magnitude of Risk	Likelihood	Mitigation Plan
Stakeholder Schedules	High	High	Add 2 week buffer

Figure 11: Simplified elicitation plan template

Source: Milošević & Martinelli, 2015, p.85

It is evident that the sorting and categorizing of elicited information in a systematic way and its careful analysis is no less important than the information extraction efforts themselves. Both require a rigorous and organized approach in order to be as effective as possible.

3.2.3 Requirements elicitation in practice

To briefly recap what the main mission and purpose of RE is: investigating, identifying, and understanding stakeholders' and users' needs. Those tasked with eliciting requirements have a variety of tools and techniques available to them to do this.

Before the time comes to pick techniques, however, a lot of preparation work should have already been done. This includes (but is not limited to): reviewing information and documentation relevant to the project, determining what the desired outcome/output is, what the scope of the elicitation project is, and determining which stakeholders should be engaged (Blais, 2011; IIBA, 2015; PMI, 2015; Young, 2004). This is done as part of an elicitation plan, like those discussed in the previous subsection. For software development projects in particular, requirement analysts may also find Young's "project requirements plan" (2004, p.63) useful, as it integrates both requirements acquisition and management in 28 steps.

3.2.3.1 Elicitation methods and techniques

The large number and wide variety of methods and techniques for RE makes it impractical to elaborate on each individual one, considering the scope of this paper. Instead, for the purposes of the current literature review, only the most prominent ones will be listed. As part of the preliminary literature research, a search was conducted in the FHV online library portal (including partnering databases) using the keywords <"requirements elicitation" + method + technique> that produced a total of 264 results. Following the platform's sorting logic (relevance), the top 50 papers were shortlisted for review. Out of those, 11 were hand-picked that most fully describe, compare, or provide empirical data on the use of RE methods and techniques. Overall, over 40 different such methods and techniques were listed. Such a sample is admittedly small and by no means exhaustive, but the purpose is to give the reader an idea and indication of what is being used in practice, and not to prove any fundamental principles. Considering the topic, scope and time budget of this paper, the author views this sample and resulting list as sufficient for demonstrative purposes.

Individual methods of conducting RE, as well as techniques which complement them are listed below. These are ordered by prominence and frequency of reference:

1) **Interviews** (mentioned in 10 of 11 sources)

   The most common and straightforward way to produce requirements. An interview is usually a one-on-one session with the requirements source (e.g. stakeholder or client), in which questions are asked in either a structured or unstructured fashion. Those questions could be planned, or improvised, or both. The purpose of the questions is to disclose needs, detect problems or identify opportunities. Some advantages that interviews bring are that they allow for the extraction of confidential or sensitive information (that cannot be shared in a group setting), as well as allowing for a deeper dive into a more detailed look at a point of interest. In addition, interviews can facilitate relationship building, which in some cases can bring many benefits to both sides and allow for a smoother information transfer. Notable disadvantages of using this technique could be that it can get costly and time-consuming; also, at the end of the day what is being collected is an opinion, so it should be taken with a grain of salt (Paul

& Cadle, 2020; Carrizo et al., 2014; IIBA, 2015; Pacheco et al., 2018; Palomares et al., 2021; PMI, 2015; Rueda et al., 2020; Sharma & Pandey, 2013; Todoran et al., 2013; Wiegers & Beatty, 2013).

2) **Prototyping** – technique used within the RE session (mentioned in 9 of 11 sources)

   Often times business users are not clear about their wants and needs, or struggle to define them. To make matters worse, in many cases the issue is as trivial as the users not knowing what the scope and/or technical possibilities are for their desired solution. To address this problem, a strongly interactive technique is used called prototyping. It involves creating either a mockup of the final product in terms of how exactly it functions (using pen and paper or other drawing tools) or developing an actual prototype – a simulation of the final product that the user can manipulate. This helps the user gain understanding about the potential of the product or solution and therefore boosts the speed and efficiency of ongoing RE efforts. It also helps the analyst directly, by helping ascertain if the requirements collected thus far are correct/complete (Paul & Cadle, 2020; Carrizo et al., 2014; Fernández & Wagner, 2013; IIBA, 2015; Pacheco et al., 2018; PMI, 2015; Rueda et al., 2020; Sharma & Pandey, 2013; Todoran et al., 2013).

3) **Workshops** (mentioned in 8 of 11 sources)

   Another interactive technique often applied are workshops. They are organized gatherings of key stakeholders/users that promote collaboration and building of trust. It is a great way to save a lot of project time by bringing multiple sources of requirements together and establishing the baseline solution specifications. Additional benefits of using this approach include on-the spot resolution of any disagreements between the key figures and stimulating cross-functional collaboration and obtaining project buy-in. Furthermore, such workshops could be used to cross-check sets of requirements to make certain they will be properly documented. This method does not lack weaknesses, however. In some contexts, it might not be effective, efficient or at all viable. It also could be a costly endeavor, when considering the number of participants and their time commitment (Paul & Cadle, 2020; Carrizo et al., 2014; Fernández & Wagner, 2013; IIBA, 2015; Pacheco et al., 2018; Palomares et al., 2021; PMI, 2015; Wiegers & Beatty, 2013).

4) **Questionnaires and surveys** (mentioned in 7 of 11 sources)

   They are the method of choice when needing to gather information from a large group of people in a short time span. This way the costs are also kept low. It should come as no surprise that this focus on quantity of data often takes away from its quality and richness. There is no way to ask for clarification or elaboration on any of the survey's answers. With every answer received, the analyst risks obtaining information that is either unclear, incomplete, or useless altogether. The inquiry, therefore, must be very carefully put together, and its questions must be very clear and unambiguous. Unfortunately, whatever efforts are put in, there is also the risk that not enough of those invited would actually respond for objective conclusions to be drawn. Still, it could be argued that value is surely created by sending such an inquiry – provided such can be prepared adequately, and in a time- and cost-efficient way. For instance, the

information gained could be used (when analyzed) to help prepare further, more specifically targeted elicitation activities, now that it's clear based on the survey who has what kind of information (Paul & Cadle, 2020**;** Carrizo et al., 2014; IIBA, 2015; PMI, 2015; Sharma & Pandey, 2013; Todoran et al., 2013; Wiegers & Beatty, 2013).

5) **Document analysis** (mentioned in 6 of 11 sources)

This technique involves the least client interaction. It concerns all the work in requirements-related information extraction via reading and analyzing written documentation and materials. The goal is for the analyst to build up insight into what sort of environment would elicitation take place in, what are the key variables, constraints, etc. Information that would typically be sought after includes (but is not limited to) business structure and processes, business/market environment, relevant regulations, charts and diagrams, user manuals. Document analysis could and should be used iteratively throughout the whole requirements elicitation process, as documentation is a valuable information source. With that said, great value could be generated by using this method at the very start, before starting to schedule sessions with stakeholders. The factual and (hopefully) elaborately described information that written records contain helps the analyst build a solid foundation and framework, on which to catalog all requirements. The biggest risks associated with relying on this technique are that some or all of the needed documentation may not exist or might be out of date; caution is therefore advised (Paul & Cadle, 2020; IIBA, 2015; PMI, 2015; Sharma & Pandey, 2013; Todoran et al., 2013; Wiegers & Beatty, 2013).

6) **Brainstorming** – technique used within the RE session (mentioned in 6 of 11 sources)

The brainstorming technique is focused around stimulating creativity. It aims to gather as many new and creative ideas as possible, from hopefully a diverse group. It's conducted by grouping stakeholders together and having everyone think on a specific topic, issue or item and share their ideas in turns. Two important rules in conducting such sessions are to 1) wait until everyone has had their say before elaborating on or evaluating any of the generated ideas and 2) carefully moderate the forum, so that everyone's voice is heard and nobody steals the spotlight. After all ideas and solutions are listed in full view, they can be analyzed and collated. A notable advantage of this approach is that there's constant information feedback between participants, which catalyzes the thought process responsible for idea generation and evaluation. A requirements list could be extracted from this method, but such would probably be preliminary and require further, more specific input (Paul & Cadle, 2020; Carrizo et al., 2014; IIBA, 2015; Pacheco et al., 2018; PMI, 2015).

7) **Observation** (mentioned in 5 of 11 sources)

As the name suggests, this technique involves watching the work process directly – in the subjects' own work environment. In this way, the analyst can gain a better understanding of the work process, as well as fill information gaps that were left during elicitation. Additionally, inspecting the workflow first-hand helps piece together everything learned so far, and make sense of the task being performed. This technique is especially useful when dealing with complex processes and workflows. It has been shown that experts, when asked to describe their work sequence, tend to inadvertently

omit information, simply because for them a large part of that work sequence may have become routine, and conscious effort is not spent on minor actions. Collecting objective and candid information through observation helps spot problems and opportunities, and also helps formulate precisely targeted requirements questions that can then be used in individual interviews (Paul & Cadle, 2020; Carrizo et al., 2014; IIBA, 2015; PMI, 2015; Wiegers & Beatty, 2013).

From a requirements engineering perspective, Young (2004) listed the following RE methods and techniques as most effective: “Interviews; Document analysis; Brainstorming; Requirements workshops (a modern day version of JAD); Prototyping; Use cases (when used correctly); Storyboards; Interfaces analysis; Modeling; Performance and capacity analysis; Scenarios” (p.96). This seems to corroborate the aforementioned results.

Meanwhile, in the most recent paper on the subject of RE, Palomares et al. (2021) offer a convenient way to give a categorical overview of what kinds of elicitation techniques are being used in practice. Listed in order of popularity/frequency of use these are: (a) group interaction, (b) individual participation, (c) reading-based, (d) market research and (e) other.

3.2.3.2 Method suitability and application

A natural question that might arise is how to determine which method(s) and technique(s) would be most suitable for a specific work need?

There are countless unique combinations of circumstances that precede any given elicitation project, due to the fact that nowadays it might be part of almost any industry. Recommending universal techniques that should always be used, or specific techniques for particular situations would, therefore, risk being inaccurate or even counterproductive. Nevertheless, each technique has its strengths and weaknesses relative to the circumstances, in which it is applied; some techniques can and will often be more appropriate than others. For instance, IIBA (2015) and Wiegers & Beatty (2013) reveal that in the elicitation phase, normally more than one technique is used. This is also reflected in the results of Palomares et al.'s (2021) study into the state-of-practice in RE.

A number of papers focus on elicitation techniques in particular – be it their categorization, frequency of use, applicability, efficacy, etc. As most notable and fitting within the scope of the current thesis, there are a few that must be mentioned:

Carrizo et al. (2014) argue that open interviews have become a highly overrated and overused method for software requirements gathering, which negatively impacts systems development. They offer a framework for selecting the most adequate elicitation technique(s) based on predefined contextual factors. This framework they built on established theory and empirical observations, while pursuing a strictly systematic approach.

Rueda et al. (2020), on the other hand, maintain that RE methods have not yet been sufficiently scrutinized in terms of their efficacy, so that reliable technique selection models can be used in software development. Instead, they conducted an elaborate series of experiments with 167 participants, where three RE methods were compared – unstructured interviews, joint application design (JAD) and paper prototyping. Their study was successful

in that it highlighted how these techniques contrast, for which situations and contexts each would be suitable, and how they can complement each other.

Finally, in their book Cadle et al. (2014, p.97) offer a comparison of RE technique suitability from the perspective of which (software) development methodology is used – waterfall or agile. This comparison is shown in Figure 12.

Investigation technique	Understanding the situation	Waterfall requirements elicitation	Agile requirements elicitation
Interview	Y*	Y*	Y*
Observation	Y*	Y*	Y
Shadowing	Y*	Y*	Y
Workshop	Y*	Y*	Y*
Hothousing	Y	N	Y*
Scenario analysis	Y	Y*	Y*
Prototyping	Y	Y*	Y*
Questionnaires	Y*	Y*	N
Special purpose records	Y*	Y*	N
Activity sampling	Y*	Y*	N
Document analysis	Y*	Y*	N

Key: Y* = very suitable
Y = suitable
N = not suitable

Figure 12: Suitability of RE techniques according to development methodology

Source: Cadle et al., 2014, p.97

The specialists charged with eliciting requirements can have various job titles (e.g. product owner, project manager), but as a defined role in the organization they are known as business analyst, requirements analyst or requirements engineer (Blais, 2011; IIBA, 2015; PMI, 2015; Young, 2004; Wiegers & Beatty, 2013). As it is becoming more and more clear to organizations just how crucial proper requirements work is, the need for skilled professionals increases. An individual that excels at both communication and analysis work, is methodical but also creative, has the needed business knowledge and IT affinity, can be a valuable asset to the requirements engineering efforts of any project team. Blais (2011, pp.45-48) and Wiegers & Beatty (2013, pp.61-67) demonstrate this through going in-depth into documenting what sort of roles and tasks the business or requirements analyst can be expected to perform.

3.2.4 Issues, challenges and obstacles faced by the field

The search for relevant literature found a number of papers that either focus on, cite, or mention specific ICO that the RE practice faces, as well as some challenges to overcoming these ICO. To list every ICO that was documented to take place, however, would lead this discussion beyond the scope of this thesis and into the wider field of requirements engineering. It would also not be possible within the limited timeframe allotted for this research. Therefore, only selected ICO were mentioned that were often encountered, and that are directly linked to RE efforts. For the sake of clarity, these are categorized and summarized.

Communication-themed ICO seem by far the most prevalent. This is reflected in Coughlan et al.'s (2003) paper, which studies the experiences of those involved in elicitation activities and concludes that communication ICO lie at the heart of many RE problems. More precisely, these were found to originate from the way knowledge is distributed and exchanged, from how elicitor and requirements source interact, and from how activities are planned by the elicitor.

Similarly, Davey & Parker (2015) cite over a dozen studies, conducted from 1996 to 2007, which found that human limitations can negatively affect consultant-client communication. Here is an outline of what Davey & Parker have found: i) humans' cognitive limitations can inhibit communication completeness; ii) people of different backgrounds or cultures find it more difficult to understand each other and find a common language; iii) the inherent ambiguity of some words and phrases used can cause confusion or emit false information; iv) the amount of information presented can be too much to process.

Raatikainen et al. (2011) report in their study of RE practices in the nuclear industry, that the communication problems encountered during RE had to do with the differences in background with stakeholders, as well as inter-company correspondence.

Similarly, Bjarnason et al. (2011) found in their publication that communication gaps between requirements elicitors and stakeholders may lead to failure in capturing vital requirements. These gaps have been found to be mainly caused by "scale, common views, temporal aspects and decision structures". Scale here refers to product complexity and a large organization size. Common views refers to an insufficient mutual understanding of roles. Temporal aspect refers to "gaps between roles over time". Decision structures refers to a "weak vision of [the] overall goal" (pp.43-45).

