

Overcoming Obstacles in Global Requirements Elicitation: A Multicultural Perspective

Kerstin Siakas [International Hellenic University, Greece & University of Vaasa, Finland | siaka@the.ihu.gr]

Elli Georgiadou [Middlesex University, United Kingdom | e.georgiadou@mdx.ac.uk]

Harjinder Rahanu [Middlesex University, United Kingdom | h.rahanu@mdx.ac.uk]

Errikos Siakas [National Archeological Museum, Greece | esiakas@culture.gr]

Nick Meggoudis [Kaizengaming, Greece | n.meggoudis@kaizengaming.com]

Dimitrios Siakas [Hame University of Applied Sciences, Finland | dimitrios.siakas@gmail.com]

Abstract

Nowadays, multiculturalism is the norm. No country or organization is monocultural. Little previous work has been carried out specifically on how culture influences multicultural requirements elicitation. In this paper we look at the importance of culture with the aim of increasing understanding of the role of cultural differences in differences in multicultural requirements elicitation. This paper starts with a literature review demonstrating the importance of raising awareness and understanding of cultural diversity which often causes conflict and mistrust which can lead to failure of any project. The ultimate aim is the improvement of the whole systems development process as well as the resulting products and services. We present the development and validation of the Multicultural Requirements Elicitation (McRE) framework which helps prevent or at least minimize prejudice, conflicts, misunderstandings and misinterpretations arising from cultural differences. McRE is an instrument for carrying out processes, defining the purpose of these processes and the methods that must be used, as well practical suggestions for raising awareness of cultural diversity and reflecting on unconscious bias. Additionally, McRE suggests relevant training and learning. Finally, it advocates prevention and mitigation actions. The rationale and results from the validation of the framework by experts from industry and academia are presented. The validation provided strong indications that the McRE framework is both necessary and suitable for multicultural requirements elicitation in the software development process but also in other domains.

Keywords: Requirements Elicitation, Culture, Multicultural Requirements Elicitation, Process Improvement, McRE, GSE

1 Introduction

Requirements are considered as the most important basis in software development “because, through them, the stakeholders of the system that is going to be implemented, can achieve a common understanding of it” (Mazo et al. 2019). Requirements elicitation is fundamentally a concerted human activity regarding requirements determination through intensive and extensive communication between the requirements elicitation engineers and the various stakeholders, such as customers, end-users, domain experts, product owners and so on.

In this paper we use the term requirements elicitation engineer (a role that is normally aligned with plan-driven approaches to software development) for denoting the software engineers (unlike customers/users) who are involved in and responsible for the requirements elicitation stage of a project. Requirements elicitation involves critical activities necessary for accurately capturing the needs of the stakeholders i.e. those individuals or groups of people with an interest in the system to be developed.

The concept of culture is understood in many different ways, usually depending on the academic discipline involved. In 1952 Kroeger and Kluckhohn identified 164 different definitions of culture and in 1983 Hofstede, who was a social psychologist and pioneer in cultural research, emphasized that “there is no commonly accepted language to describe a complex thing, such as culture”. His definition of

culture is: “the collective programming of the mind, which distinguishes the members of one human group from another” (Hofstede, 2001). The individuals in these human groups are conditioned by similar educational processes, socialization practices, and life experiences and as a result of the “collective programming of mind” they prefer certain culture bound circumstances over others. When expressed in terms of values and beliefs there is evidence that national culture influences organizational culture and individual behavior (Hofstede 2001; Schein, 1985, Siakas, 2002). In different national cultures there are differences in preferences regarding organizational structure, ways of collaborating, communication patterns, motivation strategies, and solutions to organizational problems and so on.

As culture plays a major role in the way individuals communicate and collaborate, it is also an important factor in the requirements elicitation process, and it has a critical impact on system and software quality, and also on costs (Chakraborty et al. 2010). The culture of the individuals participating in the requirements elicitation process may influence both the whole process and the resulting product development.

Our experiences and observations originate mainly from the domain of software-intensive systems and software projects, of which the outcomes and results are nevertheless transferable to other domains as well (Siakas et al. 2018a; 2018b; 2016; 2005; Siakas and Siakas 2015; Siakas and Balstrup 2006).

The focus of this research is on the meaning and the role of culture in Global Software Engineering (GSE) and the influence of culture on the requirements elicitation process. GSE is the root of a global software engineering taxonomy (Britto et al 2016) called sourcing and “*includes some form of external software development*”. Britto et al. (2016) argue that language and cultural factors play an important role in GSE projects.

As a result of the literature review and longitudinal experience from different development approaches, such as Software Process Improvement (SPI), Agile and DevOps, this study proposes prevention and mitigation actions, to address the cultural aspects of requirements elicitation in global settings. We adopted Hofstede’s definition of culture and by raising awareness and understanding of culture as a crucial factor for successful requirements elicitation in global settings, the quality of the whole software process, as well as that of the resulting products and services, are likely to increase.

The spatial and temporal distance gap in GSE as well as language and divergent values of stakeholders of different national, organizational team and professional cultures complicate the communication between the customer(s)/user(s) and the requirements elicitation engineer(s). As a result, even though contemporary synchronous and asynchronous communication tools may be used, communication needed for successful requirement elicitation is influenced negatively (Siakas et al. 2021; Damian and Zowghi 2003). The challenges are intensified compared to developing software in a collocated environment (Aranda et al. 2008; Benguria et al. 2018; Mighetti and Hadad 2016; Sadig and Sahraoui 2017; Siakas et al. 2016). Coordination and collaboration become particularly difficult in the context of GSE due to the need to coordinate many different stakeholders in a distributed multi-cultural setting. Sometimes the users are even out of organizational reach, because they are either unknown or cannot easily be identified for participating in requirements elicitation activities.

The remainder of this paper is organized as follows. In section 2, we introduce prior work identifying the two research variables, requirements elicitation and culture. We subsequently present different Software Development Approaches and how the literature deals with Requirements Elicitation in each of them as well as how culture is viewed as regards to its impact on the requirements elicitation process. The following main section is the description of our methodology and our approach for designing the conceptual Multicultural Requirements Elicitation (McRE) framework developed to encapsulate prevention and mitigation actions that aim to address and minimize the conflicts, misunderstandings and misinterpretations arising from cultural differences gained through research and own experiences from participation in diverse European Projects. The paper continues with the Rationale and Results of the Validation, Discussion and Implications of Findings, Research and Practice and Limitations. Conclusions and Further Work complete the paper.

2 Related Literature

In this section we start studying the literature regarding the two research variables, namely requirements elicitation and culture. The emphasis is placed on the meaning and the role of culture in GSE. Particular focus is put on influences of culture on the requirements elicitation process. Increasingly GSE, also called Distributed Software Engineering, takes place mainly because organizations seek cost-effective alternatives (outsourcing) outside the boundaries of countries (Siakas and Siakas 2015). These decisions are motivated by various reasons with different benefits, such as potential costs reduction, access to certain professional skills, increased competitiveness, flexibility of hiring practices, risk mitigation related to labor and taxes, and possibility of expansion into new markets (Mighetti and Hadad 2016). GSE usually takes place between a mother organization and subsidiaries, partners in outsourcing arrangements and joint ventures (e.g. innovation and research projects) with partners from different countries and organizations.

We concentrate on multicultural requirements elicitation, in which requirements elicitation engineers and stakeholders are dispersed across different national and organizational cultures. A similar situation may appear when different stakeholders and requirements elicitation engineers are collocated but may come from different national and organizational cultures; thus, mutual understanding of concepts may be challenging. Such multicultural relationships are particularly vulnerable to cultural mismatches (Siakas et al. 2016; Siakas and Siakas 2015).

The main threats identified by Mighetti and Hadad (2016) to requirements elicitation in GSE are inadequate communication, language, and cultural barriers, geographical and temporal distances, and knowledge management. These threats result in lack of confidence and engagement, lack of problem domain knowledge, ambiguity, contradictions and lack of clarity in requirements specifications and individual goals (Georgiadou, 2018). Untreated threats initially affect the quality of the requirements elicitation process, and discrepancies are easily propagated to subsequent development phases. Tentative and uncertain requirements, integration inexperience and evolving components are additional threats to the elicitation process (Benguria et al. 2018). It is important to understand the level of threats that a GSE project, by nature, is exposed to. This level depends on varying situational contexts, such as socio-technical aspects.

The human aspects are far more difficult to handle, with situational factors, such as language and communication, domain knowledge of the involved team, and knowledge sharing (Georgiadou et al 2011). Trust between the different stakeholders, and competing interests are potentially distracting for any successful requirements elicitation and process implementation. Threats should be anticipated, and a prevention and mitigation strategy should be developed to minimize risks.

Despite several decades of attempts to capture mainly soft issues related to RE in general and to requirements elicitation in particular, it is commonly recognized that there exists a communication gap between the requirements elicitation engineer(s) and relevant stakeholders on the side of the

customer. The gap between the requirements elicitation engineers and the customers/users is mainly attributed to the distance between diverse professional and team cultures, but in GSE also distance in national and organization cultures of involved stakeholders (Siakas et al. 2016). This gap propagates the problems towards modelling/specification design and implementation of the final product, and finally may end up in the production of a system which does not meet customer needs and requirements (Damian and Zowghi 2003). Despite the importance of requirements elicitation and the problems caused by an inability to understand and meet customer/user requirements (Dijkstra 1972; Alsanoosy et al. 2018), insufficient attention has been paid to this area in Software Engineering (SE) research. Basic semantic differences in viewpoints may also exist when attempting to engage in meaningful dialogue between the problem owning and the problem-solving communities (Bostrum 1989). Requirements elicitation activities increase in significance when the “*culture gap*” between software developers and users is considered (Furxhi 2021). Very little uniformity in the research literature can be found in the context of requirements elicitation.

We maintain that an optimal requirements elicitation process is dependent on the situational characteristics of individual development settings. The nature of the system under development, the requirements volatility (Siakas et al. 2022), as well as cultural characteristics of both the requirements engineers and the customers / users should be understood and managed. This study was motivated by the fact that today multiculturalism is the norm and very little previous work has been carried out regarding how culture influences multicultural requirements elicitation.

2.1 Requirements Elicitation

Requirements elicitation is the first sub-process of Requirements Engineering (RE), a widely studied field, that denotes the systematic handling of systems and software requirements. RE is a significant part of SE, which is accomplished by carrying out a set of activities for discovering, analyzing, documenting, validating, and maintaining the requirements for a system to be developed (Siakas et al. 2016).

Traditionally, requirements elicitation is performed in the beginning of the system development lifecycle (Stair and Reynolds 2017). However, in large and complex systems development, requirements elicitation is often, an incremental and iterative process, completed in parallel with other system development activities, such as design, coding, etc. (Ramingwong 2013).

Requirements elicitation is dedicated to uncovering, extracting, and surfacing the needs, requirements, expectations and preferences of customers/users, including their tacit knowledge. Requirements elicitation involves a multifaceted and iterative activity that relies on effective communication, collaboration and negotiation with all relevant stakeholders, having diverse knowledge domains, through authentic commitment of all involved parties for accomplishing requirements development and prioritization (Siakas et al. 2021). The elicitation phase aims to collect information and

viewpoints regarding application domain, business requirements, customer/user requirements, constraints, security requirements, information requirements, standards etc. (Pandey et al. 2010). It is the process of discovering and understanding the requirements of all stakeholders by the requirements elicitation engineer and disseminating “*what*” the system will do without mentioning “*how*” it would do it (Lauesen 2002). In addition, it involves systems modelling via diverse activities and multiple techniques, such as those for example reported in Pacheco et al. (2018). Both systems modelling and requirements elicitation principally include hard and soft modelling approaches reflecting different factors. When applying hard systems modelling approaches business, social and human knowledge aspects are difficult to articulate (Lopez et al. 2017).

To elicit requirements, the software requirements engineer needs to gain an understanding of the problem to be solved, the business processes in the organization of the user, the way the system will be used, and the application domain of the proposed system. Requirements, functional and non-functional (also called quality requirements (Lehman 2006)), will, in addition to being imbued with culture, have a legal dimension that the system must conform to. For example, when defining the data to be captured, processed, stored, tracked, etc. it is of the utmost importance that laws governing data protection, e.g. General Data Protection Regulation (GDPR), are considered in the formulation of the requirements. Further examples of the law regulating the specification of requirements may well center on issues of accessibility, security, intellectual property, etc.

A requirements elicitation process may be considered as an uncomplicated process of meetings and discussions between the requirements elicitation engineers and the customer/user. However, it is a complex, highly interactive, and time-consuming process due to the number of stakeholders and communications required (Pentry and Salvatore 2015). Problems occurring during the requirements elicitation process add significant complexity to the overall process. Ambiguous requirements are reported as one of the main reasons for product defects (Hussain et al. 2016; Holling et al. 2016) and project failures (Singh and Pandey 2021).

