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Communication Across Cultures in the Context of Multicultural Software Development

Anneli Heimbürger Yasushi Kiyoki
Taavi Ylikotila


```
ranks f xs = map fst $ rankBy f xs
rankBy f xs = map (\(rank,(orig,val)) -> (rank,val))
          . sortBy (compare`on`(fst.snd))
          . zip [1..]
          . sortBy (f`on`snd)
          . zip [1..]
          $ xs
clusterBy :: Ord b => (a -> b) -> [a] -> [[a]]
clusterBy f = M.elems . M.map reverse . M.fromListWith (++)
        . map (f &&& return)
groupItems b a items = map ((b . head) &&& map a)
                . groupBy ((==)`on` b)
                . sortBy (comparing b) $ items
```

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Preface and Compliments

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On Friday March 11th, 2011 at 14:46 (Japan time) a strong earthquake and, after that, a big tsunami hit Japan. This had a great impact also on our minds and our hearts. It has changed our lives. The consequences will be felt worldwide – in human, environmental and economical terms. In these new circumstances, our collaborative work seems even more important now. Our challenge is to further develop our skills in cross-cultural communication and in research on intelligent cross-cultural information systems.

In Jyväskylä June 21, 2011

Anneli Heimbürger
Yasushi Kiyoki
Taavi Ylikotila

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Communication Across Cultures in the Context of Multicultural Software Development*

Anneli Heimbürger† Yasushi Kiyoki‡ Taavi Ylikotila§

Abstract

Many of the challenges faced by software development increase when projects are distributed globally, making them multicultural. Globalization has increased the need to estimate the effectiveness and cost savings of every project. As a result, many projects are outsourced or in other ways distributed to cheaper countries. The main problems of software development projects are related to knowledge sharing, communication, and cultural issues. Nowadays it is very common that people working in the area of software engineering find themselves in a regular co-operation with people from different cultures. A company may have software development teams in several countries, or it may have outsourced part of its software development to countries with a lower cost structure. It is useful to know how people from separate cultures will behave in these different contexts. This report provides an overview and presents the research findings of our project on distributed multicultural software development. The focus of our research is on cultural issues, and its main target is to support software business globalization in order to increase the competitiveness of Finnish software industry. The research project includes both literature research and two phased interviews. The study of communication styles in Japan and in Finland is based on literature and on several years' experience on collaborative research projects between Keio University SFC's researchers in Japan and University of Jyväskylä's researchers in Finland. The main research findings indicate that most challenges identified in global software development are in the areas of multicultural project management, communication between the project manager and the development team and communication between development team members.

Keywords

Cultural Models, Cross-Cultural Communication Styles, Multicultural Context, Distributed Software Development, Multicultural Software Development, Global Software Development,

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† Department of Mathematical Information Technology, University of Jyväskylä, P.O. Box 35 (Agora), FI-40014 University of Jyväskylä, Finland, anneli.a.heimburger@jyu.fi

‡ Faculty of Environment and Information Studies, Keio University SFC, Japan, kiyoki@sfc.keio.ac.jp

§ Department of Mathematical Information Technology, University of Jyväskylä (2009-2010)

1 Introduction

Globalization is one of the main trends in our world. Increasingly, eastern and western cultures meet each other through business, governmental and environmental issues, research, education and tourism. Professionals, including business executives, project managers and project team members, are finding themselves in uncertain situations due to culturally dependent differences in the communication protocol, language and value systems. Cross-cultural communication is a current topic in many multicultural organizations and companies. In cross-cultural world, many collaborative actions are carried out in virtual and physical environments such as telecons, Web meetings, virtual spaces, face-to-face meetings, workshops and conferences and through email. Some of the differences between eastern and western cultures that we may come across are various meeting protocols, formality and rituals, orientation to time, communication style and decision-making process. [Heimbürger et al. 2010a, 2010b, 2010c, 2011; Heimbürger and Kiyoki 2010].

When we talk about the concept of *culture*, it is very important to understand its different levels. According to King [King 2007], cultures can be considered at four levels: national cultures, organizational cultures, organizational subcultures and subunit cultures. Here we extend the King's categorization to team cultures. Related to national cultures, two of the most widely cited studies are Hofstede's framework for cultural dimensions [Hofstede and Hofstede 2005] and Lewis' cultural model for communication [Lewis 1999]. Organizational culture is characterized by consistency across individuals and units in terms of assumptions, values and artefacts. These assumptions are formed over time as the members of an organization make decisions, cope with problems and take advantage of opportunities. Values are a set of social norms. Artefacts are visible aspects of an organizational culture, for example a knowledge repository system. Organizational subcultures may reflect organizational structure, professional occupations, task assignments, rank in a hierarchy or technologies used. Subunit cultures are created within the boundaries of particular subunits of an organization. Team cultures are mechanisms for individuals with diverse specialized knowledge to work towards a common goal. Teams are typically focused on a single objective, and they are temporary. If all team members are from the same organization, the team culture reflects the organizational culture. In multi-organizational projects, many team cultures may collide or softly meet, depending on the cultural competence of the team manager, team members and the ICT systems they are using.

Cultural knowledge, cultural awareness, and cultural sensitivity all convey the idea of improving cross-cultural capacity. Cultural knowledge is familiarization

with selected cultural characteristics, history, values, belief systems, and behaviours of the members of another ethnic group. Cultural awareness means developing sensitivity and understanding towards another ethnic group. This usually requires internal changes in terms of attitudes and values. Awareness and sensitivity also refer to the qualities of openness and flexibility that people develop in relation to others. Cultural awareness must be supplemented with cultural knowledge. Cultural sensitivity means knowing that cultural differences as well as similarities exist, without assigning values, i.e., better or worse, right or wrong, to those cultural differences. Cultural competence has become one important dimension for the success in today's international business and research arena. Cultural competence is defined as a set of congruent behaviours, attitudes, and policies that come together in a system and/or among professionals and enables the system and/or professionals to work effectively in cross-cultural situations.

Cross-cultural knowledge can be considered in three main levels:

Level 1. Explicit knowledge, for example temporal facts (holidays, festivals, business hours, academic terms) and geographical facts (cities, climate, people, language etc.)

Level 2. Reported knowledge based on survey data and/or field studies (meeting protocol, formality and rituals, orientation to time, communication style and decision-making process)

Level 3. Tacit knowledge, for example organization, project and team specific knowledge. Tacit knowledge is often classified.

How do cultures relate to knowledge management? Culture shapes assumptions about which knowledge is important. Culture mediates the relationships between organizational and individual knowledge. Culture creates a context for social interaction. Culture also shapes processes for the creation and adoption of new knowledge.

Software development has changed much during its history. During the first decades, software development was done mainly by local teams, but after the PC revolution in the 1980s and with the evolution of internet, software development became really global during the 1990s. This globalization has led to the distribution of software development work to multiple sites in different countries. By Global Software Development (GSD) we mean the development of software at geographically distant sites. This software development may happen within one organization in several sites or between two or more organizations. The software companies may also use offshoring, outsourcing, or subcontracting business conventions, which all have their own characteristics. Global software development faces many challenges, one problem being that there is not as much informal communication as there would be if all project members were located

near each other [Mockus and Herbsleb 2001]. In GSD, there is no occasional coffee room or corridor discussions between project members from distant sites. These informal meetings are often seen to be very important because they are valuable ways for information sharing. Project management also requires much more attention and resources when project members are located at distant sites. On the other hand, someone might ask why GSD is used at all if there is so much trouble. Some of the most important business reasons for utilizing global software development [Jaakkola, Heimbürger and Henno 2009; Jaakkola and Heimbürger 2009; Jaakkola, Heimbürger and Linna 2010] are: (a) there is a trend towards larger business units, (b) product localization to different countries, (c) the need to operate closer to the clients, (d) growing need for skilled personnel, (e) the need to reduce costs, and (f) globalization as a path to growth. By utilizing time zone differences effectively it is also possible to achieve continuous software development around the clock [Carmel 1999].

Once a software development project is established with development sites located in different countries, there will be people with different national and cultural backgrounds working together in the same project. Cultural sensitivity and understanding is very important in these circumstances. Every experienced software project manager knows that a geographically dispersed project team is much more difficult to manage than a project team located at a single site. Fluent communication is one of the most important factors in a successful software project [Herbsleb et al. 2000; Herbsleb and Moitra 2001]. A classical study by Tom Allen pointed out, already in 1977, that communication frequency drops significantly when the engineers' offices are more than 25 meters from one another [Allen 1977]. Communication can be classified into formal and informal communication. Formal communication refers to agreed practices, including project meetings, information sharing sessions, and project status reports. Informal communication means spontaneously occurring communication, which includes corridor discussions or instant chatting between project members. It has been noted that informal communication is very important, and its significance rises when projects are more complex [Herbsleb et al 2000]. Often the latest news is propagated informally between project members. A software project that is shared between various sites sets requirements for numerous communication and collaborative tools (e.g. telephone, email, teleconferences, videoconferences, net meeting tools, chats, document management systems, etc.) used in global software development. These tools should make cooperation and communication easier, but there are also cultural issues affecting the use of these tools.