From another perspective, Blais (2011) points out that business stakeholders tend to have difficulties expressing what they want due to their disconnect with the operational jargon, technological business units and their members, or even the extent of the company's technological capabilities as a whole (pp.200-204). On the flipside, Paul & Cadle (2020, pp.265-266) warn that tacit knowledge is often subconsciously filtered out of elicitation sessions, which causes problems, confusion, and incorrect/incomplete requirements. Tacit knowledge is used to describe the unspoken know-how that the stakeholder has within but does not consciously realize it must be shared so as to avoid misunderstanding. This tacit know-how usually comprises the person's skills, experience, organization knowledge and backstory (Ferrari et al., 2016). Ferrari et al. (2016) warn that ambiguity is often identified as a major barrier to knowledge transfer in RE. In their paper, however, as they analyze its role in RE further, they reach the conclusion that ambiguity can actually be beneficial to RE, as it plays a big part in uncovering tacit knowledge. They also named unclarity and multiple understanding, among others, as phenomena that are considered manifestations of ambiguity. Indeed, this corresponds with the findings of Fernández & Wagner (2013), Kalinowski et al. (2016) and Wagner et al. (2017), who show in their study that "incomplete and/or hidden requirements" and "underspecified requirements that are too abstract and allow for various interpretations" are among the biggest obstacles to effective RE.

These more recent empirical findings reaffirm the persistence of communication flaws in RE activities. A multitude of different surveys were conducted within the NaPiRE initiative – one in Germany in 2013 (Fernández & Wagner, 2013), one in Austria and Brazil in 2014/2015

(Kalinowski et al., 2016), and one in 2014/2015 in 10 different countries across 3 continents (Wagner et al., 2017). These inquiries uncovered, among all else, that communication flaws exist between the project team and the client, as well as within the project team itself. These two issues ranked among the top five in the countries surveyed.

Also in 2015, Hiisilä et al. (2015) found that difficulties exist (a) for stakeholders and suppliers to arrive at a common understanding, as well as (b) among the stakeholders themselves, to agree on the final needs of the system.

Some obstacles to RE could originate from the individual (stakeholder) or organization. Stakeholders or users: (a) don't know what they want, or what's possible (Blais, 2011, pp.200-201)**;** Laporti et al., 2009); (b) don't want to cooperate in the early RE phases (Hiisilä et al., 2015); (c) lack product knowledge (Liebel et al., 2018); or (d) hidden agendas exist that hinder RE efforts (Blais, 2011, pp.200-201).

ICO also exist on the project level. Examples are: (a) the scoping and planning of the project (Hiisilä et al., 2015); (b) there is insufficient time allotted (Fernández & Wagner, 2013; Wagner et al., 2017; Kalinowski et al., 2016); (c) insufficient resources are invested into understanding the requirements (Liebel et al., 2018). The issue might stem from requirements themselves too – either they are changing quickly (Wagner et al., 2017; Fernández & Wagner, 2013), or there are undiscovered interdependencies between them (Berntsson Svensson et al., 2012).

All of the listed ICO should not take attention away from the fact that even the elicitor or their team could be hindering the RE process. A good example is inadequate stakeholder analysis (Coughlan et al., 2003, p.530; Blais, 2011, p.114**;** Cadle et al., 2014, p.103).

It is evident that communication flaws are a universal obstacle to the practice of RE and that in many cases it's namely the requirements source that is at the center. However, we should keep in mind that all previosuly discussed findings are sourced from multiple countries and regions. And it is no secret that things are done differently in different geographical regions.

For example, Tuunanen & Kuo (2015) show that NC is a strong influencing factor when assigning importance to specific sets of features or outcomes. Apparently, different (sets of) requirements are given different priority in different cultural settings. This is explained with differences in values between NC groups. Davey & Parker's (2015) paper, referenced earlier, has findings consistent with this – it lists differences in culture and background as a probable cause for inability to find a common language.

Rubino et al. (2020, p.1564) paint an even more compelling picture. They draw on prior academic work to succinctly show that differences in NC impact the behavior of both managers and organizations as a whole. This impact also affects the levels of performance, innovation and technological progress of the organization. It is worth noting how the digitalization of European companies is impacted by NC. These same cultural dimensions are used as an instrument for analysis in the current thesis paper.

3.3 The influence of culture

It's 2022 and the world has been increasingly connected through, and in many ways dependent on, technology such as the Internet and smartphones. Businesses internationalize,

supply chains force international and intercultural cooperation, and the world somehow seems smaller and closer with each passing year. Yet, NC is observed to have a substantial effect on the organizational culture of companies operating within it (Ayub Khan & Smith Law, 2018).

This section offers a glimpse into NC and how, according to literature, it is relevant to international business, and requirements engineering in particular. The aim of this overview is to discover new perspectives, from which RE can be viewed, and its challenges addressed.

The reason culture was approached for this task is due to its dependence on communication – a quality it shares with RE. Culture is also relevant to RE in that globalization and digital transformation have meant more and more international (and eventually intercultural) exchange in elicitation sessions (Alsanoosy et al., 2020). So, whether a multi-national workforce is located in the office, or spread around multiple countries, or it's the company's clients and partners that are foreign to it, culture is bound to play some role. With all of this in mind, it seems worthwhile to probe the literature for particular views of NC, in search of a more meaningful connection to the main topic.

3.3.1 Theoretical overview

A targeted search in several portals found only few pieces of literature that directly links RE to NC. Even if we broaden the scope to include requirements engineering in general, Alsanoosy et al. (2020) signal that there is a shortage of literature on the topic. They maintain that it is a matter worth investigating, and offer "the foundation for a framework that analyses and describes the infuence of national culture on requirements engineering activities" (Alsanoosy et al., 2020, p.356).

The concept of NC itself has been defined in different ways throughout the years. In line with the objectives of this thesis and the scope defined by its RQ, a number of definitions and descriptions of NC as a construct are proposed.

How do scholars arrive at these definitions, and what concepts lie behind them? Next, a few clues are examined. This does not claim by any stretch to be an extensive or comprehensive list. The purpose of the following paragraphs is, rather, to show some of the views of the matter that are somewhat diverse, but also in some ways complementary. In this way, a generalized picture of differing views on culture could be painted.

It is probably reasonable to start with the author from this field that is most often cited[6]. Geert Hofstede defines culture as "the collective programming of the mind that distinguishes the members of one group or category of people from others" (Hofstede, 2011, p.3). According to Hofstede (2011), culture dictates how societies are structured and what is expected of each member of the group. In this way, certain behavioral norms are subconsciously forged, and this has implications for organizations as well. Organizational culture, however, is different, as it is based on conscious processing of an organization's environment (p.3). Hofstede recognizes 6 dimensions of national culture (Figure 13).

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6 https://blogs.lse.ac.uk/impactofsocialsciences/2016/05/12/what-are-the-most-cited-publications-in-the-social-sciences-according-to-google-scholar/ (Accessed on 01.05.2022)

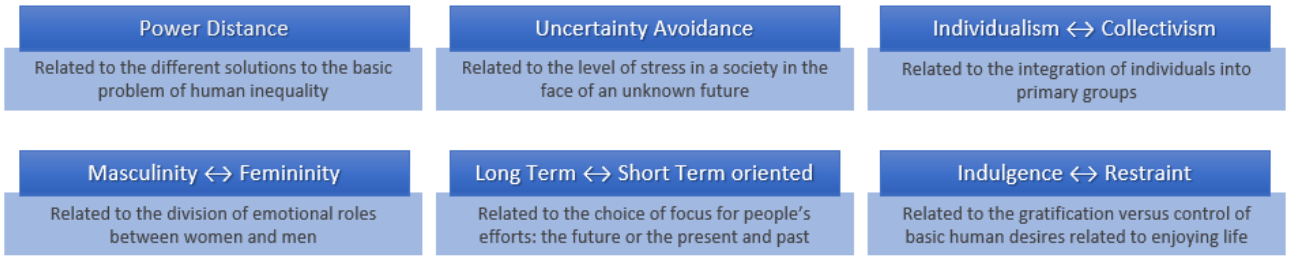

Figure 13: Hofstede's six dimensions of national culture

Source: adapted from Hofstede, 2011, p.8

Similarly, Trompenaars & Hampden-Turner (2011) like to think of culture as a layered and multi-dimensional construct that has both visible (conscious) and invisible (subconscious) manifestations. In this regard they liken it to an onion: there is the outer layer – the physical products of cullture like architecture and infrastructure, and the hidden layer that influenced these visible artifacts – the values and norms that are accepted and automatically assumed by the social group (p.6). Trompenaars & Hampden-Turner also offer in their book something of a definition of culture, or at least an attempt to understand its origins – "culture is the way in which a group of people solves problems and reconciles dilemmas" (p.6). For this definition they draw inspiration from Edgar Schein's 1985 book titled *Organisational Culture and Leadership*. From the solutions that different cultures have found to these common problems, Trompenaars and Hampden-Turner have distilled seven dimensions of (national) culture. These are visible next in Figure 14).

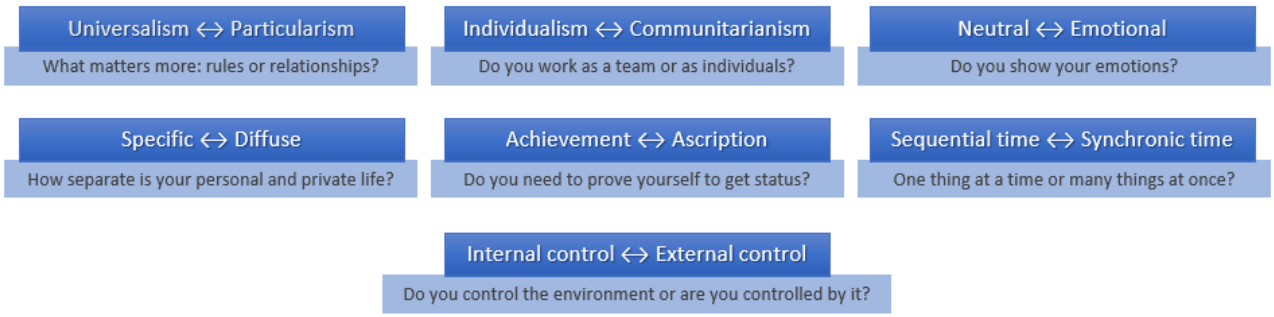

Figure 14: Trompenaars' seven dimensions of national culture

Source: adapted from Trompenaars and Hampden-Turner, 2011

Schein, too, succinctly maps culture in his *Organizational Culture and Leadership* book:

> *Culture in general can be analyzed at several different levels, with the term "level" meaning the degree to which the cultural phenomenon is visible to you as participant or observer. These levels range from the very tangible, overt manifestations that you can see and feel [Artifacts] to the deeply embedded, unconscious, basic assumptions that we are defining as the essence of culture or its DNA. In between these layers are various espoused beliefs, values, norms, and rules of behavior that members of the culture use as a way of depicting the culture to themselves and others.(Schein, [1985]2017, p.28)*

Schein (2017) believes that these levels can not only help make sense of the individual as a cultural entity, but also a larger group as a whole, as well as to understand what drives the

behavior that is observed. In order to achieve this, each of these levels of depth have to be acknowledged and appreciated.

Edward T. Hall is also among the most influential cultural theorists. In fact, if this review sorted its sources chronologically, Hall would have been mentioned first. He has a different view of culture than the others mentioned, describing it as “communication”, as “primarily a system of creating, sending, storing and processing information”. “Communication”, he believes, “underlies everything” and is the key to undestanding human behavior (Hall & Hall, 1990, p.3). Based on these premises, Hall identified and developed three cultural factors (Figure 15).

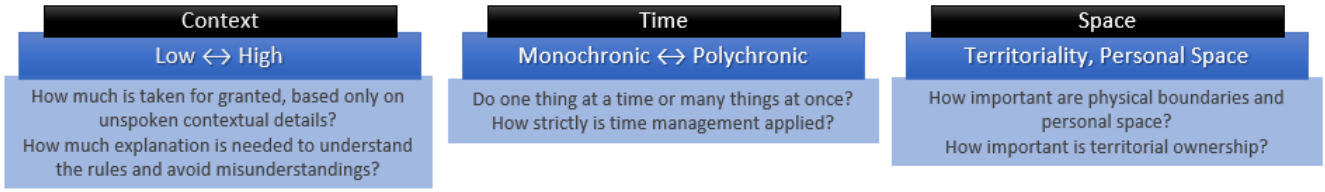

Figure 15: Three cultural factors by Hall

Source: Hall & Hall, 1990

Switching to a different perspective, de Bony (2010) is convinced that socio-political, linguistic, educational and legal context is essential to the study of NC. He criticizes studies that omit or downplay the importance of these contextual details. De Bony identifies three main streams of research into NC and management (p.174):

1) The first maintains that “management has nothing to do with national culture”, because its actors and practices are objective and independent from such influences. Proponents of this view include Tom Peters and Robert H. Waterman, Jr.;

2) The second, labeled cross-cultural studies, takes an etic approach. Countries are measured based on certain dimensions, which assume commonality between different nations and regions, and therefore allow them to be compared. This, according to de Bony, “reflects actors’ attitudes rather than their contexts”. The most notable advocates of cross-cultural studies include George Murdock and Geert Hofstede;

3) The third stream, in contrast, takes an emic approach. “It postulates that a culture is characterized by its uniqueness and consequently, there are no common dimensions and no possible direct comparisons between cultures”. Defendants of this view include Clifford Geertz and Malcolm Chapman;

Evidently, culture is expressed through a multitude of facets like how people react to certain environmental stimuli, how they position themselves within society, their family and their professional group, how they see the past and the future, and how they measure the present. These are just a few examples of way in which people and their societies vary from country to country, and continent to continent. Since these factors are defining for how people act, talk and think, it’s worth considering how it impacts the way they work together.

Since the scope of this thesis is narrowly defined, and the research itself is subject to temporal and resource boundaries, utilizing several different cultural frameworks for qualitative analysis would be at best counterproductive, and at worst unmanageable. Therefore, a theoretial

framework was chosen, which was developed with business and management professionals in mind. More specifically, the next segment explores the effects of NC on management styles and employee values. How do employees and their managers in different cultures view themselves as part of the organization? How do they interact and how much is the past, present and future important to them? Furthermore, it is shown what attitudes in general are observed towards social structures and cooperation mechanisms, and how challenges are viewed and tackled.

3.3.2 Hofstede's dimensions of national cultures

Hofstede's name and his study into national and organizational culture and its manifestations are well-known in management and business research. This is evident from the fact that, with over 40,000 citations, his 1980 book *Culture's Consequences* ranks as one of the most cited in the field (Green, 2016). Both singlehandedly, as well as with other researchers, he has published several impactful works[7]. These build upon previous study and theorization of the various aspects of culture, propose a new framework to explain their effects, and, most recently, offer suggestions on how to apply the theoretical constructs in managerial practice. Hofstede's research mainly deals with the question of how workplace values are influenced by NC.

A good overview of one of his most influential concepts – the six cultural dimensions – can be found in his 2011 article, titled *Dimensionalizing Cultures: The Hofstede Model in Context* (Hofstede, 2011). It (succinctly) summarizes his earlier work on establishing those dimensions, what earlier theoretical principles he based them on, as well as how they are found in his research on organizational culture.