The requirements elicitation and development phase include requirements analysis and allocation, and flow down (a pass-through) of requirements (Pacheco et al. 2018). The systems requirements specification document establishes the basis for an agreement between customer(s) and contractor(s) supplier(s) regarding how the final product should function. Its objectives are to transform the requirements of the stakeholders into formal specifications in order to analyze and implement a system (Mazo et al. 2019). The input from requirements elicitation often overlaps with Critical Success Factors (CSF) of the system under development (Osman and Sahraoui 2018). The Verification and Validation (V&V) of the requirements phase is concerned with the process of checking that the system is in conformance with requirements specifications and that it fulfils its intended purpose.

2.2 Different Approaches of Requirements Elicitation

In plan-driven approaches to software development, such as the Software Process Improvement (SPI) approach, the requirements elicitation process is considered a robust cornerstone. However, the SPI process is considered bureaucratic and time consuming and, thus, mainly used today for large safety-critical systems (Siakas et al. 2005). Ramasubbu et al. (2008) found that structured software processes and models, such as the Capability Maturity Model (CMM) are effective in mitigating the negative effects of work dispersion.

In Agile and Lean software development, the elicitation process is by nature incremental and iterative because requirements are considered to evolve as the customers may change their mind or because of changes in the overall technical and socio-economic environment (Tjong 2008). Agile methods provide a viable solution when the software to be developed has fuzzy or changing requirements. In Agile development, the requirements elicitation appears incrementally as the requirements are specified and prioritized (Schmidt et al. 2013) in an iterative process along with the actual customer/user (often on-site) and other stakeholders. Valuable feedback regarding the product is received through sprint reviews, also carried out together with the customer/user. Hence, it can be said that one of the interactions that facilitate the requirements elicitation process is the sprint review meetings that are used throughout the software lifecycle (Jabbari et al. 2016). In certain companies, which use Agile methods the requirements from the end user are elicited in an iterative process. The role of Product Designers and User Interface / User eXperience (UI / UX) professionals (referred to as requirements elicitation engineers in this paper) is to spot incongruity in viewpoints at an early stage in order to minimize potential gaps. During frequent planning meetings, new requirements are communicated to the development team (Schmidt et al. 2013), as design mock-ups, wireframes, user flows and so on. The aims are to support the development team to mature regarding requirements and readiness (Ramesh et al. 2010; 2017). Communication, both formal and informal, is particularly crucial in agile development for conveying requirements to the team members due to the fact that there is no formal ongoing / iterative requirements elicitation stage. Hildenbrand et al. (2008) studied how and to what extent Extreme Programming (XP), a popular agile methodology with pair programming, can be transferred to distributed development projects for large enterprise applications. They found that

- i) informal communication is principally lacking in distributed environments;
- ii) body language, may be difficult to interpret when using technical communication means;
- iii) communication and coordination are deteriorating due to spatial separation, temporal, and cultural factors.

We also recognize that agile development is an overarching culture on its own (Siakas and Siakas 2007) and conclude that in distributed agile approaches the requirements elicitation needs to be more formal.

DevOps, (Development and Operations) is a recent culture shift in the software engineering domain towards collaboration between development, quality assurance, and operations (Benguria et al. 2018, Lampropoulos et al. 2019). The main

drivers in DevOps are fewer requirements changes, focus on testing, quality assurance, and a fast delivery cycle achieved by feature-driven teams (NewRelic 2018). The aims of DevOps are to deliver value to customers faster and continuously through automation and a predefined way of handling the product development, thus reducing problems arising from miscommunication between team members, and accelerating problem resolution (Ebert et al. 2016). Requirements elicitation occurs through stakeholder participation in an advanced requirement elicitation process with feature mapping and an explicit delivery model (Ebert et al. 2016; Jabbari et al. 2016). In short, we can say that DevOps places focus on the deployment of developed software, whether it is developed via Agile or other methodologies. DevOps also addresses gaps between developers and Information Technology (IT) operations / infrastructure, whilst Agile software development addresses communication gaps between end-users and developers. DevOps does not explicitly deal with cultural issues.

2.3 Culture

The study of culture was traditionally mainly covered by sociologists and anthropologists until the 1980s (Inkeles and Levinson 1969; Kluckhohn and Strodtbeck 1961; Kroeger and Kluckholm 1952). There was a gradual awareness of the significance of culture in management studies (Adler 1983; Järvinen 1997; Schein 1985; Trompenaars and Hampden-Turner 1997). Towards the end of the 20th century Information Systems (IS) and culture, whether national or organizational, became the focus of studies by Davies (1991), Damian and Zongli (2003), Kaarst-Brown (2004); Kaarst-Brown and Robey (1999); Siakas (2002) and Leidner and Kayworth (2006). Hofstede's work-related dimensions of culture (1980; 2001) formed the basis of studies by several researchers including Siakas (2002), Jaakkola (2012), Siakas and Siakas (2015) and started receiving wider attention. Although there have been some criticisms e.g., Fang, (2003) and McSweeney (2002) Hofstede's work continues to inform research in this domain. Gallivan and Srite (2005) argue that the literature mainly focuses on national and organizational culture. They propose the use of Social Identity Theory (SIT), which offers a multi-faceted view of culture as a layered set of forces that shape individuals. Other cultural frameworks, such as the GLOBE studies (House et al 2004) and Trompenaar's cultural dimensions (Trompenaars and Hampden-Turner 1997), show similarities in the different approaches to identifying and defining culture relating to different approaches to solving common human problems.

Even though organizations in global settings, due to increasingly reliance on Information and Communication Technologies (ICTs) and a mutually established way of conducting business, are becoming more team oriented and ostensibly more flattened and culturally more convergent (which implies some degree of universalization and homogeneity), the underlying deep-rooted values and interests of individual societies show divergence (Stohl 2001). To ground our study, we draw on Hofstede's cultural dimensions for national culture, but also for other contexts of culture, such as organizational culture, team culture and professional culture, where Hofstede's dimensions also apply. In

particular, two dimensions, namely Power Distance (expressed as structure) and Uncertainty Avoidance (expressed as degree of rules and regulations) apply to organizational culture (Britto et al, 2016; Hofstede 1994). Britto et al. (2016) only adopted these two dimensions in their extended GSE taxonomy study, because they argued that empirical evidence exists which supports their influence on the organizational level. This is important because projects are usually carried out at the organizational level. Similarly, Siakas (2002) found these two dimensions directly influencing organizational culture, and Siakas and Siakas (2016) only included these two dimensions in their Cultural and Organizational Diversity Evaluation (CODE) tool. We built on evidence from studies using Hofstede's framework and through our empirical differentiation from his conceptualization, we addressed our research questions.

2.3.1 The Importance of Culture

Hofstede (1980; 2001; 2011; Hofstede et al. 2010; 2011), a prominent researcher in cultural issues, defined Culture as “*the collective programming of the mind that distinguishes the members of one group or category of people from others*”. Culture can be broadly understood to be the values, practices and behaviors originating in national, organizational, team and professional environments (Bloor and Dawidson 1994; Hofstede 2001; Siakas et al. 2016). The cultural orientation of a society reflects their complex interaction which may give rise to misunderstandings and misinterpretation of intent. In any decision making the cultural constitution of a team and the decision-making process will be affected by the culture of all involved individuals. Awareness and appreciation of cultural diversity is paramount for avoiding or at least minimizing misunderstandings and conflicts.

Hofstede's definition of Culture implies that Culture can be viewed as an overarching “*umbrella*” covering and affecting everything that is understood, determined, and practiced by human beings. Thus, culture provides individuals with implicit knowledge of the ways to interact and behave in different situations (Alsanoosy et al. 2020). Culture also controls what is acceptable for an individual and what is not, e.g., normative ethics (Spinello, 2022). Individuals may vary from the classifications and stereotypes of the nations they have grown up in. However, Hofstede's work-related values are relatively stable, and they are worth to be considered when organizing work in a distributed multicultural context. We used Hofstede's work-related interrelated values to study and understand the complex network of situational and individual dynamics (Hofstede 2001).

2.3.2 Cultural Aspects of Requirements Elicitation

The cultural orientation of a society reflects a complex interaction of attitudes, behaviors, beliefs, and values exhibited by its members. Cultural orientation is included in cultural learning and may give rise to misunderstandings and misinterpretation of intent (Siakas and Siakas 2015). In today's globalized world, culture is increasingly impacting on how systems are developed, and on their success.

Leidner and Kayworth (2006) aimed to provide insights into our understanding of the linkages between IT and culture. They stated that an area in need of expanded research is culture's influence on globally distributed, culturally diverse, software development teams. They concluded that the degree of fit between the values (national and organizational) of a social group and the values embedded in the IT is an important construct for studying the relationship between cultural values and IT development, adoption and diffusion, IT use and outcomes, IT management and strategy. Leidner and Kayworth (2006) also concluded that IT has the potential for use in organizational culture reengineering efforts. For example, large-scale IT projects, such as ERP systems, impose their own logic on business processes and organizational structures. Different types of technology artifacts, such as collaboration tools, may influence certain types of values. An important result that emerged from their analysis is that groups are more likely to adopt a technology if values of its members match or fit the values embedded within the technology or those associated with its development.

Similarly, Siakas (2002) when studying Software Quality Management in multicultural organizations showed that a fit between national and organizational values is a prerequisite for smooth collaboration. The fit between the values of a social group, that can be expressed in e.g., organization culture, and the values embedded in the IT (e.g., imposed by an Information System (ERP) developed in another different national culture) as described by Leidner and Kayworth (2006) is directly comparable to the results of Siakas (2002) that highlight the fit between national and organization culture.

For assessing the level of fit Siakas and Siakas (2015) developed the Cultural and Organizational Diversity Evaluation (CODE) tool that can be used at organizational, team or personal level. Depending on the results of the assessment they subsequently proposed different actions.

Parallels can be drawn to requirements elicitation from the two studies above. The aim is to find a cultural fit between requirements elicitation engineers and stakeholders and when this is not possible then awareness and knowledge about the different cultural factors involved will help preventing and mitigating problems arising from cultural differences.

The influence of national culture on RE activities, including requirements elicitation, was studied by Alsanoosy et al. (2020). They carried out a systematic literature review on articles published between 1990 and 2018 and identified 16 cultural characteristics that influence activities. They mapped the identified factors into Hofstede's cultural model of six cultural dimensions (Hofstede 2001). They argue that studies regarding the relationship between culture and elicitation practices are still immature and they identified several gaps in the field. Most of the studies they used had been conducted within Asian cultures. The outcomes of their systematic literature review confirm that there is a considerable variation among cultures and the way they conduct requirements elicitation activities. They argue that differences in RE practices result in poor collaboration and cause major disruption to the involved organizations and to the practitioners.

They postulate that requirements elicitation practices adopted by one national culture may work effectively within another culture only if the practices are culturally accepted.

Likewise, Hanisch et al. (2001) argued that the social and cultural aspects of RE and requirements elicitation cannot be ignored because they directly affect the success of systems development. They postulate that *“When the cultural background is different between systems developers and their clients, the use of methodologies, electronic communications and interaction may influence the quality of requirements, which then influences the success of Information Systems (IS) as a whole. There is significant tension created which will impact the effectiveness of the requirements elicitation process”*.

The basic assertion in cross-cultural studies is that national culture, expressed in terms of attitudes, behaviors, beliefs, and values have a direct impact on organizational culture and individual behavior (Hofstede 2001).

Tuunanen et al. (2006) and Tuunanen and Kuo (2015) examined how culture affects requirements and their prioritization, when the customers/users range from a variety of national cultures. They analyzed the requirements of a mobile service, which were collected from Helsinki, Hong Kong, and Las Vegas. They argued that a value-based approach in prioritizing requirements should be used in multicultural settings and for IS development projects that involve subcultures, such as adolescent users or members of specific organizations. In their value-based approach laddering (an interview technique, where the interviewer gives a participant a choice or decision task within a product category and then asks the participant to describe important consequences of the participant’s choice) was used to understand the different perspectives of system end-users. In this way the perspectives were aggregated into maps of how potential new system features connect to and could satisfy diverse consumer values. The result of the interview is a series of attribute/consequence/value chains that represent the interviewees’ preferred product features and their reasoning for the preferences (Taylor-Cummings 1998).

Sadig and Sahraoui (2017) also (without going into depth) looked at the requirements elicitation process in developing countries and argued that the national culture affects to a high degree the requirements elicitation techniques that are preferred and used.

Likewise, Jaakkola (2012) discusses culture sensitive aspects of requirements elicitation. He states that the requirements elicitation process requires a great deal of communication between the requirements elicitation engineer(s) and the customer/user and is recognized as particularly culture sensitive. He postulates that this sensitivity is related to all of Hofstede’s dimensions and suggests that the outcomes of this process determine the success or failure of a project. Similarly, Sarker et al. (2011) argue that the effect of communication manifests itself through trust, as a facilitating glue that has an impact on the success and performance of distributed teams.

In the following section, we provide viewpoints from the requirements elicitation with reference to Hofstede’s dimensions (2011; 2001; 1980; Hofstede et al, 2010; 2011).

2.3.3 Hofstede’s Cultural Dimensions and the Requirements Elicitation Process

In this section we investigate how Hofstede’s cultural dimensions have been reported in the literature to influence the requirements elicitation.