“In our face-to-face meetings in Finland with our overseas colleagues it often seems that we find a common understanding. But after our colleagues have

returned home, we frequently find that the common understanding has vanished. I believe that the x-ray scanning at the airports causes our colleagues to change their mind, because this happens so regularly" says an experienced software project manager with a smile. His joke reflects the fact that we often expect people from different cultures to behave in the same way as people from our own culture do. The situation in our example may be due to any of the several causes: (a) both parties might have wrongly understood the issues in the meeting, (b) the concept of time may be different in different cultures, and the schedule might have been understood differently, (c) there is no common language in the meeting, (d) there is a different decision-making system in different cultures or (f) some other reason.

Our research project aims to provide general support for the globalization of Finnish software business. Its main objective is to create new knowledge to support software business in globalization processes. The more detailed objectives for the project and issues to be studied by it include:

1. The basic terminology which is used in the context of multicultural software development should be clarified and harmonized. Particularly the concept of culture and its different levels in software business and engineering need to be defined.
2. It should be examined what kinds of cultural factors affect distributed software development. This could be done by detailed interviews and case studies of some global companies which have roots in Finland.
3. It should be studied how cultural factors affect the design and implementation of software products and services? How much is localization of products and services affected by cultural factors? Product and service in this context can be understood to be either product as a deliverable, product as a service, product including related services, or as services only.
4. How do cultural factors affect internationalization, target country selection and entry mode selection of software firms? How do cultural factors affect software marketing and how do customization and services interact with target country and entry mode choice?
5. How do cultural factors affect services needed to support commercialization of software products?
6. Moreover, an international and national expert network should be created.

Thus, the objectives were very wide. However, we think that we have managed to draw the curtains back, at least to a certain extent.

This report is based on the work which has been carried out in the Department of Mathematical Information Technology at the University of Jyväskylä in 2009-2011. The project's other partner was Tampere University of Technology. The research project named "Steps in Multicultural Software Business Globalization: Models, Methods and Practices Towards Increasing Competitivity (STEP)" was supported by the Finnish Funding Agency for Technology and Innovation TEKES through its Vertical Software Solutions Programme (Verso). The research project included two subprojects: one at the JYU site and one at the TUT Pori site. This report includes the research findings at the JYU site.

Our report is organized as follows: in Section 2, we present the basic terminology related to multicultural software development. Section 3 describes challenges in global multicultural software development. In Section 4, we introduce the basic cultural models. Communications styles in Japan and in Finland, as case cultures, are discussed in Section 5. In Section 6, we describe the interview process. Our research findings are given in Section 7. Section 8 is reserved for conclusions and issues for further study.

2 Basic Terminology

The basic terminology related to multicultural distributed software development is given in this section. The concepts have been arranged into the following tables:

- Culture concepts (Table 1) [Jaakkola, Heimbürger and Linna 2010]
- Organizational culture concepts (Table 2)) [Jaakkola, Heimbürger and Linna 2010]
- Software technology concepts (Table 3)
- Software business concepts (Table 4)

Table 1: Culture concepts

Concept	Description
Culture	According to [Hofstede 2005], culture is a collective phenomenon, because it is shared with people who live or lived within the same social environment, which is where it was learned. Culture consists of the unwritten rules of a social game. It is the collective programming of the mind that separates the member of one group or category of people from others. According to [King 2007], cultures can be considered at four levels: national cultures, organizational cultures, organizational subcultures and subunit cultures. We extend the concept of culture by domain cultures, project cultures, team cultures and task cultures. According to [Wang 2009] culture is embodied in how people interact with other individuals and with their environment. Therefore, it is a way of life formed under specific

	historical, natural, and social conditions.
Cross-cultural	Cross-cultural describes comparative knowledge and studies of a limited number of cultures [Lewis 1999].
Multicultural	Multicultural describes comparative knowledge and studies of, relating to, or including several cultures [Lewis 1999].
Intercultural communication	This is in many ways similar to group communication, but the role of groups is taken by ethnic cultures. Culture, of course, is not just the domain of nations; it also describes the norms and conventions of groups (such as team culture), and collectives with shared knowledge and ideology (such as academic culture). However, as it is used in communication studies, intercultural communication tends to describe the relations between members of different ethnic groups and languages, interacting in an international context, in international software project teams for example. [Marsen 2006]
Cross-cultural knowledge	Cross-cultural knowledge is critical to basic cross-cultural understanding. Without it, cross-cultural appreciation cannot take place. It refers to a surface level familiarization with cultural characteristics, values, beliefs and behaviours. [Kwintessential 2009]
Cross-cultural knowledge space	Cross-cultural knowledge spaces, such as meeting rooms especially designed for cross-cultural teams, are personal and collaborative virtual working environments on the fixed or ubiquitous Web and in physical worlds. The space can include applications such as knowledge management services, team calendars, project monitoring functions and electronic cultural assistants running in personal and collaborative information systems. [Heimbürger 2009]
Cross-cultural understanding	Cross-cultural understanding simply refers to the basic ability of people within projects and teams to recognize, interpret, and correctly react to people, incidences or situations that are open to misunderstanding due to cultural differences. [Kwintessential 2009]
Cross-cultural awareness	Cross-cultural awareness develops from cross-cultural knowledge as the learner understands and appreciates a culture internally. This may also be accompanied by changes within the learner's behaviour and attitudes such as greater flexibility and openness. [Kwintessential 2009]
Cross-cultural sensitivity	Cross-cultural sensitivity is a natural by-product of awareness and refers to an ability to read situations, contexts, and behaviours that are culturally rooted and be able to react to them appropriately. A suitable response necessitates that the actor no longer carries his/her own culturally determined interpretations of the situation or behaviour (i.e. good/bad, right/wrong) which can only be nurtured through both cross-cultural knowledge and awareness. [Kwintessential 2009]
Cultural competence	Cultural competence is a developmental process that evolves step-by-step over an extended period. Both individuals and organizations are at various levels of awareness, knowledge and skills on the cultural competence continuum and levels. Cultural competence is about respecting cultural differences and adapting to changing situations and benefiting from them. Competence is the final stage of cross-cultural understanding and signifies the actor's ability to work effectively across cultures. Cross-cultural

	competency is beyond knowledge, awareness and sensitivity in that it is the digestion, integration and transformation of all the skills and information acquired through them, applied to create cultural synergy within the workplace. [Kwintessential 2009]
National culture	National Culture is known also as national character. People acquire a way of thinking, feeling and acting from their social environment in their early childhood and this continues throughout their life. This mental programming starts at home with family, and it is affected by the neighbourhood, school, work and community. [Hofstede 2005; King 2005]
Context	Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves. [Dey et al. 2005]. Culture can be regarded as an example of context. More detailed context is presented in [Heimbürger, Kiyoki, Kärkkäinen, Gilman, Kyoung-Sook and Yoshida 2011].

Table 2: Organizational culture concepts

Concept	**Description**
Organizational culture	Organizational Culture (OC) has also been called corporate culture. OC is holistic, and it refers to a whole that is more than the sum of its parts. OC reflects the history of the organization. OC is created and preserved by a group of people who together form the organization. OC is difficult to change. [Hofstede 2005; Holden 2002]
Organizational climate	Organizational Climate reflects a contextual situation at the point of time. Organizational Climate is not as permanent as Organizational Culture. [King 2007]
Organizational subculture	Organizational subcultures may reflect the organizational structure, professional occupations, task assignments, ethnic values, rank in the hierarchy, or the technologies used. [King (2007]
Team climate	Team climate refers to that teams are typically focused on a single objective and are short-lived. So the concept of climate is more appropriate than that of culture at the team level. [Dombrowski et al. 2007; King 2007]
Inter-organizational	Activity that takes place between different organizations or companies is classified as inter-organizational.
Intra-organizational	Organization (or company) may have several departments which might be located in the same or in different countries.
Cultural dimension	An aspect of culture that can be measured (expressed by a number). [Hofstede 2005]

Table 3: Software technology concepts

Concept	**Description**
Software	Software engineering is an engineering discipline concerned with practical

engineering	problems of developing large software systems. Software engineering involves producing software products in a cost-effective way. Software engineers have to produce high-quality software with a finite amount of resources and to a predicted schedule. [Sommerville 1992] Software engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software. [IEEE and ACM 1990]
Software process model	A software process model describes the processes that are to achieve software development. Software process model can be descriptive, which tells what happened in a development project. Prescriptive software process model describes what is supposed to happen. [Gustafson 2002]. One possible software process model is *Spiral model* presented in [Boehm 1988]
Software life cycle	The period of time that begins when a software product is conceived and ends when the software is no longer available for use. The software life cycle typically includes a concept phase, requirements phase, design phase, implementation phase, test phase, installation and checkout phase, operation and maintenance phase, and, sometimes, retirement phase. [IEEE and ACM 1990]
Software project life cycle model	The framework selected by each organization on which to map the activities of life cycle process to produce the software project life cycle. [IEEE 2006].
Software system architecture	A software system architecture comprises: - A collection of software and system components, connections, and constraints - A collection of system stakeholders' need statements - A rationale which demonstrates that the components, connections, and constraints define a system that, if implemented, would satisfy the collection of system stakeholders' need statements. [Gacek et. al. 1995]
Requirements specification	A requirements specification is a structured document which sets out the system services. It should be understandable both to procurers and developers [Sommerville 1992]. Documentation of the essential requirements (functions, performance, design constraints, and attributes) of the software and its external interfaces. [IEEE and ACM 1990]
Software specification	A software specification, which is the basis for its design and implementations, is an abstract description of the software. There should be a clear relationship between this document and the requirements specification. [Sommerville 1992]
Software design	Software design process is an iterative process where informal ideas are transformed to a detailed definition of how the system can be implemented. This design process has stages like architectural design, interface design and data structure design. [Sommerville 1992]
Software verification and validation	Verification and validation of a software system is a continuous process through each stage of the software process. Verification involves checking that the program conforms to its specification. Validation involves checking that the program as implemented meets the expectations of the software

	procurer. [Sommerville 1992]
Software requirements management process	Software requirements management denotes both the process of specifying requirements by studying stakeholder needs and the process of systematically analyzing and refining those requirements.
Software maintenance	Software maintenance is the process of modifying a software system or component after delivery, to correct faults, improve performance or other attributes, or adapt to a changed environment. [IEEE and ACM 1990]
Distributed Software Engineering	Distributed software engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software at multiple sites.