Through theoretical, as well as empirical data analysis, Hofstede initially arrived at four dimensions of NCs. Later, in cooperation with Michael Bond and Michael Minkov, two more were included, for a total of six (Hofstede, 2011, pp.3-7). These dimensions reflect NC, but the data are sourced from businesspeople in their organizations. This detail makes the following insights relevant to the current thesis research. It is also necessary to specify that Hofstede sourced the data from multiple international branches of a single organization (IBM), which eliminates corporate culture as an influencing factor. Here is a summary of what the six dimensions are, what they represent, and what the potential implications are for organizations and their employees:

1) Power distance index (abbreviated as PDI):

This metric measures the accepted levels of (in)equality between members of a given social or organizational structure. At the high extreme, (PDI 100) would mean that people structures are very hierarchical, and lower ranking members only do what they are told by superiors. At the low extreme (PDI 0), it would mean that even lower-ranking people expect to participate in decision-making, and are opposed to power inequality. Hofstede maintains that there is bound to be at least some sort of inequality in all organizations, as this is crucial for preventing chaos. Therefore, an organization cannot be truly egalitarian in the long run. At the same time,

[7] https://geerthofstede.com/hofstede-books/ (Accessed on 05.12.2021)

however, Hofstede proposes that “differences in the exercise of power in a hierarchy relate to the value systems of both bosses *and* subordinates and not to the values of the bosses only, even though they are the more powerful partners.” (Hofstede, 2001, p.82). This makes sense, because both parties stand to gain from the success of an enterprise. It also explains why both social and organizational structures tend to gradually concentrate their power into a group of individuals who are willing to bear the burden of responsibility for the common prosperity.

PDI is obvisously highly significant for company culture, as it can shape fundamentals like how a company is structured and how decisions are reached. But then, upon deeper inspection, one can surmise further possible ramifications:

- How clear it is to every member of the organization what their role is;
- What leadership styles is management willing and/or able to employ;
- What is the relationship between employees and their supervisors/superiors;
- How much versus how little an employee feels they can afford to say to their supervisor – in other words, how open they can be, and how openly they can speak;
- It would probably make sense to assume that with higher PDI come wider rifts between levels of responsibility and consequently, larger salary gaps between employees;

2) Uncertainty avoidance (abbreviated as UAI):

Shows how people react to the unknown, and how “scared” they are of losing control of future outcomes. High UAI cultures tend to try and avoid uncertainty and ambiguity, are more conservative and inflexible and people are usually more stressed and emotional. In the case of low UAI, uncertainty in life is accepted as inevitable, and people tend to be more relaxed, flexible and non-emotional when faced with important life and work choices, ambiguity and uncertainty. Uncertainty, for organisations, can be equated to risk. And risk avoidance or at least minimization is, of course, one of the priorities for almost every enterprise. After all, money is the lifeblood of modern society. Thus, when it comes to money, as little as possible should be left to chance. It would follow that UAI is not a variable in organizational culture.

According to Hofstede, organizations deal with uncertainty and ambiguity by means of “technology, rules and rituals”. In this way, they can minimize the effects of the inherent unpredictability of their employees and stakeholders. But rules, however necessary they may be, should not be hastily drafted. Hofstede warns that their effects can be both beneficial and detrimental, in varying degrees according to the circumstances, in which they are applied (Hofstede, 2001, p.147). This is one of the reasons why it’s interesting to study whether or not NCs’ UAI variability has a noticeable impact on organizations.

Another reason UAI may affect company culture is its implications for creativity and innovation. A culture that is more conservative, inflexible and risk-averse will not easily embrace innovative ideas and solutions. That, in turn, would also limit the applicability of leadership styles that are more proactive and visionary. The result, however, may be net positive. A reduced or missing tendency for innovation would be perceived as stability by the risk-averse individuals in the cultural group. This would result in increased employee retention and loyalty.

3) Individualism vs. collectivism (abbreviated as IDV):

Speaking of loyalty, IDV measures how bonded members of a social or organizational group are. A high score here means a weaker connection between individuals that are not part of a core clan. Individualism here means little to no shared responsibility, freedom of expressing subjective opinion and ideas, and a need for privacy. On the opposite side of the spectrum, a low IDV would indicate a collectivist society, which relies on group loyalty, a sense of community and mutual help. So, an obvious link to organizational culture here is the sense of belonging that IDV measures. It shapes the relationship between the employer and the employee. This is, indeed, certified by Hofstede, who points out that collectivist societies produce employees that are more emotionally attached to the organization, while societies leaning towards the individualist end of the spectrum produce employees that act mainly on own interests and rarely put their faith solely in the employer (Hofstede, 2001, pp.212-213).

Having a big impact on company culture, the prevalence of collectivism is a commonly known trait of many a culture and region around the world. One need look no further for an example than *Guanxi* in China. It represents the close ties within a family, network, or group of people in general, which more or less determines who you employ or do business with. Guanxi has been defined as nothing less than “a basic building block of Chinese society” and carries within it a lot of “Chinese historical and cultural context” (Li et al., 2019 p.6).

Other reasons to consider IDV’s impact on company culture could include:

- How important is teamwork as a means to achieve results;
- How new employees are onboarded and how well they integrate;
- How important are referral and acquaintance/connections to the hiring process;

4) Masculinity vs. femininity (abbreviated as MAS):

This metric measures the role distribution between males and females. In highly masculine cultures, structures are patriarchal – men are assertive, financially dominant and expected to be the strong and professionally successful members of the family. The opposite extreme of this scale shows a society more directed towards harmony and quality of life, regardless of gender. Decisions are often made via consensus and negotiation, and modesty is perceived as a virtue.

Another thing that MAS measures is how important are work goals for women as opposed to men. In his landmark IBM survey, Hofstede asked male and female employees to rank work goals, such as the following, in terms of importance: advancement, earnings, training, up-to-dateness, friendly atmosphere, position security, physical conditions, manager, cooperation. A significant difference in opinion has been observed. This has been attributed to the differences in occupation and education. It must be noted that the comparisons in the study were drawn from men and women of the same occupation, which helps with objectivity (Hofstede, 2001, p.281). The author of this thesis, however, is not convinced of the strength of these specific findings. It is not clearly specified whether career-level disparities were accounted for, and these disparities were present at the time of the study. For one, the existence of a gender pay gap has since been empirically proven in the USA (Blau & Kahn, 2017) and Europe (Boll & Lagemann, 2019), among other regions. There is clear inequality

between the earnings of male and female employees, even when circumstances such as their occupation or position are compared on equal grounds. And from what data show, this issue is far from being resolved, several decades later. What is more, research points to the existence of a "corporate gender gap" as well. Matsa & Miller (2011, p.635) observe that "although women make up 47 percent of the overall labor force, they account for only 6 percent of corporate CEOs and top executives". This is echoed even by brand-new studies on the subject. Babic & Hansez (2021, p.2) found that "despite … the increasing number of qualified and trained women, it is clear that are still largely underrepresented in the decision-making process in all sectors". Lastly, research published by the World Economic Forum makes it clear that there is a disparity, which has hardly improved for the last 15 years (Hausmann et al., 2006; World Economic Forum, 2021). All of this evidence questions the objectivity of that specific part of the study, as such substantial differences and barriers are not consistent with what is assumed to be an even playing field.

With all that said, Hofstede makes it abundantly clear in his 2001 book (Chapter 6) that MAS does not attempt to measure male versus female, but masculine versus feminine, which is something quite different. This is important to establish, because it is not gender traits that are the object of study – it is, in fact, "the dominant gender role patterns in the vast majority of both traditional and modern societies" (p.284). These gender role patterns can be exhibited by both male and female members of that society.

Here are some ways, in which the MAS variable could be relevant in an organizational context:

- Whether men or women are more likely to hold executive/management positions.
- To what extent managers are expected to be competitive, decisive and assertive, regardless of gender.
- How inclined managers are to sacrifice family harmony for professional success.

5) Long-term orientation vs. short-term orientation (abbreviated as LTO):

LTO may sound like it's measuring perceptions of time, but it's more accurate to say it measures how pragmatic people are, and its extremes are modesty vs. pride. At the long-term end, people behave more modestly, are more calculative and virtuous. They are keenly aware of the influence of past events on the present. They consider flexibility and moderation to be key virtues. At the short-term end, people tend to oversell themselves and are more traditionalist, religious, nationalistic or otherwise values-driven. Still, they do not necessarily feel that the long-gone past has any palpable influence of their present-day lives. In fact, they prefer to be instantly rewarded for their actions, and dislike the notion of sacrificing in the present, for a potential of gaining and profiting in the future.

It's interesting to note in the context of the current thesis, that Hofstede believes "LTO scores are strongly correlated with national economic growth in the period 1965-85, …, and even more in the period 1985-95". Hofstede points out that "long-term orientation is thus identified as a major explanation of the explosive growth of the East Asian economies in the latter part of the 20th century" (2001, p.351).

The implications of LTO for organizations are hardly surprising, considering the information presented above. As examples of how LTO can be relevant to business, we can consider:

- What growth strategies the company pursues.
- How the company prices its products and services.
- How much the company innovates and how prized is innovation within management.
- How resilient an organization is to external shocks, especially economic ones.
- How crucial is it for individuals to save face, or build up reputation in general.

6) Indulgence vs. restraint (abbreviated as IND):

The newest dimension, coined by Michael Minkov, measures how much are cultures focused on their time for leisure, enjoying it and having a positive outlook on life. On the indulgence extreme, groups are more optimistic, focused on pursuing personal happiness and not taking life too seriously. On the other extreme, groups tend to show more restraint, behave in a more controlled way and have a serious and rather pessimistic outlook.

Hofstede (2011, p.16) offers a list that neatly illustrates the contrast between the two extremes of IND. This list entries deemed relevant to the RQ are presented in Table 2.

Indulgent	**Restrained**
Higher percentage of people declaring themselves very happy	Fewer very happy people
A perception of personal life control	A perception of helplessness: what happens to me is not my own doing
Freedom of speech seen as important	Freedom of speech is not a primary concern
Higher importance of leisure	Lower importance of leisure
More likely to remember positive emotions	Less likely to remember positive emotions

Table 2: Indulgence vs. restraint

Source: adapted from Hofstede, 2011, p.16

While this dimension seems the least relevant to company culture and to this current research, it is a good idea not to discount IND entirely. Though its influence may not be direct and measurable, it still shapes many aspects of life and people's perception of reality. It is not hard to imagine how this could affect the way they communicate, negotiate and cooperate. A person with a greatly optimistic outlook, for example, would be more likely to show persitence and determination in their work, and be more self-reliant in general (Minkov & Hofstede, 2012). Minkov and Hofstede go so far as to propose that "LTO is a valid predictor of national educational achievment in mathematics and of economic growth" (p.11).

The dimensions in practice

The graph in Figure 16 below shows how Austria and Bulgaria compare on their NC scores, and highlights their differences. Data taken from Hofstede's Globe[8]. It's interesting to note the

[8] https://exhibition.geerthofstede.com/hofstedes-globe/ (accessed on 05.12.2021)

substantial differences between the two in terms of PDI, IDV, MAS and IND. It looks like the two countries, which are relatively close on the world map, and with so many similarities like land area, population size and geography, rank so differently on most of these six dimensions. What is also interesting is that data from Hofstede's study show that Austria ranks the absolute lowest in terms of Power Distance (PDI), from all countries studied world-wide!

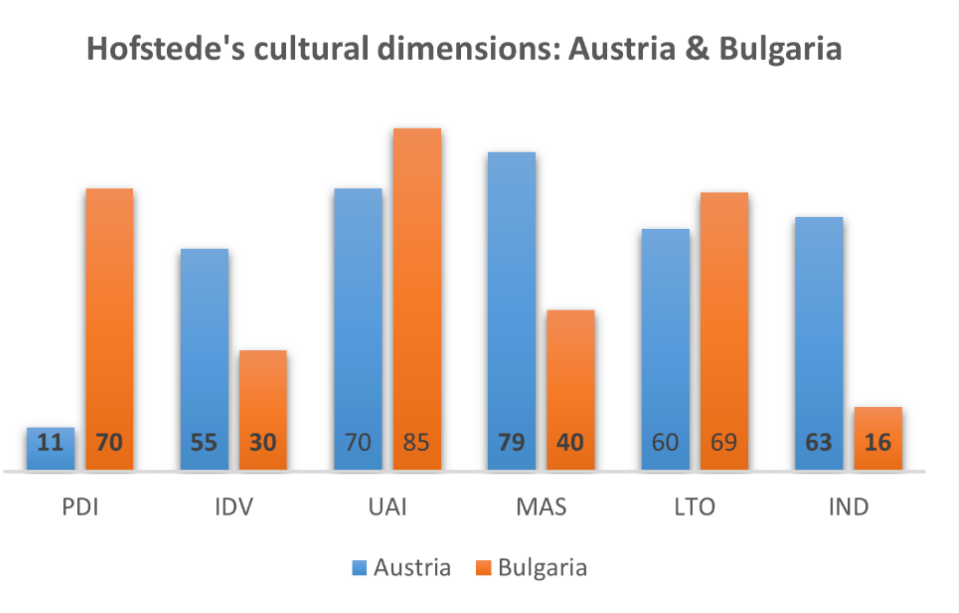

Figure 16: Hofstede's cultural dimension scores for Austria and Bulgaria

Source: adapted from: **https://exhibition.geerthofstede.com/hofstedes-globe/** (Accessed on 07.12.2021)

3.3.3 GLOBE cultural country clusters

Inspired by Hofstede's initial research findings, a large-scale world-wide research effort was launched in the early 1990's. The project was conceived and led by Robert J. House, and was named the Global Leadership and Organizational Behavior Effectiveness project (G.L.O.B.E.). Its goal was to explore the differences of cultures in an ever more globalizing world of business, and how they affect leadership in organizations (House & Global Leadership and Organizational Behavior Effectiveness Research Program, 2004).

The project's initial research effort involved over 200 researchers in 62 countries around the world, studying more than 17,000 mid-level managers. In 2004, the findings were published after a decade-long quantitative study of societal culture, organizational culture, and attributes of effective leadership. According to GLOBE , "the study redefined scholarly understanding of how culture and leadership vary by national culture". This was followed by a second GLOBE survey, published in 2007, and covering 25 additional countries.

The data from the first survey does not include Bulgaria, but it does cover other Eastern European countries that score similarly on Hofstede's Globe. Austria is considered in the same way. Therefore, the indications given by this data could be considered sufficient estimation for demonstrative purposes. Looking at the resulting categorization of NCs by 'clusters', we can see how Germanic Europe (incl. Austria) and Eastern Europe (incl. Bulgaria) compare

(Figures 17 & 18). The contrasts visible between the two cultural groups on several of the dimensions show consistency with Hofstede et al.'s earlier results.