Power Distance Index (PDI)

Organizational structure within organizations in countries with high PDI reflects a superior-inferior power relationship (Hanisch and Corbitt 2007; Hofstede 2001). Decision-making and communication processes take hierarchical and bureaucratic forms. High PDI enables establishment of behavioral patterns by both requirements elicitation engineer and customer/user, and facilitates the alleviation of tensions between the involved parts. In high PDI countries power normally comes with the title, rank, and status within the organization or in the society (Söderman 2008). A person’s position in the hierarchy appear to be more important than the person’s knowledge about the system to be developed. According to Hofstede et al. (2010), decisions are made and implemented faster in a high PDI organization due to the autocratic decision-making practices. However, the quality of decisions is poorer, because of poor communication, lack of information sharing and scarcity of input from lower-level employees (who may be the final users of a new system). In high PDI orientation societies the level of trust is low (Hofstede 1980; 2001). This was also observed in the study carried out by Alsanoosy et al. (2018) and Hanisch et al. (2001) in Saudi Arabia (PDI=95). Trust, was however, increasingly improved when a good relationship with customers / users was established during the requirements elicitation process (Hanisch et al. 2001). Opinions by top-management showed that high authority people were more valued and taken into consideration when capturing and specifying system requirements. The needs of customer/user were considered less important (Alsanoosy et al. 2018; Hanisch et al. 2001), even though their viewpoint, as main stakeholders, is particularly significant in defining customer/user needs and expectations. Thanasankit and Corbitt (2000) reported that the requirements elicitation was slow, because each time the software engineer in the high PDI country (Thailand, PDI=64) wanted to move forward to gather more requirements he/she needed to get approval from people higher up in the organization. In low PDI societies, such as Finland (PDI=33) technical excellence and opinions of lower-level employees are valued. Employees are treated as equals by managers; they are empowered to freely initiate communication and to participate in decision making; hence they can also take decisions regarding requirements (Siakas 2002). From personal experiences of the authors and from the above examples from the literature we conclude that regarding the requirements elicitation, when dealing with customers from high PDI societies, it is important for the requirements elicitation engineer(s) to identify the appropriate level in the customer hierarchy. This will decrease time and effort and lead to more adequate outcomes. On the contrary when the customers belong to low PDI societies it is important to listen to the voice of the customer at lower hierarchical levels.

Individualism-Collectivism (Ind-Col)

In collectivistic societies reality is constructed around group and social interests, instead of around individual interests (Hanish et al. 2001; Söderman 2008). Collectivism is a tight social framework of in- and out-groups, where the in-group is expected to look after its members. Individuals define their identity by relationships to the group and to others. Hofstede (2001) argues that in collectivistic countries relationships between subordinates and superiors are identified in moral terms like in family relationships. Opinions and viewpoints, when expressed by members of a family or by in-group members, have a greater impact (Söderman 2008). Relationship-oriented behavior is more common than work-oriented behavior in business relationships. Face-to-face communication (nowadays usually held virtually with videoconferencing) is preferred by both customer/users and requirements elicitation engineer(s). People from collectivistic cultures, such as China (Ind-Col=20), typically want to build strong social relationships before they contribute effectively to the requirements elicitation process (Jaakkola 2012). They might think that individualistic people do not wish to settle within the group. By contrast individualism indicates the extent to which a society demonstrates a loose social framework (Hofstede 2001). People are supposed to remain emotionally independent from the group and are expected to take care only of themselves and their immediate families. The dominant value is self-interest. Requirements elicitation engineers that come from individualist cultures, such as the USA (Ind-Col=91), and collaborate with people from collectivistic countries, may consider that too much time is spent on building unnecessary relationships (Jaakkola 2012). From personal experiences of the authors and from the above examples from the literature we conclude that if the customers belong to collective societies the requirements engineer(s) need to show an interest in personal relationships with the customer, whilst if the customer has individualistic values then the collaboration should be strict on a professional level.

Uncertainty Avoidance Index (UAI)

Countries characterized with high UAI, such as Japan (UAI=92), have more written rules, less risk taking, lower labor turnover, and less ambitious employees; all for avoiding uncertainty (Hofstede 2001). High UAI societies prefer stability and rigid managerial guidance and direction. People normally believe in absolute truths and do not tolerate deviance. Jaakkola (2012) found that requirements elicitation engineers from Japan (high UAI), finalize the requirements only after a long and thorough requirements analysis phase. This is attributed to their need for highly organized and structured teams, processes, and outcomes. In low UAI countries, such as China (UAI=30) and Denmark (UAI=23) people expect to face ambiguity, unstructured situations, and little management direction. Anxiety and aggression levels are relatively low, and emotions should not be shown (Hofstede 2001). People seem to be self-controlled, quiet, easy-going, and indolent while in high uncertainty countries people seem to be active, busy, restless, emotional and aggressive (it is acceptable to show feelings and aggression) (Hofstede 2001).

In a study in Denmark (Siakas 2002), the software engineers did not ask for management approval of change requests by the customer/user but instead they informed the manager afterwards that a change had been made. Similarly, Jaakkola (2012) found that system engineers from India (UAI=40) work with the understanding that there will be frequent requirements changes. They also accept ambiguous requirements and implicit understanding of concepts. From personal experiences of the authors and from the examples from the literature we conclude that in societies with high UAI values the requirements elicitation process need to be well organized and structured. In societies with low UAI values the requirements elicitation process can be more flexible with little management involvement.

Masculinity-Femininity (Mas-Fem)

In masculine societies, such as Italy (Mas-Fem=70) the dominant values are assertiveness, competition, money, material success and status items. The performance of employees is important and good employees are rewarded. Career choices are guided by expectations relating to earnings. Social gender roles are clearly distinct. Children are taught to fight back and large differences in gender perceptual ability, boys are considered to be analytic; hence they choose IT professions, while girls are considered to be contextual and nurturing, as they choose caring professions, such as nursing, teaching and secretarial work. In feminine societies, such as Netherlands (Mas-Fem=14) the dominant values in society are caring for others and quality of life. The concern is for quality of relationships, nurturing and social well-being (Hofstede 1980; 2001). Social gender roles overlap, in that both men and women are considered to be modest, tender, and concerned with the quality of life. There exists small gender difference in perceptual abilities and career prospects are chosen based on intrinsic interest. From experiences of the authors and based on Hofstede's findings (2001) regarding Mas-Fem we conclude that in requirements elicitation there may be more competition between individuals taking part in the elicitation process in masculine societies, whilst in feminine societies, factors related to social adaptation might be more important.

Long-term versus Short-term Orientation (LT-ST)

Short-term orientation leans toward past and present as opposed to long-term orientation which shows a futuristic and dynamic mindset. In long-term orientation societies, traditions are inviolable, service to others is important, and success and failure is considered a result of luck (Hofstede 2011). In short term orientation societies, such as USA (LT-ST=26) traditions are considered adaptable to changing circumstances; thrift, prudence and persistence are important, success and failure is attributed to level of effort. From a requirements elicitation viewpoint short-term societies value immediate gratification and satisfaction instead of long-term fulfilment. Inspection and adaptation on the go is the heart of Agility for flexible outcomes, while SPI is a heavy-weight mechanism with robust processes (Markopoulos et al. 2019).

Requirements elicitation considers both functional and non-functional requirements, which in Agile development are further refined and specified into user stories and tasks.

Agile practices focus on functional aspects of the system and non-functional requirements may even be neglected (Levy et al. 2018; Lopez et al. 2017). Long term-oriented societies, such as China (LT-ST=87), on the contrary, value persistence, perseverance, thrift, and adaptability (Hofstede, 2011).

From the experiences of the authors, and based on Hofstede (2011), we conclude that software development approaches, such as Software Process Improvement (SPI), which have a heavyweight requirement elicitation process, that continuously improve and adapt the predefined process to changing circumstances by aiming to a stable and predictable outcome, is preferable in long term societies.

Indulgence versus Restraint (IVR)

In indulgent societies, such as USA (IVR=68) there is a perception of personal life control. Maintaining order is not given a high priority, whilst in restrained societies, such as China (IVR=24), there is a perception of helplessness, meaning that “*what happens to me is not my own doing*”. In these societies there are fewer very happy people (Hofstede 2011). This dimension encompasses the degree to which people and societies can exercise control over their impulses and desires. From the experiences of the authors and based on Hofstede (2011) we conclude that restrain can inhibit the requirements elicitation process but can also inject a thoughtful, considerate and trusting style of working within groups.

3 Research Method and Phases

3.1 Research Method

Kudo et al. (2022) state that informal literature reviews (unlike systematic literature reviews) are relevant for research initiatives, especially in cases based on practice. In this study an informal literature review was adopted enriched with features of integrative or else critical literature review approach, as described in Snyder (2019). The aims of using such an approach are:

- i) to provide the requirements engineers with an overview of the broad scope of culture, and
- ii) to enhance their knowledge and comprehension of the specific topics of cultural aspects in the activities related to software requirements elicitation.

3.2 The Phases of the Study

This study was carried out in 3 phases shown in Table 1.

Table 1: the study phases.

Phase	Description
A	Literature Review
B	Development of a multicultural requirements elicitation framework
C	Qualitative Validation

3.2.1 Phase A: Literature Review

The literature review was carried out in order to expose the different aspects of requirements engineering and requirements elicitation in particular. The scientific library repositories and databases (IEEE, SCOPUS, and Web of Science (WoS)), were selected due to their credibility and consideration as high-impact scientific databases (Aksnes and Sivertsen 2019).

Having identified a gap in the literature regarding the meaning of culture and its importance in requirements elicitation, we further formulated our research questions concentrating on the requirements elicitation process in divergent cultural contexts.

Subsequently we identified a number of cultural factors that have a bearing on successful requirements elicitation.

We considered four types of culture namely national, organizational, team, and professional. Below we list the major literature sources by culture type:

- i) national culture (Hofstede 2011; 2001; 1980; Hofstede et al. 2011; 2010; Fang 2003; Siakas 2002),
- ii) organizational culture (Trompenaars and Hampden-Turner 1997; Schein 1985; Adler 1983;),
- iii) team culture (Siakas et al 2018b; 2016; Siakas and Balstrup 2006) and
- iv) professional culture (Siakas and Siakas 2008; Bloor and Dawidson 1994).

We subsequently considered the influence of culture on software development, requirements engineering, and requirements elicitation:

- i) Software Engineering (Ramesh et al. 2017; Leidner and Kayworth 2006; Gallivan and Srite 2005),
- ii) Requirements Engineering (Spichkova et al. 2021; Sadig and Sahraoui 2017; Tuunanen and Kuo 2015; Damian and Zowghi 2003) and
- iii) Requirements Elicitation (Siakas et al. 2021; Chakraborty et al 2010; Aranda et al. 2008; Thanasankit et al. 2000).

This review process confirmed the necessity of this research. Two main research variables were identified, namely requirements elicitation and culture. Research in cultural influences on the requirements elicitation process is scarce in the literature. Our research aims to fill this gap.

Thus, we formulated the following research questions:

RQ1: Does culture influence the requirements elicitation process?

RQ2: How does culture influence the requirements elicitation process?

3.2.2 Phase B: Development of a Multicultural Requirements Elicitation Framework

In this phase the multicultural requirements elicitation framework (McRE) was developed based on

- i) the work by work of Hofstede (1980; 2001), Schein (1985), Spichkova et al. (2021), Alsanoosy et al. (2018; 2020), Hanisch et al. (2001), Jaakkola (2012), and Thanasankit et al. (2000).

- ii) the authors' combined industrial and academic experience in multicultural setups and in different countries including Cyprus, Denmark, Finland, Greece, Hong Kong, Sweden, the UK; in addition, the framework's development was informed by participation and leadership over 30 years of European Union collaborative projects involving Research and Knowledge Transfer as far as Armenia, Egypt, Georgia, Italy, Jordan, Kazakhstan, Russia, and Uzbekistan.
- iii) Our research over 20 years focused on cultural and organizational diversity (Siakas et al 2022; 2021; 2018a; 2018b; 2016; 2005a; 2005b; Georgiadou et al. 2019; 2003; Rahanu et al. 2017; Siakas and Siakas 2015; 2007; Siakas and Balstrup 2006; Siakas and Georgiadou 2003; Siakas 2002).
- iv) Our research in multicultural requirements elicitation (Siakas et al. 2023; 2022; 2021).

Despite residing in different countries, we maintained coordinated communication by email and/or virtual group meetings. We had a holistic way of working and the framework was gradually developed through shared commitment. Between the group meetings each author worked on the latest iteration and prepared for the following meeting. We drafted the framework and, through 12 refinements, we produced the pictorial version shown in Figure 1. We tested the penultimate iteration with a Scrum Master of an international software development company. Feedback, such as "We might not be able to know what kind of cultural viewpoints become important and so the anticipated cultural viewpoint might be more or less too narrow" enabled us to refine the framework by clarifying and extending the purpose, and by specifying actions. The first version of the pictorial representation of the McRE framework is shown in Figure 1. The triangular representation showing the Tactics and Actions was signifying the gradual focusing from the general to the specific.