Table 4: Software business concepts

Concept	**Description**
Subcontracting	Subcontracting means, in this context, that a company is buying software development from some other company.
Outsourcing	A contractual arrangement whereby a firm employs a contractor to be entirely responsible for some or all aspects of its information systems functions. [Carmel 1999]
Offshore development	Seeking foreign professional services for coding and other software tasks outside one's home country. [Carmel 1999]
Traditional offshore	Traditional offshore means, in this context, that part (or all) of software development has been moved abroad to another company which conducts development according to its own processes and methods.
Concern-based offshore	Concern-based offshore means in this document that a company (located abroad) belonging to the same group of companies (e.g. to the same concern) is doing some part of software development.
Software business model	Software business model is the way a company plans to make profits by developing, selling and delivering its software. The business model is a description of customers and segments; product and service offering; the distribution model and partners; and the revenue model the software company employs to generate revenue and profit. [Kontio et al. 2005]
Product licensor	Product licensors are companies that have a highly productized software offering and focus their business to develop and sell the product. These companies are in the "purest" end of software product business and often expected to have high growth potential. [Kontio et al. 2005]
Product integrator	Product integrator companies also have highly productized software, but the software is only the core of the offering, services being the main part of it. Their services consist of for example user training and maintenance. [Kontio et al. 2005]
Solution Consultant	Solution consultants have product with low degree of productization and, thus, they have to do much tailoring work for each customer. Thus their business offering is the least standardized. Solution consultants are counted as product businesses because the core of their solution is based on

	products. [Kontio et al. 2005]
Product tailor	Product tailors are companies whose business revenue is based on product licenses, but whose product still has a low degree of productization. Thus, some of their revenue is still based on product tailoring and customer specific projects. [Kontio et al. 2005]
Localization	The act of modifying software to the needs of the local market: creating manuals, translating on-line help and menus, and sometimes making special release versions for large markets. [Carmel 1999]
Broker	A broker is a party that arranges transactions between a buyer and a seller and gets a commission when the deal is executed.
Internationalization	The adaptation of products for potential use virtually everywhere. Internationalization also refers to the adaptation of resources and skills in an organization to meet the challenges of selecting and servicing the most profitable customers and customer segments through optimal channels in target countries. [Äijö et. al 2005]

3 Challenges in Distributed Software Development

There are several forms of distributing software development between sites and countries. In distributed software development, the software architecture should be modular to enable the distribution of modules to different sites. Modular design reduces complexity and allows parallel development in different sites. Modular design and successful distribution into various sites also decreases the need for communication between the sites if one module or certain tightly coupled modules can be developed at the same site. Jaakkola, Heimbürger and Linna (2010] have presented the following two-dimensional distribution of factors as shown in Table 5. Several other authors have also discussed the topic [Herz et al. 2010; Krishna et al. 2004; MacGregor et al. 2005 ; Walenta 2004].

Table 5: SW Distribution dimensions

A.Outside	*Broker*	*Broker Network*	*Broker Offshoring*	*Broker Outsourcing*	*Traditional Subcon-tracting*
B. Inter-Organi-zational	*Virtual Organiza-tion*	Distributed Virtual Organiza-tion	Traditional Offshore	Traditional Outsourcing	*NULL*
C. Intra-Organiza-tional	*Traditional*	Distributed Traditional	Concern based Offshore	*NULL*	*NULL*
	1. One site	**2. Multiple sites**	**3. Offshore**	**4. Outsource**	**5. Subcon-tract**

In our research we are interested in both inter- and intra-organizational distribution of software development; what happens outside the organization (the top row in Table 5) or in one site is not within the scope of the research project. Also software subcontracting is left out from our research. Traditional offshore in this context means that part (or all) of the software development has been moved abroad to another company, which undertakes development according to its own processes and methods. Concern-based offshore, on the other hand, means that a company (located abroad) belonging to the same group of companies (e.g. the same concern) is doing some of the software development. Finally, outsourcing in this context means that the independence of operative units is increased and collaboration is based on contracts [Jaakkola, Heimbürger and Linna 2010].

The software development process has traditionally been plan-driven. It has its roots in the traditional "Waterfall Model" [Pfleeger 2006] and its variants. Strict use of this kind of plan-driven development demands the freezing of the requirements of the software product at a very early stage of the development. This means that the development project will not be able to make changes to the product requirements. Iterative and incremental modifications, in accordance with the waterfall model, are currently used because these are more flexible to user requirement changes. One example of an iterative software development process is the Open Unified Process, which is used in current development projects that are based on agile methods. This model was originally developed for small and co-located teams, which can be problematic for GSD projects.

The waterfall model has traditionally been used in global software development, because it relies on formal methods and freezing documents at early stages. This facilitates work distribution between sites and countries. Nowadays there is an increasing need to change product requirements also during development, in order to be competitive. There has also been an increasing interest in agile methods and processes, but agile development relies more on informal interaction than on formal mechanisms, which have been typical for distributed software development. The software industry faces new challenges when moving to agile methods, in global software development as well.

The most frequent general challenges for Globally Distributed Software Development are [Battin et al. 2001; Carmel and Agarwal 2001; Casey 2009; Damian 2007; Ebert and De Neve 2001; Fontaine 2007; Herbsleb and Moira 2001; Wand and Hasan 2008]: (a) strategic issues, (b) cultural issues, (c) inadequate communication, (d) knowledge management, (e) project and process management, (f) time difference and (g) technical issues. In GSD projects it has been discovered that it is very difficult to find who the experts on various issues at remote sites are.

Other considerable problems identified are lack of trust and lack of willingness to communicate openly across sites [Mockus and Herbsleb 2001].

- Strategic issues: Once the decision about a global software development project has been made, the next difficult decision is how to divide the work across sites and countries. Usually there is organizational resistance to GSD, and this sets challenges to trust-building between sites, which is very important.
- Cultural issues: In GSD, close cooperation between individuals with different cultural backgrounds is needed, and this may cause conflicts if there is not enough cultural sensitivity and awareness. Although the English language is widely used in software development, language understanding and willingness to speak may also be sources of problems.
- Inadequate communication: Software development requires much communication, which can be divided into formal and informal communication. Formal communication is needed for official communication and includes project status follow-up, solving the problems in the project, and agreeing on responsibilities for different tasks. Informal communication is considered important in order to know what other people are working on and who has expertise in what area. There are also many other issues that help people work effectively together.
- Knowledge management: Effective knowledge and information sharing mechanisms are essential in GSD, to allow teams to know which tasks are on the critical path and team members to have up-to-date documentation available.
- Project and process management: Synchronization of work is particularly important, for example, if some sites are doing development work and a team in some other site is doing testing. There are models of concurrent software development [Blackburn et al. 1996], but effective utilization of these is difficult because of changing requirements, unstable specifications, unavailability of tools supporting collaboration, and lack of informal communication [Herbsleb and Moitra 2001].
- Technical issues: A reliable and satisfactory fast telecommunication network is currently a prerequisite for successful software development. Configuration management tools, in addition to other collaboration tools, require transmission of critical data over the telecommunication network.
- Time difference: If there are teams from several different continents, there will be large time-zone differences between the teams, and only a small overlap will be available for synchronous collaboration [Damian and Zowghi 2003]. Synchronous meetings across continents are always difficult for at least one team: the meeting time is either too early in the morning or very late in the evening. In these cases, asynchronous communication is often preferred. One

solution can also be rotating meeting times, unsatisfactory meeting times being rotated between teams.

- Finding experts: It is difficult to know in GSD who understands a particular module well or who is responsible for a certain feature. Even if the right person can be located, there may be difficulties in initiating contact with the remote site because of cultural and language differences.
- Lack of trust and unwillingness to communicate: There are many reasons for this, but especially in the case of outsourcing this can be very obvious. People who feel worried about their job's security do not want to share their expertise. Building trust takes time, and distance is an impediment to building relationships of trust [Carmel 1999]. When there are no (or rare) face-to-face meetings and informal events (like lunch discussions), trust building takes time.
- Economis issues: The balance of cost and quality of the software development is important and is monitored as a whole.

When we look at the problems listed above, we notice that most of them are somehow connected to communication and, more generally, to collaboration between sites. It is evident that putting effort into collaboration planning and increasing cultural awareness would be worthwhile for global software projects.

4 Cultural Models

Cultural sensitivity has become an important dimension for success in today's international business and research arena. Despite globalization, business executives, project managers and project team members can sometimes find themselves in uncertain situations due to culturally dependent differences in communication protocol, language and value systems. Cultural competence might help us achieve project goals and avoid potential risks in multicultural or cross-cultural project environments. It would also support projects by promoting creativity and motivation through flexible leadership and "teamship".