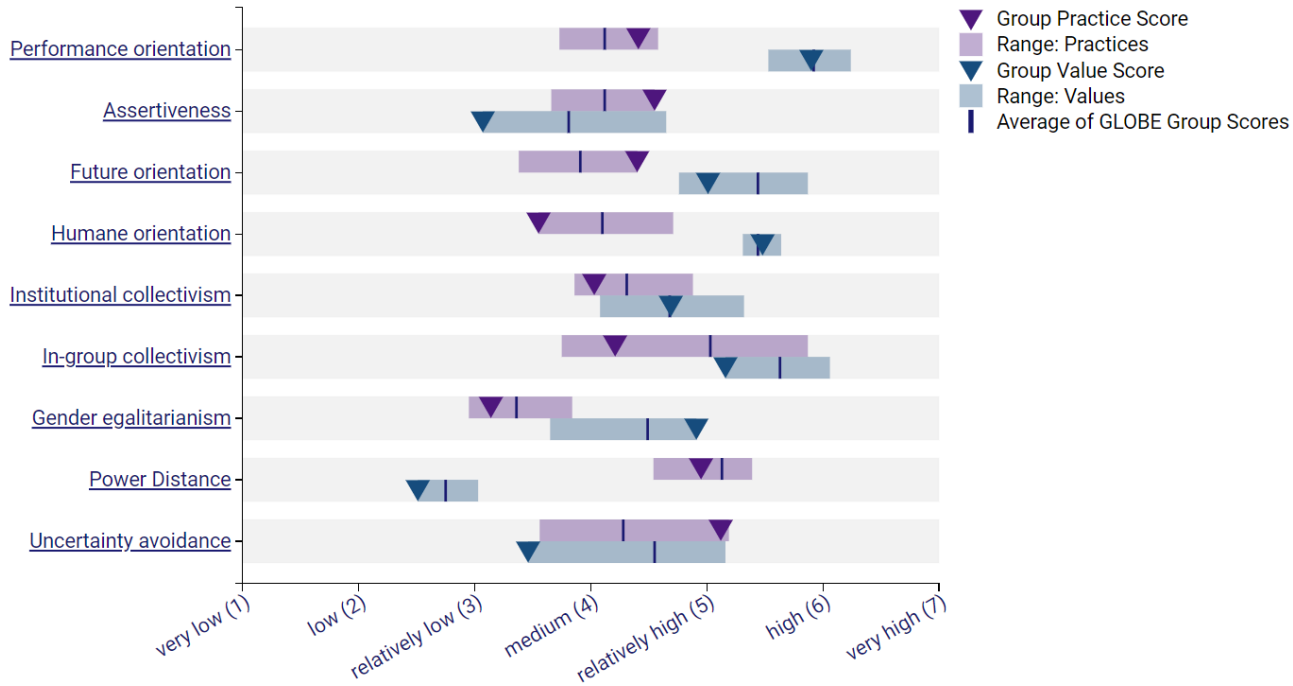

Figure 17: Cultural Practices and Values in the Germanic Europe Group

Source: **https://globeproject.com/results#cluster** (Accessed on 07.12.2021)

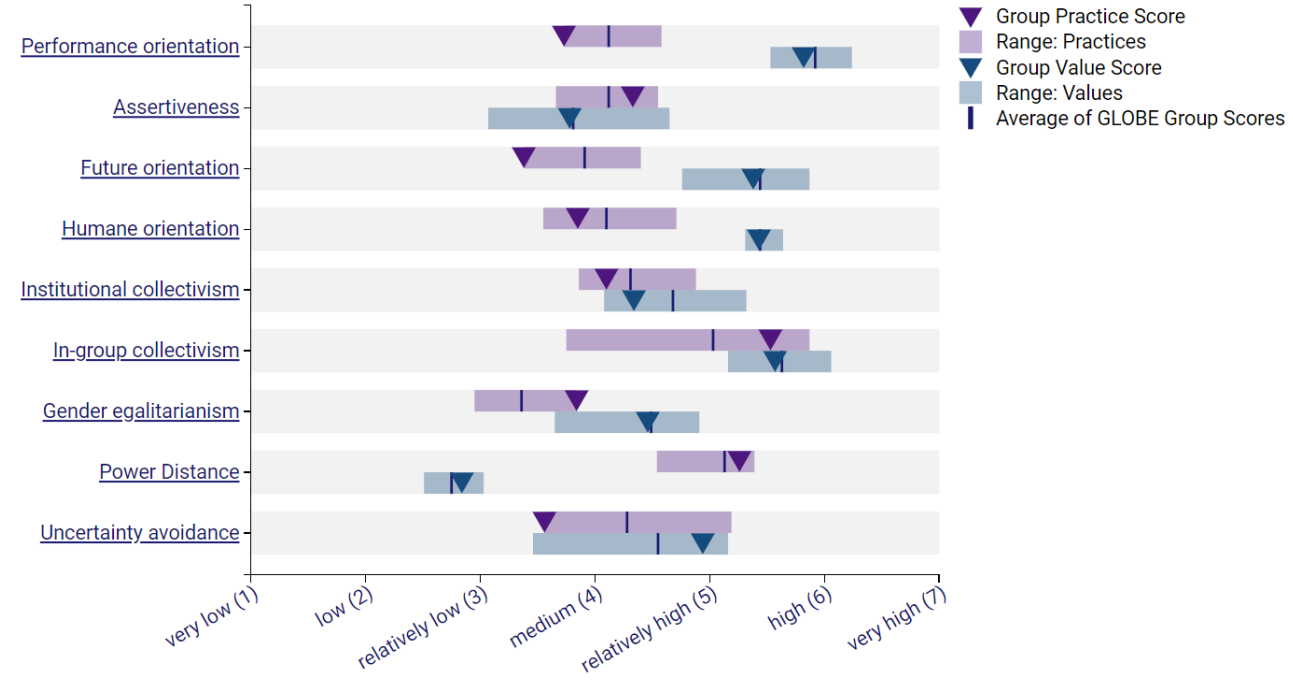

Figure 18: Cultural Practices and Values in the Eastern Europe Group

Source: **https://globeproject.com/results#cluster** (Accessed on 07.12.2021)

4 Results and findings

Before the results from the research and qualitative analysis are presented and discussed, let us remind ourselves of the RQ posed in the beginning of this paper: “How do cultural differences affect requirements elicitation efforts in Austria and Bulgaria?”

Answering this question requires a discussion that leverages all information drawn up so far, including reviewing and comparing findings, and introducing insights gained from literature. To ensure the products of such a discussion are developed in a systematic and coherent way, the four sub-questions that were posed as an extension of the RQ, would serve as discussion guidelines. This would not only help manage all the information uncovered so far and narrow it down, but would also help minimize the risk of making logical leaps, or arguments that are unfounded. Viewing the thesis problem through the lenses of the four questions that were precisely posed in the very beginnning, would also facilitate a view from different angles, potentially enriching the discussion. Furhermore, since the four questions are narrowly defined, the risk of going off-topic is lowered, adding to the discussion’s consistency.

The sections in the current chapter are laid out as follows:

- **Section 4.1** reviews, compares and contrasts the extent, to which RE practice is the same, and to which it is different in the two countries;
- **Section 4.2** looks at which issues, challenges and obstacles (ICO) to effective RE are faced by practitioners in the two countries, and whether or not similarities exist, and then narrows down to which of these ICO to RE stem from the requirements source;
- **Section 4.3** takes the findings, but this time along with their context, and introduces the *national culture* variable with the goal of highlighting any differences and contrasts that might exist in what is being experienced in the two countries studied.

As the information from each section looks at separate chunks of the data, the way in which conclusions are reached is made more easily traceable. Validity of the findings is enhanced by employing the triangulation technique, which was introduced in Section 2.2.

Interview data and resulting codes

Table 3 on the next page gives an overview of what practitioners were interviewed, including their professional context. This table is also a reference point – respondents are marked in a way that allows them to be easily referenced later (for brevity) e.g. AT1 BG2, where AT is short for Austria, and BG for Bulgaria.

The sessions can be considered to have been quite successful overall – respondents were able to paint a good picture of what challenges are faced in the RE process in the present day, as well as how the process itself is performed. Also, it can be said that heterogeneity was achieved in terms of industries represented. Looking at the list of respondents, they work in a relatively wide variety of industries. That, along with the fact that the companies, which interviewees represented, ranged from small to very large, adds objectivity to the analysis results. It is also interesting to note that all of the companies, that the listed respondents represented, have over 20 years of history.

Ref.	Position type	Industry	Company size[9]	Team size	Years in the company
AT1	Consultant	Lighting Technology	XL	8	2
BG2	Team Lead	IT	XXL	20	15
BG3	Team Lead	Banking	S	6	9
AT4	Project Manager	Automotive	XL	6	2
BG5	IT Executive	Heating Appliances	M	6	6
AT6	Team Lead	IT	S	3	2
AT7	Project Leader	Automotive	XL	8	3
BG8	Product Specialist	IT	M	10	5

Table 3: Interview participants summary

Section 2.3.3 already explained how coding was done, and here is a good place to summarize the results of this coding. Apart from the codes organized within the MAXQDA software, the author also tracked, sorted and referenced all codes in a separate spreadsheet, which is shown in parts in the next pages. Most headings there are self-explanatory (a column for each respondent, one that lists each unique code, and one that describes it – shown separately in the Tables included in this chapter). To explain headings *Set* and *Freq*, however: the former shows the group that the author has sorted the code into, and the latter shows the frequency of how often each code is encountered. The word Set is used as an alias for Category.

NB: Regarding this list of codes, it is very important to consider that non-mention in this case does not equate to non-existence. In other words, just because some statements were made by specific respondents (and therefore attributed only to those respondents), does not exclude the other participants from having the same notions valid for them. For instance, they could have made similar statements, if it was appropriate in the conversation flow. By design, semi-structured interviews do not heavily rely on consistency of questions being asked (like with surveys, for example), but rather on gaining a deeper understanding of the topic(s) discussed.

Regarding the circumstances of respondents' projects and processes, it is worth noting that:

- With the exception of AT1, all respondents directly gather (elicit) the requirements, i.e. directly from the client;
- AT1, AT4 and BG5 gather only (or mostly) from internal[10] sources, while BG2, BG3 and BG8 gather only (or mostly) from external sources. For AT6 and AT7 it's both.

[9] # of employees: S: <500 // M: 501-1,500 // L: 1,501-3,000 // XL: 3,001-10,000 // XXL: 10,001+
[10] Internal here means from within the respondent's company, as opposed to an external client

Overall circumstances of the respondents' work environment and context in general

Information was gathered from the interview respondents also about their work context in general. It was not merely a conversation warm-up – these details could be relevant for further analysis and discussions. The author believes that circumstances are important to be aware of as much as possible. With that said, such details as the ones outlined below were not central to the interview, but rather supplementary.

The codes connected with these circumstances are shown below in Figure 19. The Category (Set) is *Respondents' work context*.

	A	B	C	D	E	F	G	H	I	J	K
1	#1	#2	#3	#4	#5	#6	#7	#8	Set	Code	Freq
2	x	x							A	Equal work distribution	2
3				x					A	Disconnected from team members	1
4								x	A	Closely working with multiple teams	1
5		x	x		x	x			A	Respondent leads their team	4
6		x							A	No visual communication	1
7					x				A	Praises colleagues' competence	1
8		x	x	x			x		A	Mostly eliciting remotely	4
9	x					x		x	A	Hybrid model	3
10					x	x			A	Prefers in-presence	2
11	x						x		A	Remote RE improves efficiency	2
12	x	x			x	x	x		A	Remote work impacts RE	5
13								x	A	Remote work doesn't impact RE	1
14								x	A	Offering a standardized solution	1
15								x	A	User needs are used to improve product	1
16					x				A	Well-acquainted with stakeholders	1

Figure 19: Codes from Set A (Category: Respondents' work context)

Assigning Themes to these codes has shown exactly which circumstances are represented.

Ref.	Theme	Code	Description/Quote
BG2, BG3, BG5, AT6	Teamwork and cooperation	Respondent leads their team	Respondent is in charge of the team they work with
AT1, BG2		Equal work distribution	Equal distribution of work within the team
AT4		Disconnected from team members	Each team member works on different projects. The people he does work with, operate outside the respondent's workspace
BG5		Well-acquainted with stakeholders	*We are a huge company, but we know each other…I know personally anyone in the company - what exactly I can receive as information*
BG5		Praises colleagues' competence	*I'm proud that our staff and our colleagues are so competent on their places and I always rely on their competency*
BG2		No visual communication	Never even seen some colleagues or teammates. Turning on camera is not actively encouraged.
BG8		Closely working with multiple teams	-

(continued on the next page)

Ref.	Theme	Code	Description/Quote
AT1, BG2, BG5, AT6, AT7	Ways of working	Remote work impacts RE	Remote work has an effect on requirements elicitation efforts
BG2, BG3, AT4, AT7		Mostly eliciting remotely	The respondent performs elicitation mostly remotely
AT1, AT6, BG8		Hybrid model	The respondent elicits both remotely and in presence in the office
AT1, AT7		Remote RE improves efficiency	In-person meetings offer more distractions, so work is done more time-efficiently from Home Office
BG5, AT6		Prefers in-presence	*At first possibility we go back to the office and meet and discuss in the meeting rooms*; *Direct communication is something different*
BG8		Remote work doesn't impact RE	-
BG8	Project specifics	Offering a standardized solution	-
BG8		User needs are used to improve product	-

Table 4: (Set A) Respondents' work context

As we can see, according to respondents, remote work does have an effect on RE efforts. The abrupt change to ways of working in 2020, caused by the global pandemic, has allowed for an evaluation and comparison of in-presence versus online communication, and elicitation in particular. Since these practitioners have been gathering requirements even before 2020 (even if not all of them with the same company), they are able to make this comparison.

With regards to the team dynamics and project specifics, the information presented in Table 4 is rather self-explanatory and again, mainly serves as a background and context former.

What can be added here are some interesting findings from Set D (*The requirements source*). When inquiring with respondents about the way they locate who the relevant person/people to contact are, when looking for requirements sources, their responses were split into the following two codes:

1) *Know in advance who the req-s source(s) are* – marked for AT1, BG3, BG8;
2) *Deduce who the req-s source(s) are* – marked for BG2, AT4, BG5, AT6, AT7;

Meanwhile, BG3 had the code *Adapts to the client's schedule* assigned, and AT6 had *Adapts to the client's workflows* marked.

4.1 Comparing and contrasting requirements elicitation guidelines

This section reviews how repondents' companies approach RE as a process.

One of the sparks that ignited the motivation and curiousity in writing this thesis paper is the frequency and emphasis, with which it was made clear in literature that establishing the right requirements is crucial to the success of the project or venture. Even though this point was not raised in the interviews themselves, one of the respondents clearly confirmed this notion:

> *"So, in certain projects I do this detailed management by myself, meaning that I personally work on this from the beginning […], which starts with the gathering of requirements, understanding of the requirements of the requisitioner. And also in some of the projects I delegate these functions to my colleagues. But for the more complex and bigger projects, I actively manage and participate in this process. So from this point of view, the most important point is understanding of the requirements. And this is the moment where I pay the biggest attention, because the starting point is this one - to understand what exactly the requirement is, and there to define the details that you need in order to understand better and to define better this requirement." (BG5, 05:08)*

In the next pages, common aspects of the RE process will be examined from two perspectives – from the literature referenced earlier, and from the accounts of the practicitioners interviewed. The latter is referenced through codes. The relevant ones are listed below in Figure 20. Note that Set here refers to the code Category, which here is *The RE process*.