3.2.3 Phase C: Qualitative Validation

In this phase a qualitative investigation was carried out in order to validate the McRE framework. This resulted in the construction of the final pictorial representation of the Multicultural Requirements Elicitation (McRE) Framework (Figure 2). During the validation process we reflected on the meaning of the triangular representation in Figure 1 and decided that Tactics and Actions merit equal weight, hence the rectangular representation in Figure 2. In addition, we used the planned and structured interview document, which included the intent of the research, demographic questions and the interview questions.

We subsequently carried out the structured interviews of ten experts who were willing and able to respond. The experts were chosen due to their expertise in the subject under investigation and their position as leaders in their field. They came from different fields, namely the IT industry (7), Energy industry (1), Construction industry (1) Research and Development (R&D) (1). They were situated in different countries, namely Denmark, Finland, Greece, and the United Kingdom. Each interview lasted approximately one hour. The methods used to complete each interview were the following: face-to-

face (4 experts), online tele conferencing (3 experts) and written narratives (3 experts).

All the interviewees utilized the same interview questions during interviewing. In the beginning of the interview process the intent was conveyed by explaining the research topic and the aims of the interviews. The face-to-face and online interviews were recorded and transcribed into a personal document with demographic data of the interviewee together with the answers below each corresponding question. The written narratives were received by sending the interview document to the interviewees who subsequently typed their demographics, grading, responses, and comments.

The thematic analysis of the data was carried out in a systematic and thorough manner to comprehend how experts and practitioners perceive the influence of culture on the requirements elicitation process. This analysis was carried out in the following way: all individual responses (grading, answers, and comments) to each question were transferred under the corresponding question. Thus, below each question all the answers could be seen collectively. We studied the collected responses and highlighted the key points for each category, i.e. we codified the qualitative data and subsequently consolidated the responses into common themes which are shown in Tables 5 to 14. We then considered how these were reflected in the initial framework.

4. McRE: A Multicultural Requirements Elicitation Framework

4.1 The development of McRE

Figure 2 is a visual representation of the McRE framework, which depicts the Processes, Methods & Purposes, and Prevention & Mitigation Actions to be followed for identifying issues of bias, cultural diversity appreciation, and possible challenges. McRE suggests training and learning as well as prevention and mitigation Actions to be adopted. Below we explain in more detail the different elements of McRE and how they are related to requirements elicitation.

4.1.1 Processes

The proposed processes can be carried out in any order and to any degree considered appropriate. For example, there may not be any previous or current projects that are comparable to the one being investigated.

High-level Operational Feasibility Study: Before commencing a new project, a high-level Operational Feasibility Study needs to be carried out in order to determinate whether it is worthwhile to initiate the project or not. Basically, this process aims at identifying business opportunity, potential challenges, and conflicts, and at ensuring top management commitment and managerial support.

Feasibility is a preliminary study that should always be carried out, but in multicultural requirements elicitation it is particularly important to identify the different cultural requirements in the beginning of eventual further collaboration. This process may need to be carried out several times before commencing a project.

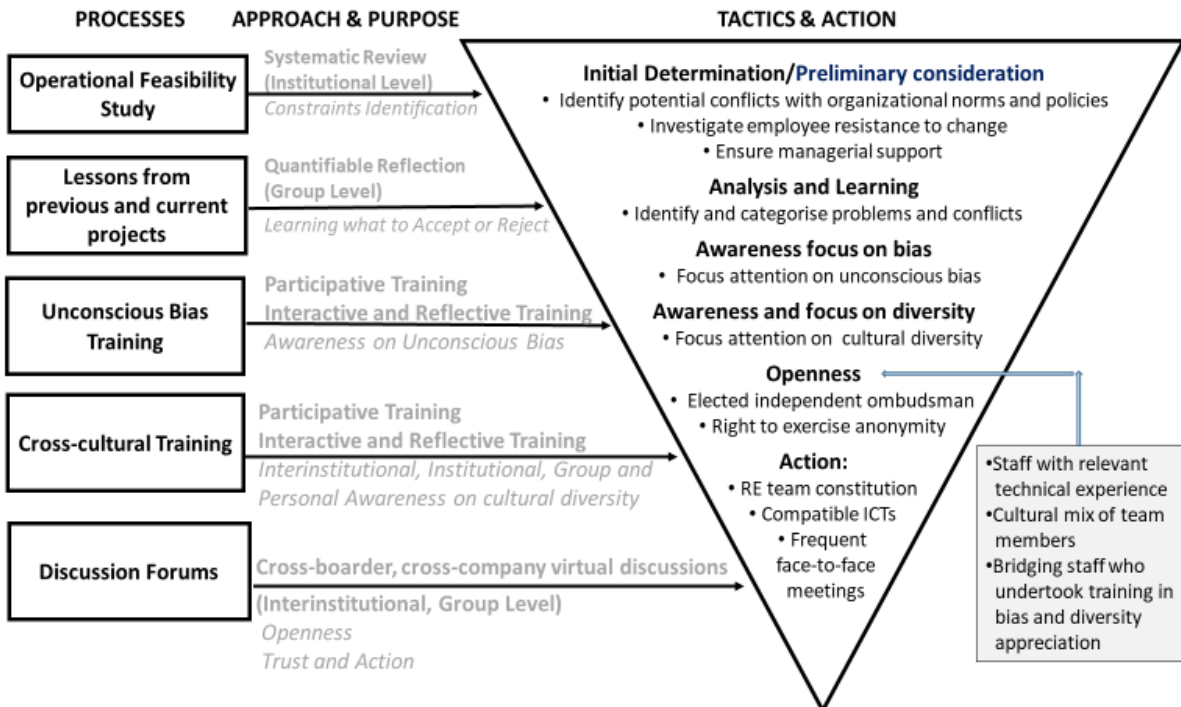


Figure 1: The first version of the pictorial representation of the McRE framework.



Figure 2: The McRE Framework.

Audit of previous and current projects including the identification of eventual projects that can be comparable in terms of culture to the one being investigated. This stage is connected to knowledge sharing and learning and may also have to be returned for several iterations.

Unconscious Bias and Conflict Mediation Training: Unconscious bias and cultural diversity need to be recognized at inter-organizational, organizational, group, and individual levels. Understanding the current situation and carrying out awareness training for both unconscious bias and cultural diversity appreciation forms the bases for increasing awareness of cultural diversity and for overcoming cultural mismatches as well as preventing future misunderstandings and conflicts.

Cross-cultural Training: The aims of cross-cultural training are to help participants to understand and adapt to different cultures and how to interact effectively with people from other cultures. This is particularly important in virtual workplaces where borders are removed.

Open Forums Discussions: In virtual environments the open forums replace the face-to-face discussions which take place in a collocated environment. The right to exercise anonymity in open forums aims to motivate people who are reserved or those who do not express their opinions spontaneously or openly because of cultural attitudes and values. Societies with high Uncertainty Avoidance, for example, imply that people are afraid of ambiguous situations and uncertain of the future (Hofstede 2001). To protect themselves from this uncertainty they may withhold information and knowledge to themselves in order to be irreplaceable (Siakas and Balstrup 2006). Similarly, according to Hofstede (2001) in societies with high Power Distance, superiors initiate communication and high respect is shown to rank and authority, which is neither questioned nor contradicted. Lower-level staff speak up only when invited to do so. These are only two examples, but they provide an indication of the importance of enabling unbiased and fair freedom of expression. Training on conflict mediation, proposed by one of the experts, may also be useful. Such preventative measures are likely to minimize or even avoid failures of the Requirements Elicitation process.

Each of these processes, operates as a set of logically related activities to be completed by all teams, allowing for:

- a better understanding of the situational characteristics of individual development settings;
- a clearer comprehension of the cultural orientation of all involved and thus an enhanced cultural awareness and learning;
- addressing of potential conflicts arising from differences amongst team members (as defined by Hofstede).

These processes help facilitate change. Schein (1985) in his three-stage approach to change (Unfreezing, Moving and Refreezing), which is based on Lewin's Unfreezing-Change-Refreeze Model (1958), suggests that initially old habits, i.e., such as culture, are unfrozen so that they are receptive to change, enabling learning new work methods and behaviors, which are refrozen to make these cultural changes accepted and second nature. These proposed processes in the McRE Framework support the unfreezing and modification of culture, and thus allow for an optimal requirements elicitation process to be achieved.

4.1.2 Methods & Purposes

Each process should be executed using a chosen method with the purpose of achieving certain outputs and/or outcomes. For example, the Operational Feasibility Study should employ a Systematic Review (at Corporate Level) in order to identify necessary changes (cultural and operational) regarding the development of a project and its future exploitation and valorization (Georgiadou et al, 2022; Siakas et al, 2013).

4.1.3 Prevention & Mitigation Actions

The requirements elicitation phase is impacted upon situational factors relating to cultural diversity. McRE proposes a practical set of actions which can preempt or alleviate problems, misunderstandings and misinterpretations arising from lack of cultural awareness, existing unconscious bias, and entrenched prejudice.

As shown in the previous sections, requirements elicitation is a vast field encompassing many processes, viewpoints, and activities.

The following five (5) stages refer to the research papers included in the literature review which informed the definition of each part of the framework.

1. Initial Determination (Go/No-go), Preliminary Considerations

- Identify potential conflicts with organizational norms and policies.
- Ensure top management commitment and managerial support.
- Investigate employee resistance to change.

Examples of relevant sources: Siakas et al. 2021; Siakas and Georgiadou 2003; Siakas 2002; Furxhi 2021; Benguria et al. 2018; Stair and Reynolds 2012; Schein 1985.

2. Analysis and Learning

- Identify and categorize problems and conflicts

Examples of relevant sources: Ramesh et al. 2017; Siakas et al. 2016; Georgiadou et al 2011; Leidner and Kayworth 2006; Aranda et al. 2008; Siakas and Georgiadou 2003; Damian et al 2003.

3. Awareness and focus on bias and diversity

- Focus attention on unconscious bias and cultural diversity.

Examples of relevant sources: BCS 2015; Siakas and Siakas 2015; Ross 2008 Siakas 2002: Ramasubbu 2008; Trompenaars and Hampden-Turner 1997.

4. Openness appreciation

- Frequent face-to-face meetings.
- *Independent coach** for conflict resolution.
- Right to exercise anonymity if requested.

Examples of relevant sources: Siakas et al 2021; Siakas et al. 2018a; Rahanu et al. 2017; Schmidt et al 2013; Söderman 2008.

5. Elicitation Team Constitution

- *Requirements elicitation engineers with relevant technical experience.*
- *Customers/users with good domain knowledge.*
- *Cultural mix of team members with interpersonal and cultural expertise and experience*.*
- Compatible ICTs.
- Bridging staff experienced in involved cultures.

The elicitation process starts with meetings of representatives from both of the side of the customer/user and the side of the development team (referred to as requirements

elicitation engineer(s)). From the side of the customer/user good domain and business knowledge is required and from the requirements engineer(s) good technical knowledge are required.

Examples of relevant sources: Siakas et al. 2018b; 2016; Mighetti and Hadad 2016 Georgiadou, et al. 2011; Schmidt et al 2013, Hanisch et al. 2011; Siakas and Balstrup 2006; Järvenpää and Leidner 1999.

4.3 Validation of the McRE Framework

The expert validation aimed at establishing the degree of importance of the different Processes, Method(s) & Purpose(s), and Prevention & Mitigation Actions as shown in Figure 2, which visualizes the McRE framework. The validation also captured the viewpoints, thoughts, reflections, and suggestions of the participating experts regarding the purpose, the expected benefits, and possible problems, difficulties, and complications that may arise.

For example, the experts were asked to state the degree to which they agree with the purpose and expected benefits of each process or entity (as described in Tables 2, 3 and 4). The scoring used was a Likert scale from 1 to 4 (not at all / a little / quite a lot / very much so).

In Table 2 we present potential prevention and mitigation actions related to processes in requirements elicitation in multicultural environments, their purpose, and the respective expected benefits. These need to be carried out to ensure that all teams, and distributed teams in particular, are composed of suitable people with required expertise in diversity awareness.

In Table 3 we propose characteristics that may support openness within distributed online discussion forums. We divide the open discussion forum entity (from Table 2) into two types, namely, the right to exercise anonymity, and the use of an elected ombudsman (changed to Independent Coach following the validation).

Table 4 presents aspects of elicitation team constitution by taking characteristics of elicitation engineers (field of expertise and experience), mix of team members (including stakeholders) and cultural bridging staff. Meetings require compatibility of ICTs. McRE also includes suggested mitigation actions relating to teambuilding of multicultural teams. The respondents were also asked to justify their choices, and to describe any drawbacks / obstacles they could see with the process(es) under study. In Tables 5 to 14 we summarize the rationale and results of the expert validation. The average of all responses for Purpose and Expected Benefits are shown in brackets at the top of two respective columns. For example, in Table 5 Purpose was scored 3.63 i.e. 91 % and Expected Benefits at 90%. The same pattern of scoring repeats in all other cases presented in Tables 5 to 14, with the lowest score (3.00 which is 75%) appearing in Table 11 which depicts the experts' responses on the Benefits of Appointing an Ombudsman. Reflecting on these responses as well as the criticisms we modified the McRE accordingly.