What is culture? We share our view of culture with that of Fei-Yue Wang (2009], the Editor of IEEE Intelligent System. According to him, as presented in the magazine's March-April 2009 Issue, culture is embodied in how people interact with other individuals and with their environment; it is a way of life formed under specific historical, natural and social conditions [Wang 2009]. However, several viewpoints on culture exist in literature.

Culture is a subject that has a long research history. Many challenges remain, however, and the unclear definition of culture is one of them. In 1952, Kroeber and Kluckhohn [Kroeber and Kluckhohn 1952] found over 164 definitions, and Lonner [Lonner 1994] found over 200 definitions in 1994. Hoft [Hoft 1996] has categorized

culture into four meta models: the onion, pyramid, iceberg, and objective and subjective models. These models help to categorize and understand theories and models of different kinds related to culture.

One of the most referenced researchers who has researched national cultures is Geert Hofstede. He has defined five cultural dimensions [Hofstede and Hofstede 2005]. The definitions of the cultural dimensions are based on the surveys conducted by the IBM (International Business Machines) company in almost 80 countries. These cultural dimensions reflect relative cultural differences between nations, and they give us a macro level framework to study cultures:

1. Power distance (PDI) is perceived in how people think about equality and relationships with superiors and subordinates. Individuals with a high power distance index accept decisions and opinions of their supervisors more easily. Those with low power index believe that inequity should be minimized in the organization.

2. Uncertainty avoidance (UAI) indicates the degree to which people feel either uncomfortable or comfortable in ambiguous situations. People with a high uncertainty avoidance index attempt to avoid uncertainty in all forms and situations.

3. Masculinity in this context means "toughness" needed in taking care of business versus softer values of taking care of people and being concerned with quality of life, which is defined as femininity.

4. Individualism/Collectivism (IND) indicates how a person sees her/himself as an individual rather than a member of a group. In individualistic cultures people are expected to have their own opinion, and they are concerned with personal achievement. In collectivistic cultures people see themselves first as part of group.

5. Long-term/short-term orientation (LTO/STO). This dimension indicates the difference between western and East Asian cultures. A large difference can be seen between the western "here and now thinking" versus the eastern "future and long-term thinking". Hofstede's cultural dimensions for some selected countries are shown in Table 6.

Table 6: Hofstede's cultural dimensions

Country/Cultural dimension	Power distance	Uncertainty avoidance	Masculinity/ Femininity	Individualism/ Collectivism	Long-term/ short-term orientation
Finland	33	59	26	63	41
Sweden	31	29	5	71	33
Japan	54	92	95	46	80
USA	40	46	62	91	29
UK	35	35	66	89	25
Germany	35	65	66	67	31
India	77	40	56	48	61
China	80	30	66	20	118
France	68	86	43	71	39

Hofstede's approach proposes a set of cultural dimensions along which dominant value systems can be ordered. All the dimensions are generalizations, and individuals may differ from their society's descriptors. The figures in Table 6 should not be taken literally. However, they provide interesting information because they show differences in answers between groups of respondents. Different value systems affect human thinking, feeling, and acting, the behaviour of teams and organizations and the temporal dimensions of research projects and negotiations. In Table 7, as an example, we have summarized implications of cross-cultural differences for meetings and negotiations in accordance with Hofstede's dimensions of culture [Heimbürger 2009].

Table 7: Implications of cross-cultural differences for meetings and negotiations

Dimension	**Implication**
Individualism/ Collectivism	Negotiators from a collectivistic society are likely to spend more time on long-term goals, are more likely to make realistic offers, and are more likely to be cooperative. Conversely, negotiators from individualistic societies are more likely to focus on the short-term, make extreme offers, are more likely to view negotiations from a fixed perspective, and are more likely to be competitive.
Power distance	Negotiators from low power distance cultures may be frustrated by the need of negotiators from high power distance cultures to seek approvals from higher authority. On the other hand, negotiators from high power distance cultures may feel pressured by the pace imposed by negotiators from low power distance cultures.
Masculinity/ Femininity	When negotiating, individuals from masculine cultures are more likely to be competitive (win-lose) and those from feminine cultures empathic and compromise-seeking (win-win). This means that negotiators from masculine cultures are likely to view the feminine negotiator as an "avoider" while the feminine negotiator is likely to view their masculine negotiator as a "contender."
Uncertainty avoidance	Negotiators from high risk avoidance cultures are likely to view those from low risk avoidance cultures as unfocused. Those from low risk avoidance cultures are likely to

	view negotiators from high risk avoidance cultures as rigid.
Long-term/short-term orientation	Long-term/short-term orientation refers to the extent to which a culture programs its members to accept delayed gratification of their material, social, and emotional needs. Business people in long-term oriented cultures are accustomed to working toward building strong positions in their markets and do not expect immediate results. In short-term oriented cultures the results of the past month, quarter, or year are a major concern. Time is seen in a different way by eastern and western cultures and even within these groupings temporal culture differs from country to country. Also, temporal identities of different organizations and teams in organizations may vary.

Richard D. Lewis, a British linguist and a well-known cross-cultural consultant and author, has written several books about cross-cultural issues. In his books, Lewis has included cultural characteristics of over 70 of the world's major countries and regions. He has described, e.g., what is typical in meetings with people from certain nations. He has also developed a cultural model in which different nations are classified in a simple way. It must be noted that these models are simplifications, and within one nation there may be several cultures. Lewis has divided the world's cultures into three rough LMR (Linear/Multi/Reactive) categories [Lewis 2006]:

1. Linear-active cultures. These cultures plan, schedule, organize, pursue action chains, and do one thing at a time. For example, Germans and Swiss belong to this category.
2. Multi-active cultures. Cultures of lively, loquacious people who do many things at once, planning their priorities not according to a time schedule, but in accordance with the relative thrill or importance that each appointment brings with it. For example, Italians, Latin Americans and Arabs belong to this category.
3. Reactive cultures. These cultures prioritize courtesy high and they respect listening quietly and calmly to their interlocutors and reacting carefully to the other side's proposals. For example, Chinese and Japanese are typical representatives of this category.

Figure 1 presents the Lewis Culture Model, where major cultures have been placed to relative positions based on those cultures' characteristics. The diagram indicates e.g. that Russia and Italy on the left side are linear-active/multi-active to a similar degree. Still, it must be noted that all types are hybrid combinations to some extent because of the type and the context.

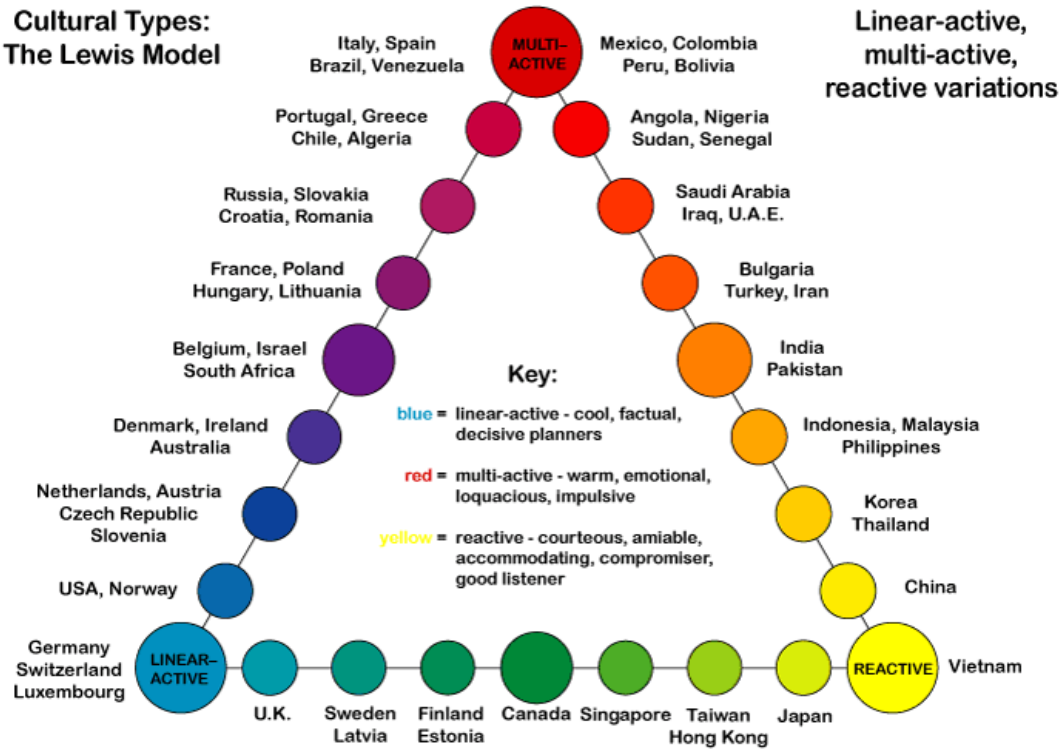

Figure 1: Lewis Culture Model [Lewis 2006]

In the following we discuss, from the viewpoint of the Lewis Culture Model, management and leadership, motivating people, team building issues and meetings.

Management and leadership

Managers in linear-active cultures will generally demonstrate task orientation. They look for technical competence, place facts before sentiments, logic before emotion and are deal-oriented. They are orderly, stick to agendas and inspire staff with their careful planning. Multi-active managers are much more extroverted, rely on their eloquence and ability to persuade and use human force as an inspirational factor. They are also usually more oriented to networking. Leaders in reactive cultures are equally people-oriented but dominate with knowledge, patience and quiet control. They display modesty and courtesy, despite their accepted seniority. They are good at creating a harmonious atmosphere for teamwork.