	A	B	C	D	E	F	G	H	I	J	K
1	#1	#2	#3	#4	#5	#6	#7	#8	Set	Code	Freq
39	x								C	Respondent only gathers	1
40		x	x	x	x	x	x	x	C	Respondent gathers **and** manages req-s	7
41	x		x	x	x	x			C	Respondent gathers all req-s	5
42		x			x			x	C	Multiple people gather the req-s	3
43					x				C	Importance of understanding the req-s	1
44	x	x	x	x	x	x	x	x	C	RE meetings or talks	8
45		x	x	x		x	x		C	Workshops	5
46								x	C	Conferences	1
47								x	C	Online forum	1
48								x	C	Large number of clients/stakeholders	1
49				x					C	Brainstorming	1
50			x			x		x	C	Prototyping	3
51						x	x		C	Visualization	2
52							x		C	Use documents as source	1
53		x	x			x			C	Back-and-forth calibration	3
54		x	x	x		x	x		C	Describing steps in RE	5
55		x	x	x		x	x	x	C	Elicitation as part of the bigger picture	6
56								x	C	Customer journey	1
57								x	C	Requirements can be predicted	1
58			x	x	x		x	x	C	Needs are gathered	5
59	x		x	x	x		x		C	Expectations are gathered	5
60								x	C	Ideas and feedback are gathered	1
61	x	x	x	x	x	x	x		C	Respondent refines requirements	7
62	x	x					x		C	Proactive feedback	3
63						x			C	Ask the right questions	1
64						x			C	High vs. low-quality req-s document	1
65		x							C	No RE methodology	1
66							x		C	Always start with functional req-s	1
67		x	x			x	x		C	Kick-off meeting	4

Figure 20: Codes from Set C (Category: The RE process)

A systematic and methodical process

Firstly, three particular concepts can be outlined as examples from the literature reviewed earlier, that point to a well-organized and precisely defined RE process:

Ref.	Concept	Source(s)
L1	Elicitation plan	Young (2004, pp.61-63) Blais (2011, pp.206-207) Wiegers & Beatty (2013, p.120) Milošević & Martinelli (2015, p.85)
L2	RE must be approached systematically and methodically	Young (2004, pp.61-63) Robertson & Robertson (2013, pp. 7, 68) PMI (2015, pp.53-54)
L3	It is possible to streamline and succinctly define the requirements elicitation process	Hickey & Davis (2004) Young (2004, pp.61-63) PMI (2015, pp.69-74)

Table 5: A systematic and methodical process

Similar concepts are also touched upon in most of the interviews. These concepts, marked as codes, have given shape to themes, and these codes and themes are outlined next:

Ref.	Theme	Code	Description/Quote
BG2, BG3, AT4, AT6, AT7, BG8	Elicitation as part of the bigger picture	Elicitation as part of the bigger picture	How RE fits in the larger project scheme. Semi-detailed workflow descriptions that show what part requirements gathering activities have in the overall project delivery.
BG8		Customer journey	*We have to know the full customer journey, which begins with creating an account, through getting the needed requirements and needed prerequisites, in order to use the service, then starting the service, using it, and completing the job, and getting the results. And [our team is] just in the middle and we have to comprehend... know all things along the way.*
BG2, BG3, AT4, AT6, AT7	RE is methodical	Describing steps in RE	How the elicitation process is being performed, or what exactly is being gathered (and why)

Table 6: Codes and themes in 'The RE process' category (part 1)

From the findings just outlined it can be gathered that:

- Code *Describing steps in RE* (listed under the theme *RE is methodical*) fully, or at least mostly matches all the notions in literature (L1, L2 and L3), and is valid for 5 out of 8 respondents, in both countries. In other words, practitioners' methodology is consistent with best practices in literature in terms of being clear on what steps should be taken in RE.

- In the same line of thought – a quote from AT6 matches perfectly with L1 and L2: “We meet in a group and we just we have a really structured approach to ask questions” (AT6, 15:02). This follows a description of how workshops are used by their company to improve the quality of elicited requirements.

- Code *Elicitation as part of the bigger picture* is valid for most of the respondents (6 out of 8), and both countries are exactly equally represented. This notion will not be entertained, as is reaches beyond the scope of this paper. This result still carries potentially valuable information about the participants. Namely, it shows that they have developed a keen perception of how processes are integrated. This adds some objectivity to their accounts of RE processes.

- Direct contrasts were also encountered – in general to what other respondents were depicting – but also in particular to L2 and L3. In BG2’s work context, requirements management and elicitation in terms of processes and sequences are **not** subject to standardization. In other words, the requirements management process is highly frexible and variable, and depends on the project environment. The code *No RE methodology* was applied in that transcript. Here are two quotes to demonstrate the respondent BG2’s thoughts:

  So, that's why there is no strict methodology, at least in my organization. What it is depends on the customer, on the culture of the customer, on the environment (where you're working), etc. (BG2, 13:06)

  You have to be very flexible if you want to be successful. There is no strict rules, or at least in consultancy, business and professional services business. Maybe with pure software companies it is easier and the stuff there are more standardized. But in our business we are very flexible.(BG2, 20:38)

The focus and performance of RE activities

Next are the most universally-applied codes in *The RE process* category. These are grouped under the theme *Operational similarities*, and are all valid by more than half of respondents.

Ref.	Theme	Code	Description/Quote
AT1, BG2, BG3, AT4, BG5, AT6, AT7	Operational similarities (observed in the majority of samples)	Respondent refines requirements	Focus is to clarify the requirements and establish what is the job to be done (for the project)

(continued on the next page)

Ref.	Theme	Code	Description/Quote
BG2, BG3, AT4, BG5, AT6, AT7, BG8	Operational similarities (observed in the majority of samples)	Respondent gathers **and** manages requirements[11]	The respondent has a high-level overview of the whole requirements management process and is involved in various steps
AT1, BG3, AT4, BG5, AT6		Respondent gathers all requirements	Usually one team member, e.g. the respondent, gathers requirements for a specific project
BG3, AT4, BG5, AT7, BG8		Needs are gathered	*Everybody's needs are discussed - what do they want exactly, what do they expect, what did they have in mind...*
AT1, BG3, AT4, BG5, AT7		Expectations are gathered	*The requirements they imagine in their heads that they want to receive*

Table 7: Codes and themes in 'The RE process' category (part 2)

- The theme *Operational similarities* shows many elements that are consistent between respondents. These codes are also symmetrically distributed in both countries. We learn that most practitioners:
    - Are the ones in the project or team that are tasked with establising what is the job to be done, by clarifying requirements;
    - Not only elicit, but also document and manage the requirements, i.e. they are involved in the entire requirements engineering effort;
    - Aim to capture the needs and expectations of requirements sources;

  These findings are not only consistent between practitioners, but also with what is shown in literature (Blais, 2011, pp.45-48; Wiegers & Beatty 2013, pp.61-67).
- The code *Respondent gathers all requirements*, also appears consistent between the respondents. That one, however, has a weighty antipode. A whole three respondents' transcripts included the code *Multiple people gather the req-s* under the theme *RE as a team effort*. These respondents are BG2, BG5 and BG8. Interestingly enough, the other remaining respondent on the Bulgarian side (BG3), could technically also make this list. He explained that, even though he is the one with elicitation duties, another team member could take up this role as his replacement, when needed. This leads to the first direct contrast between Austrian and Bulgarian results in this research.

[11] AT1 is the only outlier here, due to only gathering requirements, and not being involved in the further management of those requirements, including analysis, documentation, etc.

The iterative nature of requirements elicitation

Another notion that was expressed in literature was that RE is done in iterations:

Ref.	Concept	Source(s)
L4	RE is an iterative process RE is cyclical in nature	Blais (2011, p.227) Robertson & Robertson (2013, Chapter 14) Wiegers & Beatty (2013, p.120) IIBA (2015, p.151)

Table 8: The iterative nature of requirements elicitation

A similar notion to L4 was observed in interviews – even if only in three of them:

Ref.	Theme	Code	Description/Quote
BG2, BG3, AT6	Constant adjustment	Back-and-forth calibration	Regular communication with the client about aligning progress and/or specifying requirements

Table 9: Codes and themes in 'The RE process' category (part 3)

Elicitation = investigation

Similarities between detectives and requirements elicitors are quite apparent once such a notion is proposed – at least according to some authors of requirements-related books:

Ref.	Concept	Source(s)
L5	RE is like investigative work. Context and interrelationships are important to understand.	Blais (2011, pp.69-70) Robertson & Robertson (2013, Chapter 5)

Table 10: Elicitation = investigation

Only two of the interviewed practitioners, both representing Austria – AT6 and AT7 – painted a picture that resembles the notion in L5, with the level of similarity subject to interpreation:

> *What I can also say about these workshops is when we often ask the customers to bring […] these systems and show us physically, usually. Or the other option is if we meet at the customer's site, we could try also to see the product in the context. And so, because we usually develop just parts of a system […]. And it's actually very helpful to understand the context and to document the context of the system to be developed. (AT6, 17:43)*

> *However, we set up a lot of workshop days. Which means we show up to you, if you have some sort of special databank for your parts or whatever that you want to use. Me and a couple guys will show up to you, we'll bring our computers […] and we'll try to build a demonstration together, so we can get used to your system and really figure out what we need to do for it. Write the requirements that way. (AT7, 26:21)*

Elicitation methods and techniques

Lastly, the perspective, which offers the most straightforward way to compare and contrast the RE guidelines in the different companies and countries that were probed, is to take a look at which methods and techniques are employed for RE.

The most widely used methods and techniques, according to literature, have already been exhibited and discussed in Section 3.2.3.1. Here is a résumé of them, in order of popularity:

(1) Interviews → (2) Prototyping → (3) Workshops → (4) Questionnaires & Surveys → (5) Document analysis → (6) Brainstorming → (7) Observation

Next is a breakdown of what methods and techniques the respondents were found to use:

Ref.	Theme	Code	Description/Quote
All[12]	RE methods & techniques	RE meetings or talks	One-on-one conversations with the requirements sorce, or meeting with several sources
BG2, BG3, AT4, AT6, AT7		Workshops	Workshops as a RE method
BG2, BG3, AT6, AT7		Kick-off meeting	At the start of the project, everyone meets and gets to know who's involved, and how they are involved, and what needs to be done
BG3, AT6, BG8		Prototyping	Develop a prototype or mockup that you show the client to align whether requirements are correctly captured
AT6, AT7		Visualization[13]	The product, system or solution to be developed is visually represented, in order to understand in what context it will be used
AT6, AT7		Use documents as source	-
AT4		Brainstorming	Brainstorming as RE technique
BG8		Conferences	-
BG8		Online forum	-

Table 11: Codes and themes in 'The RE process' category (part 4)

[12] **Note**: BG3 is the only one, in whose circumstances these talks (almost) never involve just one person
[13] **Note**: This might seem identical to Prototyping, but it is requested **from**, and not offered to, the client

Here, results are consistent between literature and current observations. It should be specified that code *Visualization* equates to *Observations* in the above list of methods in literature. Also, the last two entries probably need a bit of context. It's interesting to point out that this respondent is working with an unusually large number of external clients (stakeholders).

Next, the point of view is fixed on that of the practitioners. This next table presents assorted views of the respondents. These views are singular notions (with the exception of #1 and #9) that can be explored outside the main discussion of what a typical RE process looks like.

Ref.	Theme	Code	Description/Quote
AT1, BG2, AT7	Trying to get feedback	Proactive feedback	Sharing initial thoughts to see if they align with the requirements source
BG8		Ideas and feedback are gathered	-
BG5		Importance of understanding the requirements	*this is the moment where I pay the biggest attention, because the starting point is to understand what exactly the requirement is*
AT7	Thinking ahead	Always start with functional requirements	Establish what task needs to be completed first, before trying to figure out how the solution should perform
BG8		Requirements can be predicted	-
AT6		Ask the right questions	A part of the duties of the elicitor, i.e. the service that is being offered to the client
AT6	Project circumstances	High vs. low-quality req-s document	-
BG8		Large number of clients/stakeholders	-
BG5, AT7	Strategic cooperation	Working together towards common goal	Pointed or hinted to the importance of working together with the counterparty to achieve the desired result

Table 12: Codes and themes in 'The RE process' category (part 5)

As an exception to the flow thus far, these themes and codes have not been checked against literature, and are taken more or less at face value[14]. The reasons for this are:

- As initially stated, these themes were not considered to fit the frame of the main discussion. The point here is merely to display some respondent input for later use.
- These themes are not included in triangulation, because they don't fit the main patterns that are analyzed, and that eventually lead to conclusions and generalizations.
- A lot of these codes come from scenarios/circumtances unique to the respondent.

[14] This does not mean they are held to be self-evident. They are not meant to state or prove facts.

4.2 Comparing and contrasting pain points in the elicitation process

Continuing the discussion in a similar fashion to the last section, this time ICO to RE will be examined. As a starting point, again a reference is offered in the form of an excerpt from the list of codes. Here, the heading *Set* groups those codes that, in the respondents' experience, constitute ICO to RE. *Set* is again used as an alias for Category – in this case, *ICO to RE*. A Description of each code (where necessary) can be referenced in Tables from the next pages.