These results demonstrate a very high degree of agreement with our expectations. The experts also stated that the McRE framework is suitable for multicultural requirements elicitation not only in software projects but also in other domains.

Tables 5 to 14 also show the three most prevalent comments/opinions provided by the experts. Finally, the tables show the critical opinions, drawbacks/hurdles as well as the experts' suggestions. Every table presents the comments of the experts in their own words (shown in italics).

The interview document prepared for the expert evaluation was based on the processes/entities displayed in Tables 2 to 4. Ten expert interviews constituted findings of the evaluation. We chose to exhibit three of the most prevalent expert comments regarding purpose, benefit, and drawbacks / hurdles, which either support or oppose our framework. Most of the opinions supported our McRE framework. Importantly, in a few cases the viewpoints of the experts provided useful insights that resulted in changes to the initially proposed McRE framework. The changes are included in Italics with a “*” superscript in both in the diagrammatic representation of the McRE framework and in all the tables (2-14).

There are three changes which originated from the McRE validation, namely:

- i) Staff with technical experience was changed to “Elicitation Engineer(s) with relevant technical experience,” “Customer(s)/user(s) with good domain knowledge” and “Cultural mix of team members with interpersonal and cultural expertise and experience”.
- ii) Elected Ombudsman changed to “Independent Coach”.
- iii) Unconscious Bias Training was enhanced with “Conflict Mediation”.

Below a more detailed justification of the improvement made based on the validation is provided.

Regarding elicitation team constitution one of the questions asked was regarding the agreement of experts with “*Staff with relevant technical experience*”. All experts agreed that in the requirements elicitation stage technical skills are only needed in very technical domains. Instead, insight in the use of the end-product is needed because the requirements elicitation stage is not a means of assessing the technical feasibility of the project, but of the design stage. Also, customer/user involvement was emphasized. This was corrected in the framework to “*elicitation engineer(s) with relevant technical experience*”, “*customer(s)/user(s) with good domain knowledge*” and “*cultural mix of team members with interpersonal and cultural skills*”.

Regarding the use of an ombudsman the experts did not really see the purpose and necessity of an independent ombudsman in a requirements elicitation team, except of very difficult situations when the team itself cannot find a solution. Instead, they proposed to use coaching for supporting and guiding for openness appreciation, as well as shadowing experienced staff especially when an employee is involved in a multicultural team for the first time. This was viewed as an alternative approach for supporting problem solving, and for preventing possible problems. We consider that the role and meaning of the independent ombudsman is comparable to the role of the proposed coach. We changed the word “*ombudsman*” in the framework to the word “*coach*”, which is a more understandable role, and more prevalent in the responses of the experts. Training in conflict mediation was also perceived by the experts to be important so we introduced it as an entity in the framework.

The characteristics supporting openness (Table 2), “*Right to exercise anonymity*” and “*Use of Ombudsman*” showed diverse feelings by the experts. Some of the experts considered anonymity to be positive (particularly as a starting point if the team members are unknown to each other) because it gives the opportunity to everybody to express their opinion freely, independently of their cultural communication patterns. Others considered that anonymity will not promote trust nor improve team building and could even allow racial discrimination; instead, trust can be gained through openness and transparency.

Table 2: Purpose and expected benefits of proposed cross-cultural requirements elicitation processes.

Process	Purpose	Expected Benefits	Comments
Operational Feasibility Study	Establish feasibility in terms of potential conflicts with organizational norms, policies, managerial support, potential employee resistance. (Furxhi 2021).	Prevention of over-commitment and failure.	The inclusion of involved stakeholders in the operational feasibility process is important, especially if the organizational culture and organizational processes are different (Siakas and Siakas 2015).
Audit of previous and current projects	Identify, analyze, and understand problems and their root causes.	Learning from experience, reflection, and prevention of conflicts.	Identification of risk, complexity, results, costs, quality, added value, internal value (APM 2018).
Unconscious Bias Training (Also called Sensitivity Training) <i>*Enhanced with Conflict Mediation Training following the validation</i> On-line tools, such as Project Implicit ¹ , which assesses the base-line level of implicit bias.	Raise awareness, self-assessment, and reflection. Create an inclusive environment for all people, regardless of age, race, religion, gender, sexual orientation, and health / disability.	Widening own understanding and appreciation of cultural diversity, strengths, and weaknesses. Improving the “ <i>quality of our relationships, raising productivity and improving engagement for better results</i> ” (BCS 2015).	Cultural and language barriers may result in unconscious bias, misunderstandings, conflicts, and project failures. Treating people unfairly at work because of their cultural, racial, and sexual orientation difference may even be unlawful under equal opportunity laws.
Cross-cultural Training Assessments to evaluate training needs by e.g. the CODE tool (Siakas 2002, Siakas et al. 2016).	Raise awareness of cultural diversity.	Appreciation, tolerance, widening of thinking-horizons. Conflict prevention.	Recognition of the fact that cross-cultural training is needed both in advance and continuously for increasing awareness of involved stakeholders’ possible divergent cultural values (Foster 2000).
Open Discussion Forums	Focus on conflicts arising from cultural differences.	Reflection and prevention of conflicts.	Often used in education to motivate students to participate without restraints in discussions.

¹ <https://implicit.harvard.edu/implicit/>

Table 3: Discussion forums openness characteristics.

Entity	Purpose	Expected Benefits	Comments
Right to exercise anonymity Different discussion forum tools are available, such as Zoom ¹ , Piazza ² and Canvas ³ etc.	Erasing fear of reprisals, blame culture. Freedom of speech is considered a very important right; hence also anonymity is imperative (Jiang et al. 2018).	The anonymity protects those who are not ready to be publicly associated with sensitive topics (Pentry and Salvatore 2015). Increased trust and team building on strengths of individuals.	The creation of open forums where participants have the right to exercise anonymity could facilitate equal participation for requirements elicitation feedback by reducing the gap between individuals of differing status, e.g. leaders and subordinates.
Use of Elected Ombudsman <i>* changed to Independent Coach following the validation</i>	Independently enforce legality. An elected ombudsman can be identified to assist lower-level employees and represent them in negotiations with leader level individuals.	Prevention of maltreatment. Enablement of lower powered employees of an organization to equally participate in knowledge sharing practices.	The concept of ombudsman originates in Sweden, where the first parliamentary ombudsman was elected in 1809 (Söderman 2008). The idea was to supervise public authorities by a person independent of the executive to ensure that they act in accordance with the law. The ombudsman is expected to investigate complaints or violations of rights and try to resolve them, usually through recommendations.

¹ <https://zoom.us/>² <https://piazza.com/>³ <https://facdev.e-education.psu.edu/node/325>

Table 4: Elicitation-team constitution.

Entity	Purpose	Expected Benefits	Comments
Staff with technical experience <i>*Changed to relevant technical, domain, interpersonal and cultural expertise and experience.</i>	Construct teams with the necessary expertise <i>*not only technical experience.</i>	Prevention/minimization of failures.	Staff with prior knowledge usually have better insight into the problem area and application of the end-product. Good communication skills, are likely to influence the quality of the system requirements and subsequently the quality of the end-product.
Face-to-Face Planning Meetings Important people meet face-to-face (Siakas and Siakas 2015).	Construct teams without bias combining technical and domain expertise with cultural awareness and appreciation.	Mutual appreciation, prevention, and resolution of conflicts.	When people are in the same room, their body language, emotions, facial expressions, and non-verbal cues are palpable. Small talk, informal settings and understanding of the context that surrounds particular business operations are usually missing in ICT enabled meetings.
Use of cultural bridging staff (also called intermediary, middleman or broker).	Construct teams that include staff with cultural affinity (language, previous experience on multicultural teams).	Facilitation of communication and understanding. Widened viewpoints. Increased likelihood of success.	People rooted in the country of the service provider, as well as in the country of the customer/user, can act as a bridge between the different cultures by moderating disparities in culture and communication styles (Siakas and Siakas 2015).
Cultural mix of project team members	Mix the project team with members with divergent cultural values to break down barriers of culture and language	Multicultural teams broaden viewpoints and add valuable expertise resulting in increased success of projects.	Diversity enhances the ability to find solutions to problems and is imperative for stimulating innovation (Coplien and Harrison 2005). Diverse teams often outperform homogeneous teams (Cockburn and Highsmith 2001; Siakas and Siakas 2015).
Compatible ICTs and processes	Achieve interoperability between different devices or group members to operate in conjunction with each other (Siakas et al. 2016).	Standardizing on the use of common or compatible technologies and common processes for improved effectiveness in virtual environments.	Different ICTs need to work together without alterations. Compatible processes, such as KPAs specified by Capability Maturity Models mitigate negative effects of dispersion (Ramasubbu et al. 2008).

Table 5: Expert opinions regarding Operational Feasibility Study.

Purpose (3.63)	Benefits (3.57)	Drawbacks / hurdles
<i>This is a go/no go decision.</i>	<i>The benefits of this process are better planning, and financial gains in the long run.</i>	<i>Problems due to different management styles, company ownership and unexpected changes of requirements.</i>
<i>It is important to be aware of the different cultural requirements in the beginning of collaboration. Basic pillars as time, resources & quality can be viewed differently by various stakeholders.</i>	<i>When the cultural differences are identified in the beginning the expectations of collaboration become reasonable and conflicts can be avoided.</i>	<i>At this point we might not know what cultural viewpoints will become important. The anticipated cultural viewpoint might be too narrow.</i>
<i>Project wise there should be some basic feasibility/risk analysis.</i>	<i>Early establishment of resource and quality requirements maximize the likelihood of success.</i>	<i>There is a great amount of complexity and unknown factors while working with software development.</i>

Table 6: Expert opinions regarding Audit of Previous and Current Projects.

Purpose (3.57)	Benefits (3.57)	Drawbacks / hurdles
<i>It is very important to use the experience and available information of previous similar projects.</i>	<i>The learning of which kind of cultural differences matter will be improved and will impact positively on new projects.</i>	<i>The biggest problem would be the utilization of tacit knowledge from earlier projects.</i>
<i>By looking at past projects you can identify issues and solutions reached to improve the quality of future ones.</i>	<i>Improvement of quality of new and future projects. There may be solutions that can be useful, and rework avoided.</i>	<i>Possibility of lack of similar projects and situations. Lack of documentation. Defensiveness of project "owners" creating in-team mistrust and competition</i>
<i>Feedback loops are critical in the success of a system, whether this involves a single person, a team(s), or a company that could manage the output of retrospections.</i>	<i>Initial Audits better fit with Industrial paradigms that have production lines that can "learn". Every software project is unique and has different challenges.</i>	<i>Especially in Agile development because of the regular meetings and frequent delivery of tested and finished code there could be shorter Auditing/Retrospection cycles within the project.</i>

Table 7: Expert opinions regarding unconscious bias training.

Purpose (3.71)	Benefits (3.57)	Drawbacks / hurdles
<i>Self-improvement and development can exclude discrimination from the team.</i>	<i>It is important and vital to understand the existing cultural diversity and different ways of thinking.</i>	<i>It may be difficult to design / plan a suitable training that ensures that training meets the audience.</i>
<i>Unconscious bias training encourages a wider viewpoint of unconscious bias.</i>	<i>The employees that participate in this training are likely to become aware of strengths and weaknesses of themselves and of others.</i>	<i>Non-participating staff may claim that they</i> i) <i>are too busy to participate;</i> ii) <i>do not believe that they are biased;</i> iii) <i>are not willing to change long-term held beliefs.</i>
<i>Awareness avoids assuming or believing in some unclear issues.</i>	<i>Dedicated training will support a better understanding of needs / thoughts.</i>	<i>It might be difficult to find out the important viewpoints for collaboration and project management points of view.</i>

Table 8: Expert opinions regarding Cross-cultural Training.

Purpose (3.41)	Benefits (3.12)	Drawbacks / hurdles
<i>The cultural dimension affects mainly cooperation aspects and therefore relevant training would be very useful.</i>	<i>This type of communication involves an understanding of how people from different cultures speak, communicate, and perceive the world.</i>	<i>Discussions are too general/theoretical, and it may be difficult to ensure suitable training that meets the needs of the audience.</i>
<i>Cross-cultural training promotes team working and helps to increase the flexibility and responsiveness of the employees.</i>	<i>All participants would benefit from being aware of cultural differences. Cross-cultural training is a must in cross-cultural projects.</i>	<i>When there is urgency to start a project, such training might be perceived as “waste of time” or causing unacceptable delay.</i>
<i>People who have not been working with other cultures benefit a lot from cross-cultural training. Others might also learn new things.</i>	<i>A dedicated trainer / coach could also facilitate decisions and discussions and support smoother conflict resolving.</i>	<i>In some cases, cross-cultural training may trigger and imply strong opposite and conflicting reactions or even negative actions that can hurt the collaboration.</i>

Table 9: Expert opinions regarding Open Discussion Forums.