Motivating people

A multicultural team manager should know that motivating people from different cultures is a challenging task, because motivating factors can vary enormously even between close neighbours. Linear-active individuals are motivated by access to high-level technology, generous funding for research and increased opportunities for individual flair. They are also motivated by achievement rather than words. Multi-active people are motivated by words more than deeds. They get inspiration from people or circumstances that are conductive to boosting their self-confidence. Nurture and security are also important for this cultural category. Reactive people are motivated by collective goals and action, common loyalty to respectable organization and unswerving diligence in preserving integrity and face amongst family, friends and colleagues.

Team building issues

Agility is a very important issue in every software team nowadays, but all team members are not equally disposed towards change and innovation. E.g. Whilst Americans are the drivers of change, Arabs are more interested in the status quo and Russians fear change. Common sense, self-awareness and a modicum of unhurried thought are all useful resources for avoiding behaviour that might prove irritable to some team members. If it is accepted that certain cultural traits are not going to disappear, we may come to a realization that these very differing traits can make a positive contribution to team effort. For example, American enthusiasm connected to German planning and supervision can be very effective. So manager in an international team should be skilled at choosing the right person for each environment and task.

Meetings

A successful meeting can be difficult to achieve in a multicultural environment, because the purpose of the meeting depends on where one is coming from. E.g. Britons and Americans see a meeting as an opportunity for decision-making and getting things done, whilst Frenchmen see it as a forum where a briefing can be delivered to cover all aspects of a problem. Linear-active members need relatively little preamble or small talk before getting to business. They like to introduce bullet points that can serve as an agenda. Multi-active members are not happy with the bullet-point approach, which they see as premature conclusions reached by their linear colleagues. They prefer to take points in random order and discuss them for hours. When they see topics listed at the beginning, they feel they have been manipulated. Reactive people do not have the linear obsession with agendas,

neither are they wooed by multi-active arguments. They see arguments and ideas as points converging and ultimately merging.

Table 8 presents the LMR categories for the same nations as were presented above in Hofstede's cultural dimensions (Table 6).

Table 8: Classification of selected nations based on Lewis' LMR categories

Country	LMR category
Finland	Reactive/Linear-active
Sweden	Linear-active
Japan	Reactive
USA	Linear-active
UK	Linear-active
Germany	Linear-active
India	Reactive/Multi-active
China	Reactive
France	Linear-active/multi-active

LMR categories are also shown in Figure 2, which describes the difficulties in communication. These three categories have quite different characteristics, and thus communication between nations belonging to different categories is not always simple. Generally speaking, communication between nations belonging to the same category succeeds better than between nations which belong to different categories.

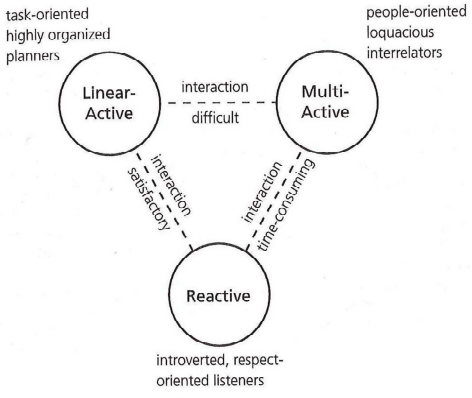

Figure 2: Communication between different LMR categories

What does culture mean for a GSD company? Culture has effects on many levels in the company: national, organizational, team, individual, customer, and product. At the national level, there are requirements, such as to understand each country's management and communication styles. At the organizational level, there are

requirements, such as to understand working styles or how strong the organizational culture is. In a weak organizational culture, national cultures are reflected in the organization more than in stronger organizations. At the team level, it is important, for example, to understand communication habits. Especially GSD companies need to think about cultural factors, because teams do not necessarily communicate face-to-face. Communication in GSD projects is, in general, very important, and in more complex projects, the need for informal communication increases. When selecting new employees, the company's human resource unit has to take into consideration that these people will work in multicultural teams. That is beneficial for new employees if they already have good cultural awareness, to prevent communication stumbling blocks and survive them [Shab 2004]. At the product level, there are also cultural differences to consider, such as product localization and design of user interfaces [Marcus 2006].

5 On Communication Styles

Traffic in global multicultural software development is bidirectional – both out from the country and into the country. In this section, we discuss communication styles that are related to it. As case styles, we have chosen Japanese and Finnish. Japanese represent Asian cultures and Finnish western cultures. The section is based on the following references:

a) Seminars, meetings, discussions, joint projects and joint publications with Professor Kiyoki and his research stuff and students at Keio University SFC between 2009 and 2011
b) An email discussion with Richard D. Lewis, the chairman of Richard Lewis Communications and his books
c) Yoji, Y. and Ronaldson, J. 2011. 100 Cross-Cultural Misunderstandings Between Japanese People and Foreigners. Bilingual Edition. IBC, Japan. 255 p.
d) Davies, R. J. and Ikeno, O. 2002. The Japanese Mind. Tuttle Publishing, Vermont, USA. 270 p.
e) Nyman, R. 2003. Doing Business in Japan, referred to on March 31st, 2011 <URL: http://www.rikkinyman.com/training/>.
f) Bartlett, C. 2001. Communicating with Finns, FINTRA 3/2001, referred to on March 31st, 2011 <URL: http://www.finland.com.au/pdfs/Communicating_with-F3_01.pdf>.
g) Snyder, R. 2007. Working well with Finns, View on Finnish Technology, Tekes 2007, p. 41.

h) Salo-Lee, L. 2011. Communicating with the Finns: From National Characterizations to Effective Intercultural Interaction, referred March 31st, 2011 <URL: http://www.jyu.fi/viesti/verkkotuotanto/kp/vf/liisa.shtml>.
i) Lewis, R.D. 2007. Finland, Cultural Lone Wolf, Boston (USA): Intercultural Press.
j) Windmeyer, L. 2008. Doing Business in Finland, referred to on March 31st, 2011 <URL: http://www.communicaid.com/cross-cultural-training/culture-for-business-and-management/doing-business-in/Finnish_business_culture.php>.
k) Ojala, A. 2008. Internationalization of Software Firms. Finnish Small and Medium-Sized Sofware Firms in Japan. University of Jyväskylä, Jyväskylä Studies in Computing 89. Jyväskylä University Printing House, Jyväskylä. 57 p. + articles (PhD Thesis).

According to Lewis (2005), there are many similarities between Japan and Finnish communication styles, such as introversion, modesty, quietness, thinking in silence, not interrupting, distrusting big talkers, using silence, using body language meagerly (Authors' comment: both nations have a rich body language, but it is unnoticed by persons who cannot interpret it). One difference is in the way that diplomacy and truth are handled. Japanese put diplomacy or harmony before truth, while Finnish put truth before diplomacy. This is, however, understandable if we think about the history, geography and population of both nations.

When we are a guest in another country, we notice that things don't work exactly the same way as they do at home. No matter how well we have prepared ourselves, we won't be prepared for every situation. Practical experiences within research organizations in joint projects between Japan and Finland have been extremely valuable, as they have greatly educated us about cross-cultural communication. These projects are an important mirror, reflecting our styles of communication. Again, it is good to keep in mind that the following issues are generalizations and provide us a macro level view to Japanese and Finnish culture and etiquettes. There are exceptions to these. We think that basic cultural knowledge is the first step to multicultural awareness and multicultural competence development. The following sections provide descriptions of:

- general cultural frameworks to communication styles in Japan and in Finland
- certain points to smooth the way for collaboration
- an application domain free approach which can be applied to any section of ICT or to other domains as well

5.1 Japanese Culture: Overview

The key concepts of Japanese culture and communication styles are group orientation, politeness, harmony, and indirectness. We introduce these concepts in the following subsections.

5.1.1 Group Orientation

Japan is a vertical society. Relationships in Japan tend to be arranged along a superior/subordinate axis. Employers are seen as parents, employees as children. Loyalty to superiors and to the company is seen as a great virtue. Japanese companies have an atmosphere of strict discipline in which rank and seniority are the foundation of all relationships. One's place in the hierarchy determines the degree of deference one must show to those above and the degree of deference one can expect from those below. Japanese people believe that one should never do anything above one's status, that one should not infringe on anyone else's status and that one should not cut across hierarchical boundaries. In the western countries, one approaches another person with the attitude that "you and I are equals." In Japan, the polite approach is "I am your inferior."

Maturity (age) is essential. The Japanese believe that wisdom comes with maturity. A young person automatically stands lower on the status scale. Youth and personal power are not revered in Japan.

Japanese culture is group-oriented. Japanese employees are taught to work in groups and to think of themselves as part of a family. They feel a great deal of responsibility toward their co-workers and their company. Knowing that failure or error might affect others leads the white-collar executive to be extremely diligent. Rewards are directed to groups, which places further responsibility on individual performance.

Peer group bonding, commitment to quality, and company loyalty are the three important components of the white-collar employee's work ethic. Developing and maintaining long-term relationships with one's peer group creates the kinds of social and professional networks that represent the very foundation of business relationships in Japan.

The Japanese tend to consider issues in groups rather than one at a time. They need to see how all factors relate to and affect each other. Japanese people want to know lots of facts and how they are connected together. They believe facts can mean different things in different contexts. This can be time-consuming and requires patience from the other side.