	A	B	C	D	E	F	G	H	I	J	K
1	#1	#2	#3	#4	#5	#6	#7	#8	Set	Code	Freq
78	x								E	Unhappy with lack of involvement	1
79	x								E	Talking vs. drawing	1
80	x						x		E	Language barrier	2
81	x				x				E	Difficulties in understanding each other	2
82	x		x		x				E	Difficulty in clearly expressing needs	3
83							x		E	Weak confirmation	1
84	x		x				x		E	Knowledge gap as RE obstacle	3
85				x		x			E	Knowledge gap issue can be avoided	2
86		x	x						E	Internal (client) disagreement	2
87		x							E	Internal (client) resistance	1
88				x					E	Changing circumstances	1
89				x					E	Inconsistent requirements	1
90			x	x	x	x	x		E	They don't know what they want/need	5
91			x	x			x		E	Lack of cooperation from req-s sources	3
92			x		x				E	Unclear or incomplete requirements	2
93			x						E	Needs are hard to express in writing	1
94				x					E	Requirements complexity	1
95				x					E	Solution's benefits are unclear	1
96				x					E	Lack of access	1
97					x				E	Necessary input is missed	1
98						x			E	Too many participants hurt RE output	1
99						x			E	Requirements not documented	1
100						x			E	Agreeing on how to document req-s	1
101							x		E	Locating the right req-s sources	1
102								x	E	Lacking tools	1
103								x	E	Can't make everyone happy	1
104								x	E	Getting buy-in	1
105								x	E	Keeping key stakeholders involved	1

Figure 21: Codes from Set E (Category: ICO to RE)

Communication-related pain points

The most often-cited ICO when it comes to RE and pain points encountered by practitioners have to do with communication in some shape or form. Furthermore, 7 out of 8 respondents have been assigned codes linked to communication-related ICO. That would make sense, considering that RE is, at its core, a communication-centered activity. Here is a résumé of communication-themed pain points that were first discussed in Section 3.2.4:

Ref.	Concept	Source(s)
L6	Faulty or inefficient distribution and exchange of knowledge and information	Coughlan & Macredie (2002) Coughlan et al. (2003) Blais (2011, pp.200-201) Davey & Parker (2015)
L7	Communication flaws exist between the project team and the client (as well as within the project team itself)	Coughlan & Macredie (2002) Fernández & Wagner (2013) Wagner et al. (2017) Hiisilä et al. (2015)
L8	Communication problems caused by the differences in background with stakeholders	Raatikainen et al. (2011) Blais (2011, pp.200-201) Davey & Parker (2015)
L9	Communication gaps between elicitors and stakeholders, caused by scale, common views, temporal aspects or decision structures	Bjarnason et al. (2011) Blais (2011, pp.200-201)
L10	Ambiguity of words and phrases, or their arbitrary use leads to misunderstandings	Davey & Parker (2015) Ferrari et al. (2016)
L11	Tacit knowledge is filtered out of elicitation sessions, leading to incomplete requirements	Ferrari et al. (2016) Paul & Cadle (2020, pp.265-266)
L12	Underspecified and/or abstract requirments	Blais (2011, pp.200-201) Wagner et al. (2017)

Table 13: Communication-related pain points in the RE process

The multitude of angles, from which the communication ICO theme is approached, has the potential to overwhelm and complicate analysis. Even if comparatively modest in number and scale, however, the interview results in the elicitation ICO category quickly began to reveal interesting patterns themselves.

The first one was the overarching pattern of how many of the ICO encountered had to do with communication. Nearly half of all 28 codes in this category belong to the theme *Communication-related ICO*. All of those 13 codes are presented on the next page. Meanwhile, Austrian and Bulgarian respondents unveiled almost the same number of communication-related ICO – 11 and 9, respectively.

Another observation is that it was almost exclusively the Austrian respondents who discussed the *Knowledge gap as RE obstacle* (with the exception of BG3). This problem exactly matches the one in L8. Two of them pointed it out as an obstacle to overcome, while the other two explained that altough it does exist, it is part of the elicitor's job to overcome it.

It is also worth considering that only Austrian respondents raised language-related ICO. These are represented by codes *Language barrier* and *Talking vs. drawing*, and exactly match L10 and L6, respectively. *Talking vs. drawing*, however, needs some context. The respondent pointed to language as a cause for ICO to RE and then elaborated: "I notice that in the German-speaking countries, people explain things only by talking, and in the Asian way, actually we like to draw. So to visualize what we want" (AT1, 11:36).

Table 14 offers a comprehensive list of what the interviews revealed in terms of communication-themed ICO to RE:

Ref.	Theme	Code	Description/Quote
AT1, BG3, BG5	Communication-related ICO	Difficulty in clearly expressing needs	The requirements source has an idea of what they want, but for whatever reason cannot express it clearly
AT1, BG3, AT7		Knowledge gap as RE obstacle[15]	Differences in professional/educational background can lead to lack of comprehension
AT1, BG5		Difficulties in understanding each other	-
BG3, BG5		Unclear or incomplete requirements	-
AT1, AT7		Language barrier	Can come from differences in: 1) language mastery levels or 2) what meaning is assigned to a specific term
AT1		Talking vs. drawing	Perceived difference in expression between the German-speaking world and the Asian world
BG3		Needs are hard to express in writing	*from just the written part it's hard to get an understanding of what the author really needs*
AT4		Solution's benefits are unclear	*this is a big problem, because (I think) the customer should define the benefits of the system, not how the system works or how the benefits are provided*
AT6		Too many participants hurt RE output	Respondent prefers *not to elicit requirements in a big group of people, because […] it does not generate good output usually*
AT6		Agreeing on how to document req-s	-
AT7		Weak confirmation	Not having written evidence of confirmation could lead to problems down the line
BG8		Getting buy-in	Getting internal stakeholders to support what the team is working on
BG8		Keeping key stakeholders involved	*So we have to describe this and communicate this with them. And to do it regularly. Not break communication*

Table 14: Codes and themes in the 'ICO to RE' category (part 1)

Multiple ICO in this list have to do with *expression* as a facet of communication. Codes *Difficulty in clearly expressing needs*, *Difficulties in understanding each other* and *Needs are hard to express in writing* stand out as they have a total of 6 mentions between themselves.

[15] **Note**: almost as many respondents expressed the counter-argument that this can be avoided (AT4,AT6)

These, however, are only valid for 3 respondents – AT1, BG3 and BG5. BG3 had one mention for each of the 3 codes, which hints at a more detailed account of the expression-related ICO. All these match the notions in L6 and L7 to a significant extent.

A notion which was expressed by Bulgarian respondents (BG3 & BG5) and coded with *Unclear or incomplete requirements*, matches both L11 and L12, as well as L14 from the following subsection. No Austrian respondents expressed similar notions.

Concept L9, meanwhile, could be considered consistent with three different codes – namely *Solution's benefits are unclear* (AT4), *Too many participants hurt RE output* (AT6), and *Agreeing on how to document req-s* (AT6).

A match is evident also between concept L7 and code *Weak confirmation* by AT7.

Codes *Getting buy-in* and *Keeping key stakeholders involved* by BG8 could also easily fit into the next subsection instead, and is even consistent with concept L15. However, they were included as a subset of communication-themed ICO due to the high reliance on communication in such situations. These ICO would not 'fix' themselves, but rather through active communication efforts, as described in the interview by BG8.

Projects, processes and stakeholders

Even though communication ICO appear to be the preeminent barrier to successful RE, there a number of other pain points that have the potential to spell doom for software development projects. Some notable examples are listed next. They cover both pitfalls and commonly encountered ICO during projects' lifecycles.

Ref.	Concept	Source(s)
L13	Requirements changing too often or too quickly	Fernández & Wagner (2013) Davey & Parker (2015) Kalinowski et al. (2016) Wagner et al. (2017)
L14	Incomplete, inconsistent and/or hidden requirements	Coughlan & Macredie (2002) Fernández & Wagner (2013) Davey & Parker (2015) Kalinowski et al. (2016)
L15	Lack of cooperation from requirements sources and project stakeholders	Blais (2011, pp.210-211) Hiisilä et al. (2015) Davey & Parker (2015) Kalinowski et al. (2016)
L16	Sources don't know what they want	Laporti et al. (2009) Blais (2011, pp.200-201) Wagner et al. (2017)

(continued on the next page)

Ref.	Concept	Source(s)
L17	Sources don’t know what’s possible	Laporti et al. (2009) Blais (2011, pp.200-204) Davey & Parker (2015)
L18	Inadequate stakeholder anaylsis	Coughlan et al. (2003, p.530) Blais (2011, p.114) Cadle et al. (2014, p.103)
L19	National culture differences affect how priorities are formed, and how managers and organizations behave	Tuunanen & Kuo (2015) Rubino et al. (2020, p.1564)

Table 15: ICO stemming from the project, process or the various stakeholders

The following table lists all those ICO uncovered from the interviews, that do not have a direct and/or apparent link to the communication theme, but rather to the project or client:

Ref.	Theme	Code	Description/Quote
BG3, AT4, BG5, AT6, AT7	ICO rooted in the requirements source (but not directly communication-related)	They don't know what they want/need	-
BG3, AT4, AT7		Lack of cooperation from req-s sources	Stakeholders are slowing down, hindering or complicating the process by not being able to provide needed information
BG2, BG3	Project/process circumstances	Internal (client) disagreement	Disagreement internally between stakeholders, as an obstacle to obtaining requirements
BG2		Internal (client) resistance	*Internal resistance* from stakeholders that are non-friendly, or even hostile to the project
AT4		Lack of access	No access to essential components needed to establish requirements
BG8		Lacking tools	Lacking (software) tools for more efficiently conducting requirement gathering
AT6		Requirements not documented	If requirements are needed for future reference, but were not documented, future RE efforts with the same client may be hurt
AT4		Changing circumstances	Changes in circumstances and/or requirements themselves in the middle of a project can lead to gaps and inconsistencies
BG8		Can't make everyone happy	-
AT7		Locating the right req-s sources	-

(continued on the next page)

Ref.	Theme	Code	Description/Quote
AT4	Rooted in the requirements themselves	Requirements complexity	Requirements themselves often have hidden requirements and dependancies (*system boundaries* that have to be overcome)
AT4		Inconsistent requirements	-
BG5	ICO originating with the elicitor	Necessary input is missed	Necessary information was not procured in time, and has to be additionally gathered
AT1	Other ICO	Unhappy with lack of involvement	The respondent feels they are not able to see the whole picture when it comes to the requirements process and purpose

Table 16: Codes and themes in the 'ICO to RE' category (part 2)

It seems that the ICO to RE are as various as they are many. This notion is echoed by the interview results. All respondents, except one, outlined multiple different RE problems. In fact, practitioners each quoted an average of ~6 different ICO to RE.

In general, there is some alignment between the two observed countries. BG3, BG5, AT4, AT6 and AT7 have all been assigned codes that fit together in the theme *ICO rooted in the requirements source (but not directly communication-related)*. Meanwhile, both AT4 and BG8 have expressed the problem that they lack specific components and tools, which would help with more effectively conducting RE – for reference, the codes are *Lack of access* (AT4) and *Lacking tools* (BG8). Neither code has been matched to any of the theoretical concepts.

Some direct matches are clearly visible in the current subsection:

- Concept L14 is echoed by code *Inconsistent requirements* attributed to AT4;
- Concept L15 is echoed by code *Lack of cooperation from req-s sources*, which is valid for BG3, AT4 and AT7, as well as by codes *Internal (client) disagreement* (BG2 & BG3) and *Internal (client) resistance* (BG2).
- Concept L16 is echoed by code *They don't know what they want/need*, which is valid for BG3, BG5, AT4, AT6 and AT7. This does really seem to be a universal problem;
- Concept L18 is echoed by code *Locating the right req-s sources* attributed to AT7;

There is also a partial matches with concept L13. It is closely related to code *Changing circumstances* attributed to AT4.

Finally, there were a number of codes that couldn't fit anywhere else, and also don't match any of the theoretical concepts. Still, they are worth calling attention to, because they offer interesting information. These are: 1) *Can't make everyone happy* (BG8) – referring to project circumstances; 2) *Requirements complexity* (AT4) – hinting to ICO coming from the requirements themselves; 3) *Necessary input is missed* (BG5) – hinting to ICO coming from the elicitor; and 4) *Unhappy with lack of involvement* (AT1) – a limitation coming from the organization in this respondent's case – either from its structure or from its team dynamics.

Requirements sources

From the data exhibited and analyzed so far, and from the revealed findings, another concept could be tackled – that of which ICO to RE stem from the requirements source specifically.

To move towards uncovering this, the following steps will be taken:

1. start with a full list of ICO that were uncovered in interviews, then
2. narrow down by those that involve the requirements source in any way, and finally
3. extract those ICO codes, in which the requirements source plays a key role.

The overview of all the codes in this category was already made available in Figure 21 on page 55. From it, we can narrow down the list to include only those where the client is involved:

Ref.	Theme	Code	Description/Quote
AT1	Communication-related ICO	Talking vs. drawing	Perceived difference in expression between the German-speaking world and the Asian world
AT1, AT7		Language barrier	Comes from differences in 1) language mastery levels or 2) what meaning is assigned to a term
AT1, BG5		Difficulties in under-standing each other	-
AT1, BG3, BG5		Difficulty in clearly expressing needs	The requirements source has an idea of what they want, but for whatever reason cannot express it clearly
AT7		Weak confirmation	Not having written evidence of confirmation could lead to problems down the line
AT1, BG3, AT7		Knowledge gap as RE obstacle	Differences in professional/educational background can lead to lack of comprehension
BG3, BG5		Unclear/incomplete requirements	-
BG3		Needs are hard to express in writing	*from just the written part it's hard to get an understanding of what the author really needs*
AT4		Solution's benefits are unclear	*this is a big problem, because (I think) the customer should define the benefits of the system, not how the system works or how the benefits are provided*
BG2, BG3	Project/process circumstances	Internal (client) disagreement	Disagreement internally between stakeholders, as an obstacle to obtaining requirements
BG2		Internal (client) resistance	*Internal resistance* from stakeholders that are non-friendly, or even hostile to the project
BG3, AT4, BG5, AT6, AT7	ICO rooted in the req-s source (but not directly communication-related)	They don't know what they want/need	-
BG3, AT4, AT7		Lack of cooperation from req-s sources	They are slowing down, hindering or complicating the process by not being able to provide needed info

Table 17: ICO to RE, which involve the requirements source

From this finding it becomes apparent that many ICO involve the requirements source in some way. From a total of 28 codes in the *ICO to RE* Category, 13 are associated with the client, among other factors – that's almost half. This is, however, only half the story. When we add to this the other perspective – that of how frequently these codes were encountered, the picture becomes even clearer. The codes listed in Table 17 on the previous page accumulate a total of 24 mentions, while all the rest of the *ICO to RE* codes contribute only 16 mentions.

As a next step, those codes are extracted that represent a pivotal role of the requirements source. They are actually not many – just 4 codes match such a description:

1) Difficulty in clearly expressing needs;
2) Solution's benefits are unclear;
3) They don't know what they want/need;
4) Lack of cooperation from req-s sources;

The first thing to point out is that, while 2) has only one mention, the other three listed codes were among the most frequently encountered in this Category. 1) and 4) have 3 mentions each, while 3) boasts an impressive 5 mentions. The latter finding becomes even more significant when we consider that the average mention frequency of codes in this category is 1.53. It is clear that this constitutes a notable challenge and an obstacle to be overcome.

There is also a symmetry that is worth noting: 1) and 2) are assigned to theme *Communication-related ICO*, while 3) and 4) are assigned to the theme *ICO rooted in the req-s source (but not directly communication-related)*.