Purpose (3.44)	Benefits (3.22)	Drawbacks / hurdles
<i>Open discussion forums may be helpful for avoiding cultural conflicts.</i>	<i>Open discussions will help understanding, smoothing, and will probably eliminate existing conflicts.</i>	<i>A set of tools that make the differences in values, assumptions and thinking visible to all is needed.</i>
<i>People should always be encouraged to speak up and tell their opinion.</i>	<i>Conflict management needs honesty, openness, and dialogue.</i>	<i>Knowledge of cultural differences is key to be able to conduct cross-cultural projects.</i>
<i>When things are openly discussed it is easier to solve the problems.</i>	<i>Criticism, sharing of ideas, active participation in the discussion increases trust and team spirit.</i>	<i>There might be difficulties with some cultures to talk openly and this process might fail in some respects.</i>

Table 10: Expert opinions regarding Right to Exercise Anonymity.

Purpose (3.29)	Benefits (3.17)	Drawbacks / hurdles
<i>Anonymity is not a driver for trust, team building and individual strength. Openness, transparency, and mutual respect is. This requires strong leadership.</i>	<i>Personal strength of the individuals is growing, the team members become more dedicated to the aims of the project and team cohesion is increased.</i>	<i>Building trust among the partners coming from different environments is the main problem.</i>
<i>Anonymity is important, although it may be difficult to implement as an entity of the framework.</i>	<i>Ideally this would help different cultural behaviors that cannot express their opinions openly.</i>	<i>Individuals can utilize anonymity to hide their identity and express different opinions or negative criticism.</i>
<i>Anonymity is likely to increase confidence in expressing viewpoints even if this (viewpoints) are not palatable to managers or other colleagues.</i>	<i>Increased trust is the main expected benefit.</i>	<i>Anonymity could allow hurtful and controversial comments which would not have been used if linked to a person.</i>

Table 11: Expert opinions regarding Use of Elected Ombudsman * changed to Independent Coach following the validation.

Purpose (3.43)	Benefits (3.00)	Drawbacks / hurdles
<i>The purpose and necessity for an ombudsman in a requirement elicitation team is not obvious.</i>	<i>Very useful for fast and economic resolution rather than going to law.</i>	<i>This person should be accepted by all cultural groups.</i>
<i>An independent ombudsman should only be used in very difficult situations when the team cannot find a solution.</i>	<i>Depends on the situation. The ombudsman typically can only affect the events after-the-fact.</i>	<i>Problems in finding someone acceptable to both sides and agreement by both sides with the final decision.</i>
<i>In case of different cultures some issues may not be raised. An independent ombudsman could help in creating a culture of transparency.</i>	<i>The situation is likely to be solved but the collaboration may be difficult afterwards.</i>	<i>Trust among the project team can be totally lost.</i>

Table 12: Expert opinions regarding Staff with *Relevant Technical, Interpersonal Expertise and Experience.

Purpose (3.71)	Benefits (3.57)	Drawbacks / hurdles
<i>Although the assignment of certain experienced members to specific posts can be beneficial, there are a lot more factors to be considered in order to achieve smooth team function.</i>	<i>The tech expertise can help and can prevent potential failures so that employees do not waste their time in problems that they cannot solve.</i>	<i>Why try to solve a human problem with technology. Usually, available staff is allocated to new project teams and not always the most competent and experienced staff.</i>
<i>Stakeholders should be on board.</i>	<i>Essential with technical applications.</i>	<i>Difficulty in obtaining suitable team members.</i>
<i>Requirements elicitation is not a technical problem, though technical solutions may reveal possible problems.</i>	<i>Without staff with relevant technical experience, possibility of unexpected risks may occur during the development or after implementation.</i>	<i>If elicitation engineers represent various partners no problems are envisaged.</i>

Table 13: Expert opinions regarding Face-to-Face Planning Meetings.

Purpose (3.57)	Benefits (3.19)	Drawbacks / hurdles
<i>Face-to-face meetings are important for immediate handling of conflicts and disagreements.</i>	<i>Very much situation-specific but learning to know each other helps to accept the differences.</i>	<i>Rather, the lack of any face-to-face meetings may increase risk of errors and overlooking things, especially those of cultural nature.</i>
<i>Very useful in initially building of teams, but less necessary as the teams get used to working together.</i>	<i>The prevention of conflicts can be easily handled through a face-to-face meeting.</i>	<i>No problems provided that face-to-face meetings are feasible and the corresponding travelling costs can be covered.</i>
<i>It is easier to understand each other when meeting face-to-face.</i>	<i>Face to face communication is the most efficient type of communication.</i>	<i>Face-to-face meetings can create travel restrictions of time and cost of travel.</i>

Table 14: Expert opinions regarding Bridging Staff.

Purpose (3.63)	Benefits (3.43)	Drawbacks / hurdles
<i>Useful when working on new projects particularly in unknown fields or applications.</i>	<i>Can help sort out misunderstandings or conflicts.</i>	<i>Potential over-dimensioning compared to the scope of the project.</i>
<i>Bridging staff is the most important factor to facilitate communication when several people from different cultures need to work together.</i>	<i>Staff with cultural like-mindedness of cultures involved, can point at potential mismatches, misinterpretations and expected behavior.</i>	<i>A potential problem could be finding staff willing to bridge, commit themselves and try to cooperate closely to prevent and solve conflicts.</i>
<i>Bridging staff are familiar with the involved cultures and thus can help avoid or resolve cultural conflicts.</i>	<i>Bridging staff can foresee the challenges and plan the project so that there will not be difficulties.</i>	<i>Strong competence of a chairman of these teams is needed.</i>

5 Discussion and Implications

The literature review and the expert validation strongly confirmed the validity of our research questions and in particular RQ1, namely “does culture influence the requirements elicitation process?” By using Hofstede’s six cultural dimensions, the RQ2 (i.e., the how) was also answered.

This research signified the need for a requirements elicitation framework that addresses cultural aspects in GSE. By integrating both cultural factors (national, organizational, team, and professional culture) and divergent values of requirements elicitation engineer(s) and stakeholders in the process of requirements elicitation into a theoretical framework we accounted for substantial knowledge regarding requirements elicitation in multicultural environments that usually occur when:

- i) customers and developers come from different national, organizational, team, and professional cultural settings;
- ii) the development team is dispersed and involves individuals coming from different national and organizational cultures.

Figure 1 shows the Multicultural Requirements Elicitation (McRE) framework and incorporates the results of this study.

5.1 Discussion of Findings

Today’s organizations are highly likely to have personnel of multi-cultural backgrounds, and/or the requirements elicitation may be distributed to different organizations and different countries. In addition, customers, due to different professional disciplines, by nature belong to different professional cultures.

Requirements elicitation involves a multifaceted and iterative activity that relies on effective communication, collaboration and negotiation with all relevant stakeholders, having diverse knowledge domains, through authentic commitment of all involved parties for accomplishing requirements development and prioritization (Siakas et al 2021). As also identified by Mighetti and Hadad (2016) the main threats to requirements elicitation in GSE are inadequate language, communication, knowledge sharing and cultural barriers. These threats originate in differences in values, practices and ways of solving problems (cultural differences) as well as in geographical and temporal distances. Divergences in national, organizational, team and professional cultures tend to make issues concerning communication more difficult (Mighetti and Hadad 2016; Siakas et al 2021; 2022; 2023). Impediments in the successful conveying or sharing of ideas are amplified in distributed organizations where face-to-face communication is relatively rare. The challenges of working in a distributed environment are intensified compared to working in a collocated environment (Aranda et al. 2008; Benguria et al. 2018; Mighetti and Hadad 2016; Sadig and Sahraoui 2017; Siakas et al. 2016). In particular in distributed requirements elicitation threats and challenges need to be minimized since in this phase information and viewpoints regarding application domain, business needs, constraints, security requirements, scope, standards etc. are identified and collected for laying the

base for the project (Pandey et al. 2010). A lot of problems may be avoided by using well selected, compatible, and widely adopted communication tools. Cultural background, however, cannot be changed or taken away.

Jaakkola (2012) indicates that multicultural teams with a large difference in Hofstede’s work-related national values are challenging to manage and that special emphasis must be given to leadership practices and organization of the work. Earlier studies (Sadig and Sahraoui 2017; Siakas et al. 2018a; 2018b; 2016; Siakas and Siakas 2015) prove that culture is a crucial factor that needs to be taken into consideration for developing effective teams particularly in global settings. In requirements elicitation the level of trust is important for knowledge sharing (Sarker et al, 2011; Järvenpää and Leidner, 1999).

Without trust and genuine knowledge sharing the requirements elicitation process will suffer (Georgiadou et al 2011; Moser and Deichmann, 2020; Siakas et al, 2016; 2018b)

Järvenpää and Leidner (1999) argue that distributed virtual teams may experience a form of “*swift*” trust, but such trust is very fragile and temporal. Since trust and knowledge sharing seems to be two very important factors in the requirements elicitation process related to culture, a Cultural Trust and Knowledge Sharing framework was created (Siakas et al. 2018b) conceptualizing the two factors in accordance with Hofstede’s cultural dimensions. The framework shows that in feminine countries and countries with low PDI, low UAI and high Indulgence trust is high and knowledge sharing is an expected natural process, one of the basic values of that certain culture. In Individualistic cultures, voluntary knowledge sharing is relatively hard to achieve, so other supplementary activities, such as incentives are recommended. In Collectivistic cultures, knowledge sharing can be enhanced if knowledge sharing is rewarded and made prominent with higher reputation and status (Handzic and Lagumdžija 2006). A study carried out in a global organization in Denmark (Siakas and Balstrup 2006) identified that the main differences between traditional teams and global virtual teams are within communication, trust, and knowledge sharing. Teams lacking trust will turn into detached groups of uninvolved strangers without leadership or cooperation, and this will inevitably impact negatively on the requirements elicitation process. Moser and Deichman (2020) investigated the moderating effect of national culture on knowledge sharing in online environments and conclude that social capital facets, such as trust, reciprocity, and a shared vision, are imperative for perceived knowledge quality.

Organizations that want to turn the cultural divergence from impediment to benefit need to raise cultural awareness and recognize the source of potential problems (Georgiadou et al 2011).

Since we use Hofstede’s definition of culture we examined how Hofstede’s cultural dimensions representing national culture, have been reported in the literature related to the requirements elicitation process. In high PDI societies the requirements elicitation engineer(s) need to identify the level of the customer hierarchy that can take decisions regarding the

requirements. In low PDI societies such decisions can be taken on lower hierarchical levels. In collectivistic societies the requirements engineer(s) need to show an interest in personal relationships with the customer, whilst in individualistic societies a strictly professional relationship is needed in the requirements elicitation process. In societies with high UAI the requirements elicitation process needs to be well organized and structured, whilst in societies with low UAI the requirements elicitation process can be more flexible with little management involvement. In societies with masculine values there is more competition between individuals taking part in the elicitation process, whilst in societies with feminine values, factors related to social adaptation are more important. National culture influences organizational culture and individual behavior (Hofstede 2001; Schein, 1985, Siakas, 2002). Noticeable differences in national cultures can be seen in communication patterns, ways of collaborating, organizational structure, solutions to organizational problems and so on.

Based on the literature view and the experiences of the authors we proposed a number of prevention and mitigation actions which we encapsulated in the McRE framework. These actions should be used in order to minimize misinterpretations, misunderstandings and conflicts arising from cultural differences. Our framework was evaluated by ten experts from industry and academia. The rationale and results from this evaluation agreed to a very high degree with our proposed prevention & mitigation actions, and also supported the proposed processes, methods & purposes encapsulated in the McRE framework.

The high agreement with the proposed processes / entities of the McRE framework was particularly evident in the agreement ratings of the purpose and expected benefits stated by the authors in the interview document. The ratings were on the Likert scale from 1 to 4 (not at all / a little / quite a lot / very much so) and the mean values of all ratings varied between 3.00 and 3.71, which means that the experts agreed between “quite a lot” and “very much so” with the proposed statements. The experts also justified their ratings and, in most cases, totally agreed with the authors viewpoints. Regarding the need of training one of the experts considered that the McRE framework “*may be too general and theoretic, and target mainly people who have not been working with other cultures*”. Another expert postulated that “*After being able to better understand ourselves (Unconscious Bias Training), Cross-cultural Training will support the trainees to better understand the others*”.

The evaluation provided strong indications that the framework is both needed and suitable for multicultural elicitation in any project. In a few cases where the experts’ comments were enlightening, such as in “*technical staff*”, “*right to exercise anonymity*” and “*elected ombudsman*” the framework was improved to incorporate the viewpoints of the experts.

5.2 Implications for Future Research

Since all the cultural factors we identified in the multicultural elicitation process seem to be interrelated a deeper analysis is needed to understand how they influence each other. Future

work concentrating on the development of an overarching classification of the identified factors and their impact on the requirements elicitation sub-process would bring a deeper understanding of the cultural factors involved in the global elicitation process.