5.1.2 Politeness

The Japanese like to know who they are doing business with. They want to make sure they are dealing with a strong company that has a good reputation. An ideal introduction would come from someone who knows you, your background, and the Japanese company you want to do business with.

Business cards are indispensable for introductions. A business card is a person's "face." Therefore, the way one handles someone's business card must be the same way they would behave toward that person. Exchanging and handling business cards requires much thought. Sometimes asking about the origin of a person's name is a good icebreaker and can help build your relationship. It is not impolite to write the pronunciation of their name on their business card. When you have exchanged business cards with a number of people at a meeting, it is all right to line the cards up on the table in the order in which the other people are seated.

The visitor is the one who offers presents at the first meeting. The host may give the visiting team gifts at the end of the series of meetings. It is polite to give and receive gifts with both hands. Gifts should be carefully selected and wrapped up appropriately.

Japanese people take work seriously. Only after the visitor has proved to be good at work he/she has the right to be silly and make jokes. They also seldom understand your jokes since jokes are based on an individual culture. However, the Japanese do like to joke and have a good time after work.

Accuracy is important to the Japanese, and errors are not appreciated. A Japanese person does not like to be put in a position of having to admit a mistake or failure. Thus, losing face and perhaps causing troubles to other persons is regarded as a serious issue. The Japanese tend to see criticism as something personal; they don't understand how criticism can be separated from one's actions. They have difficulties in debating because they do not separate issues from persons. To directly disagree is seen as rude. Japanese also tend to speak very softly.

They tend to be reserved and humble and like to blend into the crowd. Speaking loudly is considered rude and threatening. Pointing is also considered rude. They are also reserved when it comes to physical touching.

5.1.3 Harmony

The Japanese value consensus. The leader makes the final decision, but only after taking into consideration the opinions of everyone involved. The leader's decision represents the consensus of the people working under him. The Japanese value harmony, and the family style of organization in a company requires that everyone

agrees with the final decision. The decision-making process may be time consuming, but there is no way to shortcut this process.

Meetings are open to almost anyone since they are for the purpose of gathering information and not for making decisions. The key activity is fact gathering. Decisions are made outside meetings and only when there is complete consensus among all involved. During a meeting with people from overseas, there will be two sets of negotiations going on: the visitors with the Japanese, and the Japanese among themselves, to reach a consensus.

The Japanese can seem very rigid when dealing with differences due to their complex consensus-building process. They do not make a proposal until they feel completely comfortable with it, and then they do not want to make concessions. Aggressive and argumentative approaches will be received coolly. Inflexible deadlines will not be appreciated. Also any strategy that might cause a loss of face should be avoided. If you feel you may have offended someone in some way, do not be afraid to apologize. The Japanese apologize frequently; it is an insurance against accidental rudeness.

The Japanese believe truth is dependent upon circumstances and obligations to other people. Nothing should be allowed to disrupt the harmony of the individuals; therefore, the Japanese will often give an answer they believe will please the listener.

5.1.4 Indirect

In Japan, "no" for all practical purposes does not exist. No one is to be publicly embarrassed or humiliated. This is the notion of face or one's image. Because saying no or even implying displeasure or disappointment risks humiliating the other party, these must be avoided. Instead the Japanese have devised a number of ways of indirectly saying no e.g. asking a question, pretending not to understand, changing the subject, not being able to answer at that particular time, claiming that the question is very difficult or having no authority to answer the question.

The Japanese are non-projecting and restrained in their speaking style and tend to use small gestures. They like to have the speaker's views presented clearly, logically and firmly. The Japanese also appreciate visual images. They are basically non-argumentative and are uncomfortable with attempts to be persuasive.

When negotiating a contract with a Japanese company and during the meetings there are times of silence on the part of the Japanese negotiating team. The negotiations, from the visitors' perspective may appear to be proceeding at an unusually slow pace, and even the simplest decisions or commitments appear to take a long time. The visitor might begin to push a little harder, and his/her

frustrations mount as he/she begins to hear statements such as, “it will take a little more time” and “this is quite difficult.” What should the visitor do? What is happening? How do the Japanese negotiate?

The Japanese do not tend to be particularly strong at negotiating since they see it as a form of conflict. They dislike debate, and if the other side becomes too aggressive, they will simply withdraw. The major purpose of negotiations to the Japanese is to see if the two companies can get along over the long term. The Japanese want to build a personal relationship and this can take a long time. They will want to know your age, the university you attended, about your family and, in general, about your background.

Many Japanese listen with closed eyes, and a smile means they are really listening. The Japanese don’t discuss, argue, or express opinions openly at meetings. Decisions are made quietly and slowly by building consensus outside meetings. Japanese tend to use words as only part of the message. Other factors, such as silence, subtle body language, mood, tone, and intuition imply meaning communication styles. To the Japanese nodding or saying “yes” only means they are listening to what you are saying. It does not indicate agreement.

The Japanese tend to be suspicious of words; they are more concerned with actions. They believe in using silence as a way of communicating. They also believe it is better to talk too little than too much. Japanese take special note of the pauses between words. They are comfortable with less talk and longer periods of silence than are Westerners in general. The Japanese tend to give very little explanation as to what they mean, and their answers are often very vague. They dislike saying no and will not tell a visitor if they do not understand. If they disagree or do not feel they can do something, they will make a statement like “it will be difficult.” This usually means they do not feel they can do what you requested. They often leave sentences unfinished, allowing the other person to finish it in their own mind.

In Western cultures, people are taught to look people in the eyes at all times. Averting one's eyes often signifies a lack of sincerity or confidence. In Japan, constant eye contact is considered rude or even aggressive.

The visitor should learn to become an active listener, as well as a good observer of body language. Otherwise, it is easy to miss a great deal of what is being conveyed to him/her, seriously misjudge a situation, or make incorrect assumptions.

5.1.5 Time and Space

The Japanese are flexible about time and believe in keeping everything in harmony. They tend to resist deadlines until they are sure they can meet them, and are very

meticulous about keeping appointments. Meetings don't usually have deadlines but continue until all business has been completed. Taking time is seen as a sign of wisdom and sincerity. Upper level managers cannot be reached on short notice. A delay in keeping an appointment may be a polite way of saying they aren't interested.

The Japanese are interested in long term planning and also tend to be good tactical planners. A plan, a contract, or the content of a transaction is very flexible to the Japanese. Personal relationships are more important to them than the details of a contract. The Japanese like to spend a lot of time asking very detailed questions in order to find out the position of the visitor from another country. They try to encompass this within their own position. They also prefer informal negotiations in which time is spent building long-term relationships on trust.

The Japanese need to build consensus since it is important that everyone affected agree with the decision. This can take a long time. But once consensus is achieved, they quickly implement the plan.

Because Japanese people live in such a densely populated country, they value their personal space.

Sitting protocol is strict – persons are seated according to rank both in normal meetings and informal business entertaining. Usually a visitor's Japanese colleague directs the visitor to the seat. The person of the highest rank sits in the place of honour - furthest from the door or at the head of the table. When hosting a meeting or social event, the guests should be seated on the side that faces the door. The host group should sit with their backs to the door. When riding in a chauffeur-driven car, the highest ranking Japanese executive should be the first to enter and the last to exit. He/she should also be given the seat beside the driver.

5.1.6 Important Steps with Japanese

- When Japanese are introduced to each other, they bow with no eye contact. With Westerners, they may shake hands and also bow - no eye contact. Westerners are not expected to bow. If you do decide to bow, remember that the person of lower rank bows lower and longer.
- Handshakes are fairly loose and not particularly firm. At the end of the meeting, shake hands with the senior ranking member. Acknowledge others with a nod and smile or a handshake. Make sure you have put all business cards away.
- The most senior member of the visitors leaves the room first.
- Proceed slowly, focus on long-term business relations, preserve a congenial atmosphere, and accept Japanese ambiguity and delays.
- Observe good communication shills - feedback, active listening, decoding body language, be less verbose and use silences and pauses

- Speak slowly and clearly, jargon, idioms, long sentences, complex grammar and negative questions should be avoided.
- Humour should be used cautiously, jokes are easily misunderstood
- It would be better to write down numbers, especially ones over 100,000. Japanese have different terms for large numbers, and it could be confusing. Direct communication about money should be avoided.
- It is important to check and clarify that both sides have understood the issue correctly.
- Indirect and vague communication is more acceptable than direct and specific. When the Japanese listener nods or says "yes," this means "I'm listening" or "I understand" not "I agree."
- Saving face and achieving harmony are more important factors in business than higher sales and profits. Harmony means avoiding confrontation and disagreement. Japanese often do not tell you their true feelings in order to maintain harmony.
- It is often best to send older, more mature employees to meetings with Japanese. The Japanese respect age and wisdom.
- Use business cards with your name and title in both Japanese and in your language.
- You will constantly need to nurture and adjust your relationships with your Japanese partners.
- Japanese business is slow, polite, subdued, and harmonious.

5.2 Finnish Culture: Overview

The key concepts of Finnish culture are equality, individualism, pragmatism and directness. This is one viewpoint on Finnish communication styles. In the following subsections we introduce these concepts.

5.2.1 Equality

Finns highly emphasize equality and egalitarianism and believe that every person deserves the same advantages and opportunities shown on the overall educational structure. This attitude prevails in the business world as well. Finns firmly believe in the protection of democracy and civil rights.