4.3 Introducing the 'culture' variable

As a starting point for exploring culture-related interview findings, the cultural framework outlined in Section 3.3.2 will be used. Empirical data collected on the basis of the Hofstede framework shows some sharp contrasts in how dimensions of national culture (NC) vary between the two countries currently studied – Austria and Bulgaria. This is most clearly visible in Figure 16 on page 42. To reiterate:

- The six dimensions of NC are represented by the indexes PDI (Power Distance), IDV (Individualism vs. Collectivism), UAI (Uncertainty Avoidance), MAS (Masculinity vs. Femininity), LTO (Long-term Orientation) and IND (Indulgence vs. Restraint);
- Research shows that Austria's and Bulgaria's scores differ significantly on 4 of those 6 metrics. This is best visually represented on the aforementioned Figure 16;
- For PDI, AT scored 11, while BG had 70;
- For IDV, AT scored 55, while BG had 30;
- For MAS, AT scored 79, while BG had 40;
- For IND, AT scored 63, while BG had 16;

Before introducing the interview data and resulting codes, it should be noted that these include both the respondent's own accounts, views and opinions, as well as the author's observations of respondent statements in general. Even though the emphasis is put on the latter, some codes directly represent the practitioners' own views on cultural peculiarities. Figure 22 below lists all codes in the *Cultural context* Category:

	A	B	C	D	E	F	G	H	I	J	K
1	#1	#2	#3	#4	#5	#6	#7	#8	Set	Code	Freq
17	x			x		x	x	x	B	No clear hierarchy within the team	5
18							x		B	Respondent operates independently	1
19						x		x	B	Sociocracy	2
20			x		x				B	Responsibility varies with rank	2
21	x		x		x	x	x	x	B	Team is native	6
22		x		x					B	Team is multicultural	2
23	x			x			x		B	Respondent from a foreign culture	3
24	x								B	Lacking challenges	1
25	x								B	Freedom of expression	1
26	x								B	Little to no creative freedom	1
27			x	x			x		B	Creative freedom	3
28	x								B	Unclear purpose	1
29	x								B	People are punctual	1
30				x					B	Chinese avoid negative responses	1
31				x					B	Germans report bluntly	1
32		x	x	x					B	Formal work atmosphere	3
33					x	x	x	x	B	Casual/relaxed work atmosphere	4
34					x				B	Using first name to show friendliness	1
35		x							B	Respondent is culturally competent	1
36		x							B	AT more structured than BG*	1
37		x							B	BG more creative than AT*	1
38		x							B	DE+AT are quite hierarchical*	1

Figure 22: Codes from Set B, which groups the codes representing the Cultural context Category

*The bottom three entries represent the respondent's own views, experiences and observations

The first and most apparent thing to note is that in the majority of the respondents' cases, their team or business unit was mostly or fully comprised of people from the local region. The only two exceptions comprise one from Austria (AT4) and one from Bulgaria (BG2). Meanwhile, only in the case of AT1, AT4 and AT7 they were foreign to the region they were working in.

The other striking pattern is that the code *No clear hierarchy within the team* was valid only for Austrian respondents, with BG8 being the only exception. This strongly resonates with the PDI score that was previously outlined. More support for this was found with code *Responsibility varies with rank*, which was only applied to Bulgarian respondents (BG3, BG5). Furthermore, the code *Sociocracy* represents a company structure where consent is sought in decision-making, and not just a majority. This code was directly quoted from respondent AT6 who used the term. It carried, however, a striking resemblance to what BG8 was saying as well.

Code *Respondent operates independently* was only applied to AT7, but in some ways it also applies to AT4, who was rather marked with code *Disconnected from team members*, part of

Set A (Category *Respondents' work context*). This points to some degree of individualism. Similar codes were not applicable to other respondents.

Another pattern forms around a similar concept to the previous – that of freedom. The code *Freedom of expression* was only valid for AT1, but the concept of *creative freedom* had a higher representation. For AT1 the case was Little to no creative freedom, while for BG3, AT4 and AT7, *Creative freedom* was hinted to exist.

The topic of (perceived) work atmosphere was directly raised as a question in most interviews. Here, obviously, the input could only be considered subjective. With that said, respondents' answers here could help with painting the background of their RE routine. The answers could also possibly explain or give context to some of the respondents' other codes. Views in this theme were rather balanced: BG2, BG3 and AT4 were coded with *Formal work atmosphere*, while BG5, AT6, AT7 and BG8 were coded with *Casual/relaxed work atmosphere*.

Code *Talking vs. Drawing* in Set E (*ICO to RE*) also refers to culture, as the respondent pointed out what they perceive is a difference in expression between the German-speaking world and the Asian world (AT1, 11:36)

Regarding the last two dimensions of NC metrics: MAS and IND, it is not possible to involve them in any of this paper's discussions and analyses. These dimensions represent highly complex and sensitive interpersonal matters. Furtermore, such notions as the ones touched upon in MAS and IND do not fit the scope of discussion topics for the current thesis.

As for the respondents' own subjective views, opinions and observations, it's worth noting that on several occasions, statements and notions about NC were spontaneously expressed by respondents (i.e. were not direct answers to culture-related questions). Here is an overview:

Ref.	Code	Description/Quote
AT4	Chinese avoid negative responses	They could say that everything is good, no problems, even though in reality there could be substantial problems
AT4	Germans report bluntly	Without any regard for how the other will perceive the information or how they will feel about it
BG2	AT more structured than BG*	*According to the respondent's own observations
BG2	BG more creative than AT*	*According to the respondent's own observations
BG2	DE+AT are quite hierarchical*	*According to the respondent's own observations

Table 18: Codes directly connected to the NC topic

Of the listed notions, only the last three fit this paper's topic, and since only the last one has both relevance and connection to the matters discussed here, it could most effectively be addressed without going off-topic. The view expressed by respondent BG2, that Austrians are "very hierarchical oriented" (BG2, 22:30) is an exact opposite of what is shown by Hofstede's research.

5 Discussion

RQ1.1: Comparing and contrasting requirements elicitation guidelines

RE is systematic and methodical – both as described in literature, and as observed in interviews. As represented with the theme *RE is methodical*, 5 out of 8 respondents have given an elaborate account of how the elicitation process is performed in their company's projects. Both countries' respondents agree here. What's more, 6 out of 8 have even demonstrated how RE fits in the overall framework of their project (theme *Elicitation as part of the bigger picture*). This would not have been noteworthy if the respodents were being asked this directly. What's interesting is that these elaborate accounts emerged spontaneously – no questions were asked that would directly require such an answer. Respondents were rather asked about their role in the RE process. The fact they are listing steps and how processes and procedures tie together, indicates that these processes are well-structured. If this is not convincing enough, the code *Requirements not documented* by AT6, under the category *ICO to RE*, is a case-in-point for meaningful benefits to having requirements processes that are well-organized and systematically managed. In the case of AT6, past requirements for an existing client had to be referenced, but were found to not be documented by the previous elicitor. This led to an embarassing situation, where the same information is requested for a second time: information, which was expected to already be with the respondent (AT6, 24:59).

The existence of qualities in most practitioners, like well-developed professional knowledge and perception, and high levels of engagement with their current projects, could also be inferred from the interviews. This makes results overall feel a bit more objectively sourced.

This feeling of order and structure in how practitioners approach requirements engineering is further compounded with the finding that consistency is visible in the things elicitors from both countries focus efforts on. Gaining a profound understanding of what is the job to be done, what are the clients' needs, and what are their expectations, are goals that most respondents quoted as pivotal. This is consistent with what is described in literature, where requirements are often defined to be expressions of the client's needs and expectations.

In addition, interview practitioners are using more or less the same methods and techniques to extract requirements. The fact that literature has outlined the same techniques as most effective, should hardly come as a surprise, but is still worth noting here.

The depiction of RE as an iterative process in literature did not conclusively reveal itself in the interviews. Even though 3 out of 8 respondents' narratives are consistent with this depiction, it falls a little short of making a compelling case.

The same could be said about the notion that RE is something of an investigation endeavor. While this can be considered true for two of the respondents, and while these findings and matches do hold some weight, it cannot simply be attributed to the majority.

When we draw the bottom line, more similarities exist than differences between the two countries studied, in terms of how the RE process is approached and how it is performed. We see a proportional[16] distribution of responses on both Austrian and Bulgarian side for:

- Describing the RE process, as well as how it fits in the bigger picture of the project;
- How RE activities are performed and what are they focused on achieving;
- What methods and techniques are used in performance of these activities;

The contrasts, which were discovered are that:

- only in the case of the Bulgarian respondents multiple people gather the requirements;
- only Austrian respondents touched, in their narratives, upon the need to actively investigate the context of the solution, which they are gathering requirements for;
- only Austrian respondents mentioned using observation as a technique or documents as a source of the requirements;

With that said, the latter two points should be disregarded for conclusions, since they are caused by the specific circumstances of a specific industry or project type.

RQ1.2: Comparing and contrasting pain points in the elicitation process

Literature has clearly outlined a plethora of communication-related ICO. What was observed with the interviews was that such ICO were also frequently encountered by practitioners in both countries. Also when compared to each other, an initial inspection of the codes shows Austria having 11 entries and Bulgaria having 9. It would appear, at first glance, that communication-themed ICO are universally encountered. This adds to the importance of research aiming to study these pain points and ways to alleviate their effects on RE practice.

When, generally, the focus of discussion in interviews switched from the overall (RE process) to the specific (ICO to RE), accounts became a bit more fragmented – i.e. there was no large-scale consensus like, for instance, with the questions of what methods are used to elicit requirements, or what is the focus of elicitation. This was to be expected – while the RE process in general is, ideally, systematic and well-defined, ICO could come in all varieties, shapes and sizes, even when bundled into the *Communication-related* category. This means that each separate account of what constitutes an ICO to the respondent, holds weight on its own. It also means that the goal of the analysis (comparing and contrasting) becomes a bit more staightforward in this case.

Similarities:

- Difficulties in expression or reaching a common understanding with the client, is perceived as an issue by both Austrian and Bulgarian respondents. There was such a

[16] Meaning an exact or approximate match (e.g., 3-3 or 3-4) . It is considered with a min. of 4 samples.

sense when reflecting on the conversations as a whole, even if this was not expressly wrapped in a specific code in some cases;

- Both Austrian and Bulgarian respondents have unveiled ICO that stem from the requirements source. Excerpts from conversations with BG3, BG5, AT4, AT6 and AT7 were coded as *They don't know what they want/need*, with *they* referring to the requirements sources, or clients in this case.
- Both Austrian (AT4) and Bulgarian (BG8) respondents have expressed the same problem. They explained that they lack some tools and components that would help them more effectively conduct RE. These instances were marked with codes *Lack of access* (AT4) and *Lacking tools* (BG8).

Contrasts:

- The *Knowledge gap as RE obstacle*, i.e. the differences in professional/educational background between the elicitor and the client, has been brought up almost exclusively by the Austrian-based respondents. *The* was not used by accident – this ICO was revealed by all four Austrian interview participants (although two of them actually portrayed it as a part of the job, rather than a menace), and by just one of the Bulgarian participants – BG3;
- Another ICO-related theme, that was mentioned exclusively by Austrian respondents, was that of language. It was represented with the codes *Language barrier* and *Talking vs. drawing*. The caveat here is again the circumstances, in which these people work. While two of the four Bulgarian respondents work mostly in their native language, this was only true for one of the Austrian respondents;
- Only Bulgarian respondents shared running into the issue that requirements are unclear or incomplete;

There is one other notable contrast – this time between literature and the interview findings. From the 7 “most critical RE problems in Austria” cited by Kalinowski et al. (2016, p.10), there were no direct matches with any codes attributed to Austrian respondents in the current study.

Finally, the codes *Can’t make everyone happy* (BG8), *Requirements complexity* (AT4), *Necessary input is missed* (BG5) and *Unhappy with lack of involvement* (AT1) helped generate interesting insights, and showed that the elicitor, and even the requirements themselves (in the circumstances of the project) can be ICO to RE. However, they neither correspond to any the outlined theoretical concepts, nor to any other previously discussed theme. Furthermore, they are too different to attach to any other discussion.

RQ1.3: Pain points originating with the requirements source

The analysis clearly showed how big of a role clients play in the effectiveness of RE efforts. Uncovering different ways, in which this is the case was one of the successful outcomes of the qualitative data collection. As a main issue being experienced in terms of the requirements sources’ role, one specific instance could be cited. These sources often times don’t know what

they want, what they need, and/or what is possible. When we add to this the existing hurdles caused by the multi-faceted complexity of communication, the job of transferring one's vision from their own mind, through multiple different people and finally to the finished product, becomes really hard to do right. This was observed to be the case in both Austria and Bulgaria, as well as in multiple cited studies.

Indeed, the other major problem observed with requirements sources is how often they can't communicate their ideas and their vision clearly. Sometimes they simply fail to properly and clearly convey wants and needs. Other times they overcomplicate the discussion. And other times they fail to even take part in the discussion in a timely manner, leading to delays and blockers.

RQ1.4: Different dimensions of national culture

Data from studies based on the Hofstede NC model have revealed major contrasts between Austria and Bulgaria on four of the six available metrics (PDI, IDV, MAS and IND). However, only two of those metrics (PDI and IDV) could be effectively compared to data from the current research. Only those two meet the criteria of a) fitting within the subject and scope of this research, and b) being applicable to the interview topics discussed with participants.

Out of those two metrics, however, only one (PDI) showed consistency with previous study results. Still, there were multiple consistencies, and this strengthens existing claims. PDI represents the differences between power being given low versus high importance in a culture. On this metric, Austria had the lowest score out of all studied, and sharply contrasting with Bulgaria – with 11 versus 70. The interview results from the current research were consistent with this finding in multiple ways. For instance, a lack of a clearly outlined hierarchical structure was observed almost exclusively with Austrian respondents. Also, sociocracy as a concept was introduced by one of the Austrian respondents. Sociocracy is a decision-making structure, where priority is given to consensus, rather than seniority and/or influence. Meanwhile, with respondents based in Bulgaria it was almost universally the case that one's rank within the organization determines things like responsibility, leadership opportunities, as well as access to a wider spectrum of stakeholders.

The other metric in question (IDV) was not as well-represented, but also showed existence of touchpoints. Most notably, operational independence was observed with respondents – even if just with two of them.

Another notion could be considered in some ways related to this topic, but not entirely. It's the notion of operational freedom. More specifically, freedom of expression and creative freedom were assigned, and mostly to Austrian respondents (3 Austrian and 1 Bulgarian). This means that for IDV, unlike PDI, the result was inconsistent with results from the Hofstede study.

The rest of the culture-related context data extracted from interviews, serves not so much to add to, or subtract from, previous findings on cultural differences between nations, but rather to show in what circumstances requirements are being collected. With that said, these details are not crucial, or even that important to the flow of requirements-related work. They merely add the much-needed context, which we have to keep in mind when comparing RE practices between nations.

6 Limitations

The first entry here would, perhaps, come as no surprise. It should still be mentioned, as it is an important constraint to make clear in an academic paper. The narrow time and human resource constraint (only one researcher), that is characteristic of a master's thesis, has led in this case to limitations such as:

- Relatively low and insufficient number of primary data samples. The number of interviews conducted (8) means that this research cannot claim to be a full-scale one. As was already specified, this project does not aim to provide proof, but rather indications, or lack thereof. Further to this, it is worth reiterating that this paper does not aspire to draw generalizations and large-scale conclusions about the studied populations. As Saunders et al. (2019) point out, "purposive samples cannot be considered to be statistically representative of the target population" (p.321). The deficiency of primary data was attempted to be, at least partially, offset by complementing it with secondary data – that from literature sources.
- The paper utilizes only one cultural framework for its analytical part. In further studies, this approach might be replicated with other frameworks, or perhaps even with multiple, compounded NC frameworks.
- Only two countries were observed, and both are part of the same continent and global geographical area. It would be interesting to see intercontinental results, or research on RE that spans a multitude of different cultures.
- Even though different requirements management practices as a variable may affect the flow and success rate of RE efforts, the current thesis research did not account for this variable. To do so would make it reach beyond its scope and beyond the time limit. Furthermore, it could lead to excessive complexity, and would make the interviews twice as long, which, in turn, woud make it hard to find willing respondents.