It is likely that newer multidisciplinary studies concentrating on multiculturalism are necessary. Such studies may reveal the need for revisiting Hofstede’s dimensions in response to new contexts and new ways of communications. Travelling and population moves have already resulted in an increasing number of countries which are no longer monocultural. In multicultural societies and multicultural companies bias (whether conscious or unconscious) can lead to misunderstandings and friction. Managing and alleviating friction facilitates teamwork and engenders trust which in turn helps the requirements elicitation process.

In order to use positive action (identified as a prevention and mitigation strategy in this paper) for assembling a culturally diverse project team further work will be conducted, to identify concrete measures an employer/project manager(s) can take that would be permissible under discrimination legislation.

The richness of multiculturalism integrates multiple views of any situation which enhances the chances of finding innovative solutions to conflicts, thus maximizing the likelihood of success.

5.3 Implications for Practice

The importance of a successful completion of the requirements elicitation phase correctly cannot be over emphasized. The team constitution is paramount for the success of the requirements elicitation. Organizations that will embark on the use of the McRE framework are likely to increase cultural awareness and sensitivity, and thus improve multicultural collaboration. In-depth studies need to be carried out in organizations that develop software-intensive products in a global context for measuring the influence of national culture, organizational culture, team culture and professional culture regarding the requirements elicitation process and the impact of culture on systems quality.

5.4 Limitations of this Study

The aims of a literature review are the interpretation of the meaning of a collection of individual studies. The validity of the results depends on the quality of the review process (Dellinger, 2005). The research topic was familiar to the authors, which may have been a source of bias. In order to minimize author bias scientific high quality and credible library repositories and databases, such as IEEE, SCOPUS, and Web of Science (WoS) were used. The informal literature review process was selected because of its relevance for research initiatives based on practice (Kudo et al. 2022). Snyder (2019) argues that all forms of trustworthy evidence need to be considered in multidimensional problems (such as culture). Hence, we enriched the informal literature review by integrating existing knowledge about the research topic (integrative critical literature review).

Validity associated with the qualitative analysis includes three threats, namely researcher bias, reactivity (e.g. emotional) and respondents' bias (Lincoln and Guba, 1985). In order to minimize researcher bias, the authors, coming from different academic disciplines, discussed thoroughly and from different points of view the meaning of important concepts.

Multicultural teams are increasingly being deployed for large projects. This study is an initial attempt to focus on cultural factors influencing multicultural requirements elicitation. The McRE framework is an abstraction of reality, as is the nature of all models and metamodels. Therefore, it needs practical application and further validation with case studies and metrics.

5.5 Conclusions and Further Work

The purpose of this paper was to introduce a means for a better understanding the role of cultural differences in multicultural requirements elicitation. The McRE Framework conceptualizes the cultural factors trust and knowledge sharing, in conformity to Hofstede's cultural dimensions. In addition, the McRE framework suggests a number of prevention and mitigation actions that could be adopted in order to address the cultural aspects of requirements elicitation.

Ongoing improvements, extensions, and refinements of the McRE framework will be possible through its practical application. We will concentrate on promoting the adoption and use of the McRE framework by multicultural software development companies with the view of monitoring the longitudinal impact on the behavior of the various stakeholders and the degree of success of Information Systems.

A potential further work area could also include an alignment between Hofstede's dimensions and the practices and techniques of requirements elicitation.

Understanding and managing cultural friction will always be necessary and a real challenge. However, Blanding (2013) quoting Professor Roy Chua advises that “*managing cultural friction not only creates a more harmonious workplace but ensures that you reap the creative benefits of multiculturalism at its best*”.

Acknowledgements

We would like to thank the experts for their useful comments in validating our framework. We also want to thank the reviewers for their detailed, constructive, and helpful feedback which focused our effort to restructure, extend and improve the originally submitted version of this paper.

References

- Adler N J (1983) A Typology of Management Studies Involving Culture. *Journal of International Business Studies*, 14(2): 29-47.
- Aksnes D.W. and Sivertsen (2019) G. A criteria-based assessment of the coverage of Scopus and Web of Science, *Journal of Data and Information Science*, vol. 4, no. 1, pp. 1-21, Feb., doi: 10.2478/jdis-2019-0001.
- Alsanoosy T, Spichkova M and Harland J (2020) Cultural influence on requirements elicitation engineering activities: a systematic literature review and analysis. *Requirements elicitation engineering*, 25:339-362.
- Alsanoosy T, Spichkova M and Harland J (2018) Cultural Influences on Requirements elicitation engineering Process in the Context of Saudi Arabia, *Proceedings Evaluation of Novel Approaches to Software Engineering*, Madeira, Spain.
- APM (2018) Association for Project Management, *A guide to project auditing*, www.apm.org.uk (visited 30.02.2020).
- Aranda GN, Vizcaino A, Cechich A and Piattini M. (2008) Strategies to minimize problems in global requirements elicitation, *CLEI electr. journal*, 11 (1) 3.
- Blanding M (2013) *Working Knowledge. Business Research for Business Leaders*, Harvard Business School, Research Ideas.
- Benguria G, Alonso J, Etxaniz I, Orue-Echevarria L. and Escalante M. (2018) Agile Development and Operation of Complex Systems in Multi-technology and Multi-company Environments: Following a DevOps Approach, in X Larrucea, I Santamaria, RV O'Connor, Messnarz R. (eds). *Systems Software and Service Process Improvement*, pp 15-27.
- Bloor G and Dawidson P (1994) Understanding Professional Culture in Organizational Context. *Organization Studies*, 15 / 2.
- Bostrum, RP (1989) Successful application of communication techniques to improve the systems development process. *Information and Management*, 16 (5), pp. 279-295.
- BCS (2015) British Computer Society (BCS) and Unconscious Bias Training <http://www.bcs.org/content/con-WebDoc/55370> (visited 10.01.2021).
- Britto R, Wohlin C, Mendes E. (2016) An extended global software engineering taxonomy, *Journal of Software Engineering Research and Development* 4:3, <https://doi.org/10.1186/s40411-016-0029-2>
- Chakraborty S, Sarker S and Sarker S (2010) An Exploration into the Requirements Elicitation: A Grounded Approach, *Journal of the Association of Information Systems*, 11(4): 212-249.
- Cockburn A and Highsmith J (2001) Agile Software Development: The People Factor. *IEEE Computer*, 34(11):131-133.
- Coplien JO and Harrison NB (2005) *Organizational Patterns of Agile Software Development*, Prentice Hall.
- Damian DE and Zowghi D (2003) An insight into the interplay between culture, conflict and distance in globally distributed requirements negotiations. *36th Annual Hawaii International Conference on System Sciences*, Hawaii, USA, IEEE Computer Society Application, 8(2):41-55.
- Dijkstra EW (1972) The humble programmer. *Communication of ACM*, 15, pp. 340:1-15.
- Ebert C, Gallardo G, Hernantes J and Serrano, N. (2016) DevOps, *IEEE Software*, pp. 94-100.
- Fang T (2003) A Critique of Hofstede's Fifth National Culture Dimension, *International Journal of Cross-Cultural Management*, 3 (3):347-368.

- Foster N (2000) Expatriates and the impact of cross-cultural training. *Human Resource Management Journal*, 10(3): 62–78.
- Furxhi, G. (2021) Employee's Resistance and Organizational Change Factors, *European Journal of Business and Management Research, European Journal of Business and Management Research*, Vol 6, Iss.2, DOI: <http://dx.doi.org/10.24018/ejbm.2021.6.2.759>
- Gallivan M and Srite M (2005) Information technology and culture: Identifying fragmentary and holistic perspectives of culture, *Information and Organization*, 15(4):295-338.
- Georgiadou, E. (2018) Reflections on the need for Disambiguation of Terminology for Software Process Improvement, EuroSPI 2018, Bilbao, Spain, September 5-7, 2018, Proceedings. In: 25th European Conference, EuroSPI 2018: Systems, Software and Services Process Improvement, 05-07 Sept 2018, Bilbao, Spain. ISBN 9783319979243. ISSN 1865-0929 (doi:10.1007/978-3-319-97925-0_48)
- Georgiadou E, Siakas K, Estdale J, Berki E, Rahanu H and Ross M (2019). A Comparison of two Manifestos: Agile and SPI, in O. Khan, P Marchbank, E Georgiadou, P Linear, M Ross and G Staples in *International Experiences and Initiatives in IT Quality Management, 27th Software Quality Management (SQM) conference*, British Computer Society (BCS), 15 April, Southampton, UK, pp. 77-90.
- Georgiadou E, Siakas K, Ross M, Rahanu H (2022). Achieving Sustainability: From Valorisation and continuous improvement. In: Yilmaz, M., Clarke, P., Messnarz, R., Wöran, B. (eds) *Systems, Software and Services Process Improvement*. Communications in Computer and Information Science, vol 1646. Springer, Cham, pp. 763–780, DOI: 10.1007/978-3-031-15559-8_53
- Georgiadou, E., Siakas, K. and Balstrup, B. (2011). The I²P Visualisation Framework for Performance Estimation through the Alignment of Process Maturity and Knowledge Sharing, *International Journal of Human Capital and Information Technology Professionals (IJHCITP)*, Vol. 2 No. 2, pp. 37-47.
- Georgiadou E, Siakas K and Berki E (2003). Quality Improvement through the Identification of Controllable and Uncontrollable Factors in Software Development, *European Software Process Improvement Conference*, Graz, Austria, 10-12.12.2003, pp. IX 31-45.
- Handzic M and Lagumdzija A (2006) Motivational Influences on Knowledge Sharing, in P Feher (ed), *Proceedings of 7th European Conference of Knowledge Management*, Reading, UK, pp. 208–212.
- Hanisch J and Corbitt B (2007) Impediments to requirements elicitation engineering during Global Software Engineering. *European Journal of Information Systems*, 16 (6):793–805.
- Hanisch, J Thanasankit T and Corbitt B (2001) Understanding the cultural and social impacts on requirements elicitation engineering processes-identifying some problems challenging virtual team interaction with clients. *Proceedings Information Systems*, Bled, pp. 11-22.
- Hildenbrand T, Geisser M, Kude T, Bruch D and Acker T. (2008) Agile Methodologies for Distributed Collaborative Development of Enterprise Applications Proceedings *Complex, Intelligent and Software Intensive Systems*, IEEE Comp. Soc. pp. 540- 545.
- Hofstede G (1980) *Culture's Consequences: International Differences in Work-Related Values*, Abridged Edition, Newbury Park, CA: Sage Publications.
- Hofstede G (1983). The Cultural Relativity of Organizational Practices and Theories, *Journal of International Business Studies*, pp.75-93.
- Hofstede G (2001) *Culture's consequences: comparing values behaviors institutions, and organizations*- 2nd Ed. - Thousand Oaks, Calif.; London: Sage Publications.
- Hofstede G, Hofstede GJ and Minkov M (2010) *Cultures and Organizations - Software of the Mind: Intercultural Cooperation and its Importance for Survival*. McGraw-Hill.
- Hofstede G (2011) Dimensionalizing Cultures: The Hofstede Model in Context, *Online Readings in Psychology and Culture*, 2(1).
- Hofstede G, Hofstede GJ and Minkov M (2011) *Cultures and Organizations: Software of the Mind*, McGraw HillUS.
- Holling D, Méndez Fernández D and Pretschner, A (2016) A Field Study on the Elicitation and Classification of Defects for Defect Models, *Proceedings of the International Conference on Product-Focused Software Process Improvement*, <https://doi.org/10.48550/arXiv.1611.10023>
- House R, Hanges P, Javidan M, Dorfman PW and Gupta V. (2004) *Culture, leadership, and organizations: The GLOBE study of 62 societies*. Sage.
- Hussain A, Mkpojiogu EOC and Kamal FM (2016) The Role of Requirements in the Success or Failure of Software Projects. *International Review of Management and Marketing (IRMM)*, 6(7):306-311.
- Inkeles A and Levinson D (1969) National Character: The Study of Module Personality and Socio-Cultural Systems in Lindsay G Aronson E. (eds.), the *Handbook of Social Psychology*, Vol. 4. Addison-Wesley.
- Jaakkola H (2012) Culture Sensitive Aspects in Software Engineering in A Düsterhöft (Ed.): *Thalheim Festschrift*, LNCS 7259, Springer, pp. 291–315.
- Jabbari R, bin Ali N and Petersen K (2016) What is DevOps? A Systematic Mapping Study on Definitions and Practices. *XP '16 Scientific Workshop Proceedings*, article no. 12.
- Jiang L, Li T, Li X, Atiquzzaman M, Ahmad H and Wang X (2018) Anonymous Communication via Anonymous Identity-Based Encryption and Its Application in IoT, in K Andersson (ed.), *Special Issue on Secure Computation on 4G / 5G Enabled Internet-of-Things*, ID 6809796, pp. 1-8.
- Järvinen P (1997) On cultures and information technology applications in organizations. in Ber leur J Whitehouse D (eds.): *An Ethical Information Society*, IFIP 1997, Chapman and Hall.
- Järvenpää S and Leidner DE (1999) Communication and trust in global virtual teams, *Organization science*, 10(6):791-815.
- Kaarst-Brown ML (2004) How Organizations Keep Information Technology Out: The Interaction of Tri-Level Influences on Organizational and IT Culture, IST-MLKB, Syracuse University, US.