The Finnish emphasis on equality prevails in the workplace. Organizations are not typically hierarchical and are usually flat in structure. Finns tend to take company policy very seriously and follow the rules. Finns do not expect favouritism nor do they expect exceptions to the rules to be made. Finns respect

managers who are experienced and hardworking rather than managers with status alone.

5.2.2 Individualism

In both the professional and personal aspects of Finnish culture, Finns are self-sufficient and prefer to keep to themselves. Finns tend to be very private and group work is not as popular as in other western nations. Because Finns are typically introverted, Finnish communication may seem impersonal at times, though Finns often become friendly once they know their colleagues better.

Personal relationships with colleagues are not as important as in other business cultures. As Finns prefer to keep their personal and professional lives separate, building friendships with business partners is not required. Finns tend to look at facts and have more trust in contracts and documents than in personal promises and relationships.

5.2.3 Pragmatism

Finns are logical thinkers who tend to consider all decisions thoroughly. Most have a very analytical viewpoint and prefer to make decisions based on facts rather than on emotions. Finns are open to new ideas but prefer to keep a realistic perspective when negotiating or planning. Finns pride themselves on their work ethic and believe it to be the secret to high Finnish standards of living. Finns are efficient and effective and expect the same of their international business partners.

Saunas are a large part of Finnish culture and symbolise Finnish ideals of hospitality and cleanliness. Saunas provide the opportunity to connect with your Finnish business partners and to experience Finnish culture.

5.2.4 Directness

Finns have a very upfront and direct style of communication. While in other cultures attempts are made to try to sound optimistic when delivering bad news, Finns would prefer straightforwardness from their business partners. This style of communication may make foreigners feel uncomfortable, Finns often seeming blunt and upfront as a result. Foreigners will often try to soften their language when something is unsatisfactory and, thus, from the viewpoint of Finns, they give false hopes.

Finns are uncomfortable with small talk and tend to avoid it, preferring silence over frivolous chatter. Long silences and pauses in conversation may make foreign business partners feel uncomfortable, but Finns use the silence to contemplate

what has been said. Finns prefer to maintain a certain level of formality with colleagues. In negotiations and meetings, Finns do not engage in small talk and prefer discussing business matters straightaway. They are reserved. Verbal communication is vital in Finnish business culture, and Finns will not typically rely on emotions when doing business. Finns pride themselves on being direct and expect the same of foreigners.

It is important, when dealing with Finns, to understand the Finnish communication style. Finns are quiet. People are expected to contribute to a meeting or conversation only when they have something of importance to say. Thus it is not unknown for a Finn to sit through a lengthy meeting without making any verbal contribution. This lack of contribution should not be confused with a lack of comprehension or interest. The Finn will respond when he or she feels it appropriate. Formality is maintained in business meetings and negotiations. Finns do not typically use humour in their presentations or with their colleagues.

Silence is an integral part of the overall communication pattern, and Finns are more comfortable in silence than most other nationalities.

The self-deprecating Finns will tell the visitor that they are, as a nation, poor at foreign languages - don't believe them. Many Finns speak not only English and Swedish (the other official language of the country) but one or two other languages as well. Fear of making mistakes in a foreign language can give rise to shyness in international arenas, but patience and encouragement will bring their rewards.

5.2.5 Time and Space

Meetings are not typically scheduled for the summer months, as most Finns are on their holiday during July. Finns are not required to work overtime and earn roughly four or five weeks paid annual leave. Finns are very punctual and expect their international business partners to be on time. If you are running late, it is best to let them know in advance and apologize. If a meeting is scheduled for one hour, it will end after one hour. Finns generally adhere to planned schedules and deadlines since punctuality is taken seriously and meetings are very structured.

Finnish people want to keep distance to people they are talking with. Depending on the situation, Finns' personal space is from one to two meters, at the very least.

5.2.6 Important Steps with Finns

- Eye contact and direct speak are important for Finnish business partners. Finns take lack of eye contact for dishonesty and untrustworthiness.

- Sauna is an excellent way to connect with the colleagues while learning about traditional Finnish culture, as many important meetings tend to be followed by a trip to the sauna.
- Finns appreciate dry wit and enjoy self-deprecating humour. Finns enjoy irony and have a rather subtle sense of humour.
- Interrupting Finnish colleagues during presentations should be avoided. Questions will be presented at the end of the presentation and kept to a minimum. Finns tend to distrust talkative people.
- Finns view too strong emotions as unprofessional, and being too emotional will harm relationship with Finnish business colleagues.
- Finns can be rather blunt. This is typical in Finnish communication, as Finns prefer to tell the truth directly and take pride in their matter-of-fact attitudes.
- Negativity should be avoided, as any kind of negativity will offend your Finnish colleagues.

6 Description of the Interview Process

The overall target for this research is to provide support for globalization of Finnish software business. Globalization has led to the distribution of the software development work to multiple sites in different countries. The software development may take place within one organization in several sites or between two or more organizations. Once a software development project has been established so that there are development sites located in different countries, people with different national cultural backgrounds will be working together in the same project. Cultural sensitivity and understanding is very important here. In order to get a better understanding about challenges faced by multicultural software development, the following main themes and questions were formulated. The subthemes (a bullet list after each main theme) resulted from the pre-interview process (Figure 3).

1) How do cultural factors affect distributed development?
    - Multicultural team-management
    - Multicultural project-management
    - Communication
    - Time zones
    - Respecting authorities
    - Punctuality
    - email culture (how to get it used in communication)

2) How do cultural factors affect designing and implementing software products and services?
    - Market requirements
    - Product management
    - Customization
    - Internationalization (e.g. Multilanguage product)

3) How do cultural factors affect internationalization, target country selection and entry mode choice of software firms?
    - Entry barriers (e.g. Legal)
    - Overall infrastructure (e.g. Safety)
    - Market conditions
    - Working infrastructure (conditions)
    - Cost savings
    - Managements costs

4) How do cultural factors affect services needed to support commercialization of software products?
    - Market requirements - Infrastructure (e.g. Internet connection)
    - Localization
    - Customization
    - User interface
    - Visual outlook
    - Intercultural studies

To be able to answer these questions, a complementary set of interviews, alongside a literature research, have been conducted in software companies in Finland.

6.1 Thematic Interviews

The interview process included three phases: pre-interview process, actual interview process and post-interview process (Figure 3). The study started with literature research, where multicultural issues and issues related on global software business were detected. Also the terms which are used in the context of global software business and global software development were defined. The terms were classified under the following categories: culture concepts, organizational culture concepts, software technology concepts and software business concepts (Tables 1-4).

In the next phase, a list of interesting companies and organizations which are participating in global software development was made. Around thirteen pre-interviews were conducted based on that listing, in order to explore themes and questions for later, more detailed interview sessions.

Before any actual interviews, the interviewees were contacted by phone. Personal contacts were made in order to increase the commitment of the participants and to get an opportunity to pass them the themes of the coming interviews. In the next phase, a more comprehensive interview process was carried out in the selected companies. Around twenty interviews were conducted between April 2010 and September 2010.

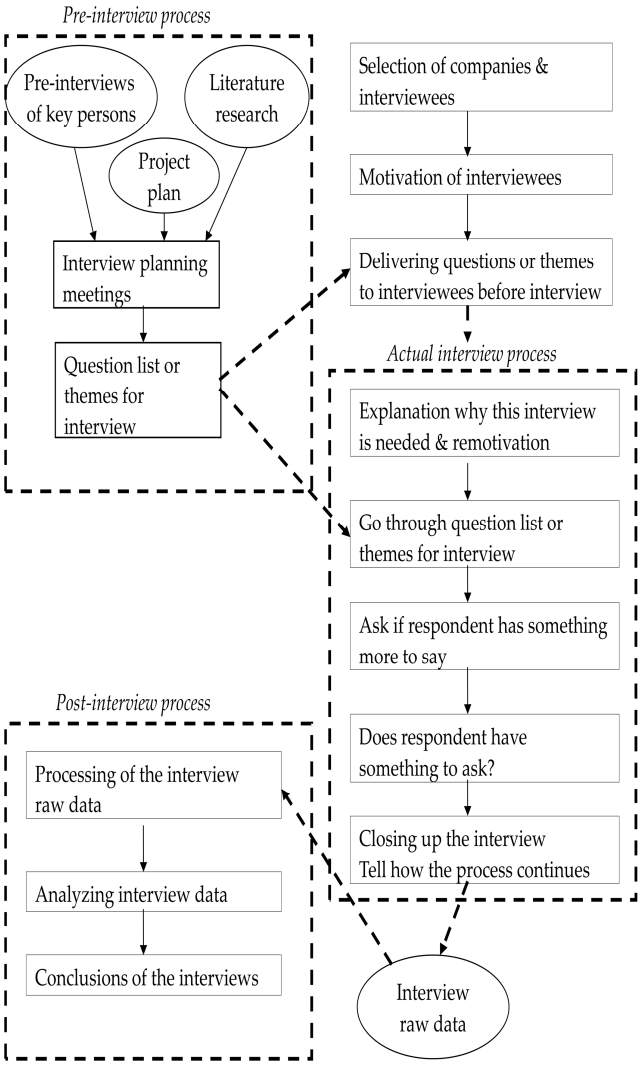

Figure 3: Interview process

6.2 Pre-interviews

Pre-interviews were carried out before actual interviews, in order to get an overview on multi-cultural issues related to global software engineering and also in order to get a proper orientation on the interview situation. Thirteen persons were pre-interviewed. These pre-interviews were free-form sessions where the interviewed persons had an opportunity to tell about their experiences with global software development or global software engineering. Some sessions were face-to-face meetings, but also telephone and email were used.