Then, as useful as Hofstede's framework is in highlighting differences in societies across the world, it might be considered to also come with certain limitations.

The Hofstede NC dimensions framework is based on the notion that certain cultural characteristics define a nation state. However, many countries host more than one culture, especially when we account for the diversity of ethnic groups within. And, often times, a country is comprised of a multitude of these ethnic groups. By labeling a country in a specific way, that label is applied to all these ethnic groups by default, and this is more or less stereotyping. On the flipside, we can consider that the cultural traits exhibited in the study, the "collective programming of the mind" Hofstede (2001, p.1), represent dominant collective values of society at large within the country. In other words, even though differences exist between ethnic and social groups, they are greatly outshined in scale by the similarities that define that nation's population. Nevertheless, looking through Chapter 10 of *Culture's Consequences*, Hofstede does admit that differences between regional and ethnic subcultures should be accounted for when pursuing this topic further (p.462).

What's an even more prominent limitation of the Hofstede cultural dimensions research, and a cause for criticism is the cultural bias of the researchers themselves. The theoretical

concepts and frameworks it builds upon are almost exclusively Western in origin (Sánchez & Brühwiler, 2015, Chapters 1 & 2). This inevitably adds some stereotyping, as observations are a matter of perception; and external observations are bound to be at least partly contaminated with the observer's own values. Sure, the authors cite non-Western sources as inspiration as well, but the empirical data they collect is shaped by inquiries of their own design. What's more, Hofstede himself (2001, p.352) acknowledges that his IBM research, in the design of its survey questions, was not free from Western cultural bias. He admitted that, even though the research team put conscious effort in avoiding cultural bias by ensuring the questions are designed by researchers of different cultural origin, the dynamics within the research crew resulted in analysts from Western backgrounds having disproportionate influence on the formulation and content of these questions. This was reportedly the case as a result of the larger authority that certain researchers enjoyed. While Hofstede states that "doing research without culture bias is impossible", and that "there will always be a researcher effect" (Hofstede, 2001, p.352), these biases – both from a theoretical and from an empirical perspective – are worth keeping in mind.

Furthermore, the qualitative analysis in Section 4.3 with regards to culture shows potential for deeper and wider analysis. Due to the time constraints involved in writing a master's thesis, however, the analysis was not expanded and extended beyond the key observation and discussion points. This is one of the obstacles to performing research (even small-scale) on a complex topic like culture. This is why the author, instead, tried to systematically describe a sample approach to looking at the problem, and then exhibit the extracted data, along with notable insights.

Finally, the results of analysis for RQ1.4 were not sufficiently conclusive. Therefore, concrete conclusions and generalizations could not be realistically and objectively reached. Instead, the results have led to comparisons, descriptions of occurences, and insights. All of these, when combined with other contextual details gathered in interviews, could be interesting to explore further in the context of RE.

7 Conclusion and implications

The practices and methodology that practitioners were observed to be following is consistent with what is described as best practice in literature. The results also show uniformity in how practitioners of different backgrounds and circumstances approach the RE process. There seems to be consensus on key notions like the importance of a) an organized and structured approach to RE, b) focusing efforts on discovering what the actual needs and expectations of the client are, and what is the job to be done in general, as well as c) keeping track of the bigger picture, of how the requirements will fit in and affect the project.

Consensus was also reached on procedural elements. Practitioners were found to utilize the same main elicitation methods and techniques, with a few exceptions that are based on specific industry or project circumstances. Practitioners were also found to have similar scopes of requirements-related responsibilities, for example both gathering and managing these requirements. In general, triangulation has helped enhance the validity of interview findings.

The observed differences between the practice in Austria and Bulgaria mainly had to do with the specific professional circumstances that the practitioners were in. The only sharp contrast that was drawn, is that the gathering of requirements for the same project by multiple people, was only observed in the cases of the Bulgarian respondents.

Communication is a multi-faceted subject and is the glue holding modern society together. It is the means of exchanging information, knowledge, feelings, and commands, among other things. Therefore, it is always a relevant discussion point – even more so when armed with empirical findings, like those presented in Chapter 4.

Those findings were consistent with each other overall, as they show that communication-related ICO to RE are universally-encountered and affect a large portion of the elicitation proces. Furthermore, there are many different manifestations of communication-related ICO.

It was also made clear from the analysis that ICO often stem with the requirements source themselves. This is a notion that is backed by literature as well. The frequency of encountering such issues, as well as what part of the overall picture they fill, shows that more attention should be given to planning around these obstacles and minimizing their impact. The client is the one holding the answers, but these answers are not always within easy reach. Far from it. This should not be considered a fault, but rather a circumstance that has to be considered. The client is not at fault for not being able to give the most clear requirements most of the time. The elicitor is not at fault for not being able to extract these requirements. The answer probably lies somewhere in the middle. Regarding outcomes – they can depend on many different factors beyond just those two.

The best defense against detrimental outcomes seems to be a systematic approach, good preparation and knowledge of potential pitfalls. Of course, the circumstances of the specific project shape much of the picture, and therefore generalizations are not always useful. As to whether such outcomes could be avoided altogether, and how, are questions that are not only complex, but also require further analysis and experimentation, including from different perspectives.

The insights generated so far could benefit a wider study of RE problems by helping narrow down the categories of pain points. Communication ICO were found to be among the most frequently encountered and important to address. Those types of ICO were analyzed starting with Section 4.2. They exist not only according to literature, but were also observed in the interviews, which are part of this thesis' qualitative research. Adding further validation to the list of most frequently encountered ICO to RE would aid efforts to consolidate the findings and move towards searching for ways of mitigating these ICO.

Literature on RE has been enriched with a plethora of studies throughout the last few decades, and even within the modest research scope of this thesis paper, multiple books and papers were found that attempt to define the field, its practices and the challenges it faces. What seemed to be lacking were new perspectives. New angles, from which RE is viewed and new disciplines that it is crossed with. The current thesis project attempted to address one such underexplored intersection – that between RE and NC. The aim of this research was not to generate proof, or new facts and theoretical models or frameworks. Instead, its goal was to explore this intersection and perhaps uncover interesting insights. This could be deemed successful, as a few relevant questions were raised that could be answered with further research. Through systematic collection, preparation, presentation and interdisciplinary analysis of the data, patterns emerged that led to some notable questions, including:

1) Which organizational structures would better promote diligent RE efforts?
2) Does RE benefit more from a collectivist, or an individualist approach?
3) How does remote work affect RE efficiency?
4) How can communication between elicitor and requirements source be improved?
5) How well do current best practices in RE fit into agile software development methodologies that are currently predominantly utilized?

Finally, the scope of analysis of RE in this paper is narrowly defined, as it only focuses on the specific context of software development projects. However, the principles outlined and insights generated, could widely apply even outside the circumstances explored in this thesis. The main benefit of thinking about RE is allowing oneself to think in *requirements*. Basically, not so much "What do they need?" and more like "What is the job to be done?". This sort of thinking could apply to a multitude of professional situations, where some specific thing, or a bunch of things are needed, in order to achieve a positive end result. It could probably be applied to most professions that include problem-solving, for at least some elements of their work. This should come as no surprise. But more interestingly, this sort of thinking could also bring benefits to one's personal life. Any time a complex undertaking lies ahead, and there are multiple variables and things that could go wrong (for example when planning important events with lots of attendees, or sorting out civil administrative tasks), it helps to have a clear vision of what exactly the job to be done is, what is expected, and how can the core needs fit this vision. It is also important to stay on the path and not lose sight of that vision. The systematic and methodical spirit of the RE process could be evoked in such scenarios to positive effect.

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Appendix

Appendix 1: Research Information Leaflet

FH Vorarlberg
University of Applied Sciences

Research information leaflet

The effects of national culture on requirements elicitation practice: an inquiry with Austrian and Bulgarian professionals

Master Thesis

University of Applied Sciences Vorarlberg
Programme: **International Management and Leadership**

Researcher
Todor Todorov

Supervisor
Prof. (FH) DI (FH) Heidi Weber Ph.D.

Dornbirn, 13.02.2022

Master's Thesis working title:

The effects of national culture on requirements elicitation practice: an inquiry with Austrian and Bulgarian professionals

Researcher:

Todor Todorov

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⚠ Interviews and all communication linked to the research will be treated with strict confidentiality. Conscious effort will be spent so that no information is used that can directly or indirectly identify the respondent or their organization (both will be anonymized in the research paper).

Research purpose and aim:

In the process of writing the term paper for my specialization course, I became very interested in the fields of business analysis and requirements engineering. Now, for my diploma research, I decided to pursue a specific subject in need of further study – requirements elicitation (or gathering). My preliminary literature review found that professionals face obstacles beyond their control in eliciting the right requirements, which negatively affects the success rate of software development projects. I intend to study whether the way, in which things are done and are communicated, varies between different cultures, and how this affects elicitation.

As an integral part of the qualitative research of my Master's Thesis, I am looking to reach beyond established theory by finding out what challenges requirements gatherers face in practice. I then intend to process this data through the lens of national culture dimensions.

The knowledge, that would hopefully be gained, would help produce insights that may prove useful (or at the very least relevant) to both researchers and practitioners. As an end goal and guiding principle, this research aims to help improve the success rate of development projects for software products or systems.

Expectations from you as a respondent:

I invite you as an interview partner, for an interview estimated at 20-30mins in length, that is to be conducted via online call. The interview is designed to be semi-structured, meaning that even though I have prepared broad questions beforehand, the interview is intended to feel more like a conversation, in which I ask follow-up questions, depending on your replies. The list of topics discussed you will find below. Note that the interview will be recorded.

Topics covered in the interview:

- company basics: industry, size, age, cultural variety
- respondent basics: position, time in company, team size, level of responsibility
- the role of the respondent in requirements management initiatives in the company
- typical approach when preparing for/performing requirements elicitation(gathering)
- elicitation methods and techniques used *(if applicable)*
- are the requirements sources most often external or internal?
- difficulties, obstacles and issues to requirement gathering efforts

Why you would want to take part in this study:

While no material rewards are offered in return for participation, respondents are offered the final thesis paper. Therein you will find information concerning the current theoretical perspectives on requirements elicitation and the differences in national culture between Austria and Bulgaria. This information is expected to be professionally relevant to you, and may also bring new insights and perspectives that might prove useful in your daily practice – for example, if and how national culture affects the elicitation process, as well as what differences (if any) exist in the way things are done in different regions.

Do you have to take part?

Taking part as an interview respondent is completely voluntary, and you are within your full right to refuse participation, refuse to answer any of the questions, or withdraw at any time without any consequence whatsoever.

With that said, your participation is greatly appreciated. This research is designed in a way that aims to respect your best interests.

Appendix 2: Participant Consent Form

FH Vorarlberg
University of Applied Sciences

Participant consent form

The effects of national culture on requirements elicitation practice: an inquiry with Austrian and Bulgarian professionals

Master Thesis

University of Applied Sciences Vorarlberg
International Management and Leadership

Researcher
Todor Todorov

Supervisor
Prof. (FH) DI (FH) Heidi Weber Ph.D.

Dornbirn, 13.02.2022

Participant consent

1. I…… voluntarily agree to participate in this research study titled: *"The effects of national culture on requirements elicitation practice: an inquiry with Austrian and Bulgarian professionals"*

2. I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.

3. I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.

4. I understand that I will not materially benefit from participating in this research.

5. I understand that participation involves an interview as part of this research study.

6. I agree to my interview being recorded.

7. I understand that all information I provide for this study will be treated in strict confidentiality, and will be used only for the purposes of the researcher's Master Thesis.

8. I understand that in any report on the results of this research both my identity and the identity of my organization will remain anonymous. This will be done by changing the names and disguising any details of my interview which may reveal my identity, my organization's identity, or the identity of people I speak about.

9. I understand that signed consent forms, recordings and transcripts will be retained by the researcher only, and only for as long as required by FHV, in compliance with both EU and local data retention policies.

10. I understand that, under freedom of information legislation, I am entitled to access the information I have provided at any time, while it is in storage, as specified above.

11. I understand that I am free to contact the researcher involved in the research to seek further clarification and information.

Signature of research participant

_____ _____

Signature of participant *Date*

Signature of researcher

I believe the participant is giving informed consent to participate in this study

_____ _____

Signature of researcher *Date*

Appendix 3: Interview Guide

Interview guide for the Master's Thesis research on the topic of:

"The effects of national culture on requirements elicitation practice: an inquiry with Austrian and Bulgarian professionals"

Main Theme	Question	Follow-up question	Research interest
Context-forming basics about the respondent and their company	1. Let's start with a few basic facts about your company. 2. And how about **your** place within the company? 3. Do you work in a team? 4. (if yes) What are your main responsibilities within the team?	1. Industry? Size? New/Established? 2. Position? Time in company? Level of responsibility? 3. (if yes) How big?	✓ Building a profile that provides context and background to the data ✓ Helps interpret next answers
Respondent's role in requirements management	5. How would you describe **your** role in the management of requirements? 6. (if not yet mentioned) Do you directly bridge the client-developer gap? 7. Usually, do you gather the req's from sources int. or ext. to your bs.unit?	6. (if not) Who else?	✓ Understanding the relationship between the elicitator and the client
The elicitation process	8. How do you decide which method or technique to use? ***(e.g. meeting..)*** 9. Have you noticed any m-ds and t-ques that you use more than others? 10. How do you select interview/workshop partners for the elicitation? 11. And what is typically your main focus of elicitation?	8. (if not mentioned) Do you also do group sessions or just individual?	✓ Elicitation guidelines ✓ How elicitation is performed in the company
Obstacles encountered	12. Do you recall any obstacles, challenges and issues that you have faced while trying to gather requirements? ***(give examples)*** 13. How often would you say you run into any such obst-/chall-/issues?	12. (if needed) <Inquire further, based on respondent's answers>	✓ Which obstacles the elicitator faces ✓ Which of these obstacles have to do with the requirements source
Cultural setting	14. *(if in team)* Is your team multi-cultural, or are most members from Bulgaria/DACH? 15. *(now in general)* Are decisions made exclusively by your superiors or +you? 16. And would you say the work atmosphere is more serious or more relaxed?		✓ Helps interpret the data through the lens of national culture
Obstacles encountered	17. Do you think that virtual vs. in-person has any effect on this kind of work?	14. Positive or negative?	✓ May bring a new and relevant perspective for the research (COVID)

Statement of Affirmation

I hereby declare that all parts of this thesis were exclusively prepared by me, without using resources other than those stated above. The thoughts taken directly or indirectly from external sources are appropriately annotated.

This thesis or parts of it were not previously submitted to any other academic institution and have not yet been published.

Dornbirn, 06/07/2022 ***Todor Todorov***