- Kaarst-Brown ML and Robey D (1999) More on Myth, Magic and Metaphor: Cultural Insights into the Management of Information Technology in Organizations, *Information Technology and People* (12:2):192-217.
- Kluckhohn F and Strodtbeck F (1961) *Variations on Value Orientations* Evanstone Illinois: Row Peterson and Comp.
- Kroeger A and Kluckhohn F (1952) *Culture: A Critical Review of Concepts and Definitions*, Harvard Business Review, Cambridge, UK.
- Kudo TN, Bulcão-Neto RF, Vincenzi AMR, de Souza EF and Felizardo KR (2022). Using evidence from systematic studies to guide a PhD research in Requirements elicitation engineering: an experience report, *Journal of Software Engineering Research and Development*, 10:7, doi: 10.5753/jserd.2021.1978
- Leidner DE and Kayworth T (2006) A Review of Culture in Information Systems Research: Towards Theory of Information Technology Culture Conflict, *MIS Quarterly*, 30 (2):357-399.
- Lampropoulos G, Morcavallo A, Salvi L, Spiralska-Golak, I. and Siakas, K. (2019) DevOps: The New Frontier of Industrial Software. in O. Khan, P Marchbank, E Georgiadou, P Linecar, M Ross, G Staples, in *International Experiences and Initiatives in IT Quality Management*, BCS, Southampton, UK.
- Lauesen S (2002) *Software Requirements-Styles and Techniques*, Addison Wesley, Pearson Education.
- Lehman M (2006) *Development and Evolution*, Address at IDI, Oslo, 16 March.
- Lewin K (1958), Group decision and Social Change, in E Maccoby, TM Newcomb, EL Hartley, Holt, Rinehart and Winston (eds) *Readings in Social Psychology*, New York, pp. 197–211.
- Levy M, Hadar I and Aviv V (2018) A requirement's engineering methodology for knowledge management solutions: integrating technical and social aspect, *Requirements elicitation engineering*, 24(1): 503–521.
- Lincoln Y S, Guba E G (1985) *Naturalistic Inquiry*, Beverly Hills: Sage.
- Lopez L, Behutiye W, Karhapää P, Ralyté, J, Franch X and Oivo M (2017) Agile Requirements Management Best Practices Portfolio: A Situational Method Engineering Approach. *PROFES*, LNCS 10601, Springer, pp. 548-555.
- Mazo R, Jaramillo CA, Vallejo P and Medina JH (2019) Towards a new template for the specification of requirements in semi-structured natural language, *Journal of Software Engineering Research and Development*, 8:3, doi: 10.5753/jserd.2020.473
- McSweeney B (2002) Hofstede's Model of National Consequences: A Triumph of Faith – A Failure of Analysis. *Human Relations*, 55(1):89-118.
- Mighetti JP and Hadad GDS (2016) A Requirements elicitation engineering Process Adapted to Global Software Engineering. *CEI Electronic Journal*, 19(3), No 7.
- Moser C and Deichmann D (2020) Knowledge sharing in two cultures: the moderating effect of national culture on perceived knowledge quality in online communities, *European Journal of Information Systems*.
- NewRelic 2018. *Navigating DevOps - What it is and why it matters to you and your business*, eBook, available at https://try.newrelic.com/rs/412-MZS-894/images/NewRelic_DevOps-101-Navigating-DevOps-eBook.pdf.
- Osman N and Sahraoui AEK (2018) A Software Requirement Engineering Framework to Enhance Critical Success Factors for ERP Implementation. *International Journal of Computer Applications (IJCA)*, Foundation of Computer Science, 180(10):32-37.
- Pacheco C, García I and Reyes M (2018) Requirements elicitation techniques: A systematic literature review based on the maturity of the techniques. *IET Software*, 12 (4), pp. 364-378.
- Pandey D, Suman U and Ramani AK (2010) An Effective Requirement Engineering Process Model for Software Development and Requirements Management. Int. Conference on *Advances in Recent Technologies in Communication and Computing*, IEEE Comp. Soc pp. 287 – 291.
- Pentry LF and Salvatore J (2015) Individual and social benefits of online discussion forums. *Computers in Human Behavior*, 50:211–220.
- Rahanu H, Georgiadou E, Siakas K and Ross M (2017) Towards Developing a Software Process Improvement Strategy Through the Application of Ethical Concepts. In J Stolfa, S Stolfa, R O'Connor and R Messnarz (eds) *Systems, Software and Services Process Improvement. EuroSPI 2017*. Communications in Computer and Information Science, Vol 748. Springer, pp. 627-641.
- Ramasubbu N, Mithas S, Krishnan MS and Kemerer CF (2008) Work Dispersion, Process-Based Learning and Offshore Software Development Performance. *MIS Quarterly*. 32(2):437-458.
- Ramesh B, Cao L, Kim JJ and Mohan K. (2017) Conflicts and complements between eastern cultures and agile methods: an empirical investigation. *EJIS* 26(2):206–235.
- Ramesh B, Cao L and Baskerville R (2010) Agile requirements elicitation engineering practices and challenges: an empirical study. *Information Systems. Journal* 20(5):.449–480.
- Ross, H. (2008). *Exploring unconscious bias. Diversity Best Practices*. Retrieved on 30.04.2023 from <http://www.cookcross.com/docs/UnconsciousBias.pdf>.
- Ramingwong L (2013) A Review of Requirements elicitation engineering Processes, Problems and Models. *International Journal of Engineering, Science and Technology (IJEST)*, 4(6):2997-3002.
- Sadig A and Sahraoui EEK (2017) Culture Effect on Requirements Elicitation Practice in Developing Countries. *International Journal of Software Engineering and Applications*, 8(1): 49-58.
- Sarker S, Ahuja M, Sarker S and Kirkeby S (2011) The Role of Communication and Trust in Global Virtual Teams: A Social Network Perspective, *Journal of Management Information Systems*, 28 (1):273 – 309.
- Schein EH (1985) How Culture Forms, Develops and Changes, in Kilmann RH Saxton MJ Serpa R (eds.): *Gaining control of the Corporate Culture*, San Francisco, Jossey Bass Publishers.
- Siakas E, Rahanu H, Loveday J, Georgiadou E, Siakas K, Ross M (2023) Managing Ethical Requirements Elicitation. In: Yilmaz M, Clarke P, Riel A, Messnarz R (eds)

- Systems, Software and Services Process Improvement*. EuroSPI 2023. Communications in Computer and Information Science, vol 1890. pp. 258-272, Springer, Cham. https://doi.org/10.1007/978-3-031-42307-9_19
- Siakas E, Rahanu H, Georgiadou E, Siakas K. (2022) Requirements Volatility in Multicultural Situational Contexts. In: Yilmaz M, Clarke P, Messnarz R, Wöran B (eds) *Systems, Software and Services Process Improvement*. EuroSPI 2022. Communications in Computer and Information Science, vol 1646, pp. 633-655, Springer, Cham. https://doi.org/10.1007/978-3-031-15559-8_45
- Siakas E, Rahanu H, Georgiadou E and Siakas K (2021). Towards Reducing Communication Gaps in Multicultural and Global Requirements Elicitation. In: Yilmaz M., Clarke P., Messnarz R., Reiner M. (eds) *Systems, Software and Services Process Improvement*. EuroSPI 2021. Communications in Computer and Information Science, vol 1442. Springer, Cham. pp. 257-277 https://doi.org/10.1007/978-3-030-85521-5_17
- Siakas K, Georgiadou E, Siakas D and Rahanu, H. (2018a) Developing effective teams in global multidiscipline engineering and manufacturing organizations in X Larrucea, I Santamaria, RV O'Connor, Messnarz R, *Systems, Software and Services Process Improvement*, Springer, pp. 564-576.
- Siakas K, Georgiadou E and Siakas D (2018b) Knowledge Sharing in Distributed Teams: Influence of National and Organizational Culture, in Khosrow-Pour, M (ed). *Entrepreneurship, Collaboration, and Innovation in the Modern Business Era*, Chap-11, pp. 221-242.
- Siakas K, Georgiadou E and Siakas D (2016) The Influence of National and Organizational Culture on Knowledge Sharing in Distributed Teams. *International Journal of E-Entrepreneurship and Innovation*, 6 (1), January-June (doi.org.10.4018 / IJEEI.2015910102)
- Siakas K and Siakas D (2015) Cultural and Organizational Diversity Evaluation (CODE): A Tool for Improving Global Transactions. *Strategic Outsourcing International Journal*, 8 (2 / 3):206 – 228.
- Siakas K, Georgiadou E, Siakas E (2013) Addressing the Lack of Valorisation Skills for Project Results (ECQA Certified Valorisation Expert, VALO). *ECQA Conference*, Session: Networking Skills, Cannes, France 26.09. – 27.09.2013
- Siakas K and Siakas E (2007) The Agile Professional Culture: A Source of Agile Quality, *Software Process: Improvement and Practice Journal*, John Wiley and Sons, 12 (6):597 – 610
- Siakas K and Balstrup B (2006) Software Outsourcing Quality Achieved by Global Virtual Collaboration. *Software Process: Improvement and Practice*, John Wiley & Sons, 11 (3):319-328.
- Siakas K, Balstrup B, Georgiadou E and Berki E (2005a) Global Software Engineering: The Dimension of Culture, In: Isaias, P., Nunes, M.B. & dos Reis, P. (eds). *Intern. Virtual Multi Conference on Computer Science and Information Systems* (MCCSIS 2005) - 11- 29, pp. 386-391.
- Siakas K, Georgiadou E and Berki E (2005b) Agile Methodologies and Software Process Improvement Isaias, P Baptista-Nunes, M and P dos Reis A (Eds), *Virtual Multi Conference on Computer Science and Information Systems* (MCCSIS), Portugal. pp. 412-417.
- Siakas K, and Georgiadou E (2003) The Role of Commitment for successful Software Process Improvement and Software Quality Management, *The 11th Software Quality Management Conference*, Glasgow, UK, pp.101-113.
- Siakas K (2002) *SQM-CODE: Software Quality Management – Cultural and Organizational Diversity Evaluation*, PhD Thesis, London Metropolitan University UK.
- Singh V and Pandey D (2021) Problems Associated with Requirement Elicitation Process: An Overview, *International Journal of Advanced Research in Computer Science*, Vol. 8 Iss. 5, DOI:10.26483/ijarcs.v8i5.3717
- Schmidt CT, Kude T, Tripp J, Heinzl A, Kpohrer K (2013) Team Adaptability in Agile Information Systems Development, *34th International Conference on Information Systems*, Milan, Italy, pp.1-11.
- Snyder H (2019). Literature review as a research methodology: An overview and guidelines, *Journal of business research*, vol. 104, pp. 333–339, doi: 10.1016/j.jbusres.2019.07.039.
- Spichkova M, Alsanoosy T, and Harland J (2021, September). Impact of Organizational Culture on the Requirement Engineering Activities. In 2021 IEEE 29th International Requirements elicitation engineering Conference (RE) (pp. 426-427). IEEE. <https://doi.org/10.1109/RE51729.2021.00053>
- Spinello, R. (2022). *Global Capitalism, Culture, and Ethics*. New York: Routledge.
- Stair RM and Reynolds GW (2012) *Principles of Information Systems*, Cengage Learn Inc, 11th ed.
- Stair RM and Reynolds GW (2017) *Fundamentals of Information Systems*, Cengage Learn. Inc, 9th Ed.
- Stohl C (2001) Globalizing Organizational Communication, in F. Jabin and L. Putman (eds). *The new handbook of organizational communication*, pp. 323-375, Thousand Oaks CA: Sage.
- Söderman J (2008) How to be a good ombudsman. *11th International Ombudsman Institute (IOI) World Conference*, Occasional paper nr. 80 available at <https://www.theioi.org/publications/occasional-papers-1979-2008> (accessed 12.09.2019).
- Taylor-Cummings A (1998) Bridging the user-IS gap: a study of major systems projects. *Journal of Information Technology (JIT)*, 13(1):29-54.
- Thanasankit T and Corbitt B (2000) Cultural Context and its Impact on Requirements Elicitation in Thailand. the *Electronic Journal of Information Systems in Developing Countries*, 1(2):1-19.
- Tjong F (2008) Avoiding Ambiguity in Requirements Specifications, PhD Thesis, Nottingham Univ., UK.
- Trompenaars F and Hampden-Turner C (1997) *Riding the Waves of Culture: Understanding Cultural Diversity in Business*, London: Nicholas Brealey Publishing.
- Tuunanen T, Peffers K, Gengler CE and Hui W (2006) Developing Feature Sets for Culturally Diverse External End Users: A Call for Value-based Preference Modeling. *Journal of Information Technology Theory and Application* (JITTA), 8(2):41-55.

Tuunanen T and Kuo IT (2015) The effect of culture on requirements: a value-based view of prioritization, *European J.of Information Systems*, 24 (3):295-313.