The group of pre-interviewees included specialists from different areas: company managers, university professors and software project managers, among others. It should be noted that the opinions collected here and also in the actual interviews are those of Finnish people, and the issues that have surfaced may not be generalizible because of limited sampling.

6.3 Selection of Interviewees

6.3.1 Companies

The plan was to interview several key persons from companies engaged in distributed software development. The idea was to select companies with different distribution dimensions (presented in Table 5) for interviewing. The selected companies represent a wide range of software production in Finland and abroad. Some of them have software product(s) of their own, and some of them are specialized in software engineering. All of them have already taken at least their first steps in internationalization.

The total number of the selected software companies was 20. Also one of the Jyväskylä region's development organizations was interviewed. Of the companies, 14 have an office in Jyväskylä, and their interviews were made in Jyväskylä. Included are small companies as well as very large corporations. Of the interviewed companies, 8 can be labelled as SME's having 500 or fewer employers.

6.3.2 Experts

Since software project managers seem to be among the key persons in global software development, most of the selected interviewees had experience on software project management. They represent the project manager level and senior project manager level. Also unit level managers, with several project managers as their subordinates, are included in the group of interviewees.

6.4 Actual interviews

The themes for the interviews were sent to the interviewees beforehand by email. All except one interview took place in the premises of the interviewee's employer. The duration of these interviews was approximately 1.5 hours. The interviews were recorded, transcribed, and documented.

At first the interviewer explained the objectives of the research project. Attempts were made to make the actual interviews quite informal. In the beginning of the interviews, the interviewees were asked to tell about their companies and their jobs. That was found to be a good way to lighten the atmosphere during the interview sessions.

The study focused on four main themes. Since no single interviewee could discuss all of the themes, each were asked to choose the most appropriate ones in accordance with one's expertise. Under the themes selected e.g. the following questions related to software business management issues could be found:

- What were the business reasons for entering some specific target country or countries?
- How was the software business model/strategy selected?
- What kinds of experiences (good and bad) were encountered?
- Have there been any cost savings after the decision to use distributed engineering (any benefits)?
- What kinds of cultural experiences have there been in working with people from other cultures?
- What were the biggest problems related to working with people from other cultures?
- Have any organizational vs. national culture differences been identified?
- What kinds of experiences (good and bad) did you detect in working with other cultures?
- Have you encountered any situations of misunderstanding in working with people from other cultures? What kinds of situations?
- What have been the biggest problems related to working with other cultures?
- Would cultural training help?
- Software engineering process –which phases have caused the most problems?
- Were there any experiences of agile methods in distributed multicultural projects?
- How was (informal and formal) communication handled in the distributed project?
- Were there communication problems?

7 Research Findings

The following research findings are based on the pre-interviews and actual interviews. Each topic map can also be used as a tool for identifying and clustering essential topics in company, from company's own viewpoint.

7.1 Summary of Pre-interviews

7.1.1 What is Culture in the Global Software Development Context?

There are different characteristics of culture which can be seen in Figure 4. The figure also shows what characteristics can be discovered from national cultures.

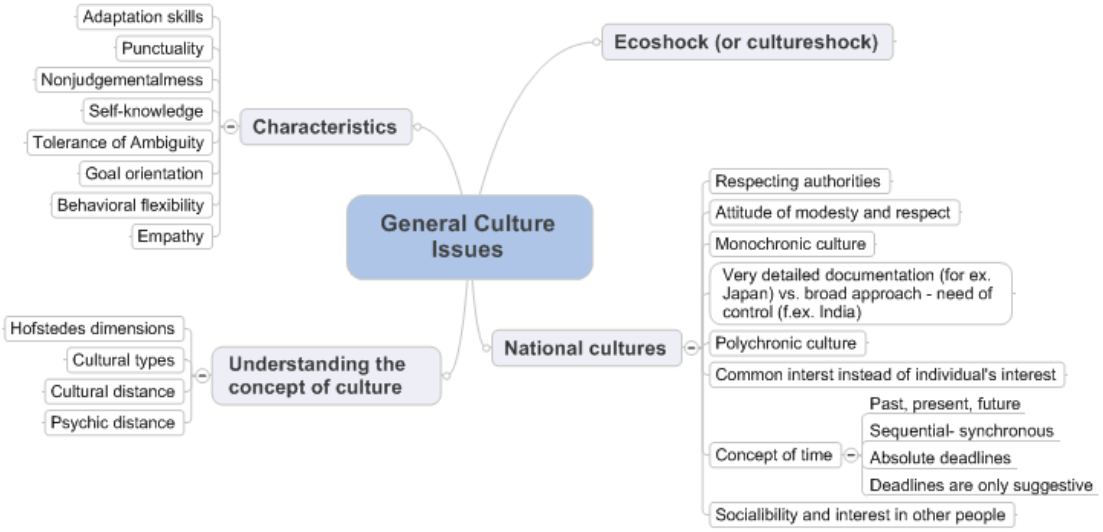

Figure 4: General cultural issues

7.1.2 Global Software Development

There are several approaches to globalization of software engineering and internationalization of software business as shown in Figure 5.

Software project manager is the key person in a global software project. The project manager has to be very flexible, good in understanding different cultures and also a good listener. In addition, there are different ways to manage a multicultural software project, some of which are very demanding and new. For instance, it has been stated that there is not yet very much experience about agile methods in global software development.

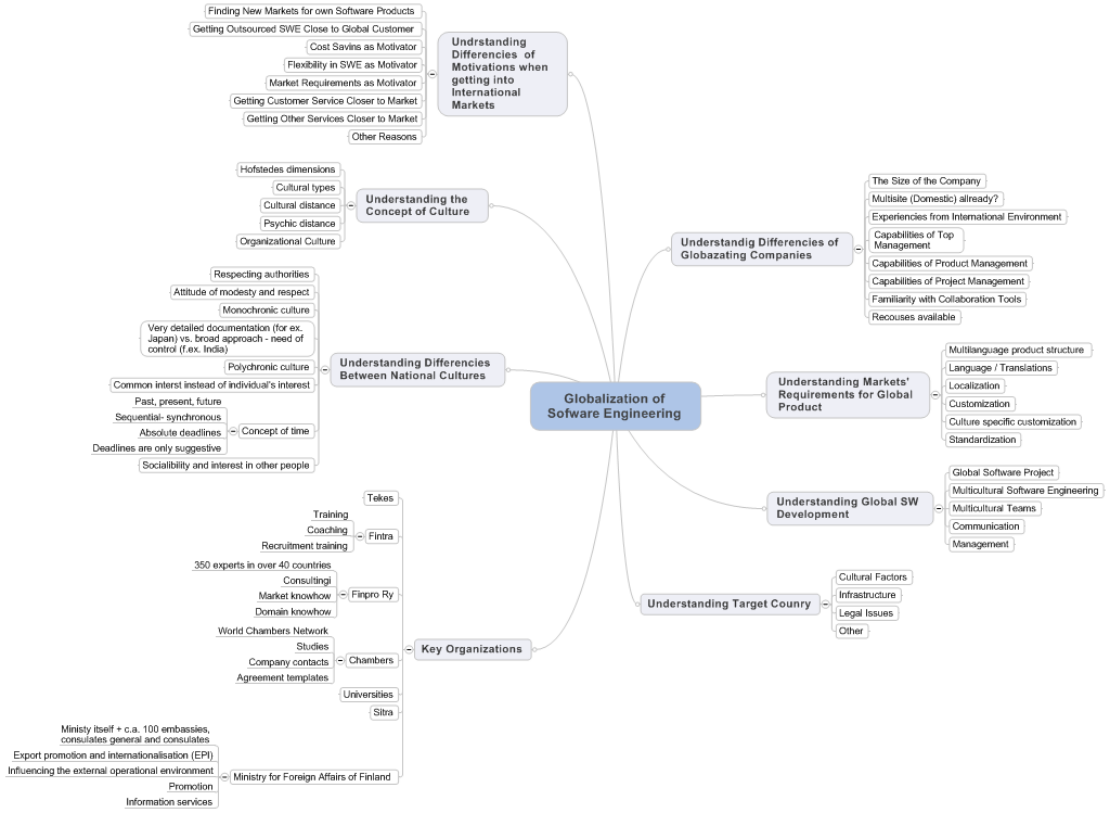

Figure 5: Approaches to globalization of software engineering

Large global companies seem to have quite a strong organizational culture. As an illustration of this, it was discovered that when an engineer came to a team from a distant culture he was very soon behaving in the same way as the native team members. Moreover, Boden et al. (2009) have discussed that in a large global company, tools, methods, rewards and the way to give feedback should be similar regardless of the culture. Usually, a person's cultural background was not seen to affect job allocations in a team. Having members from several cultures was seen as a positive thing tending to increase cultural richness. Cultural bridging of staff (building mixed teams so that members are brought from another culture to a team) was seen a good way to enable adaptation and learning between different national cultures. This could be used especially when a company is planning to expand its software development to a new country and culture. When recruiting new engineers, the suitability for the job was seen as more important than the applicant's cultural background. A multicultural manager must have organizational skills, and he/she must be good at diversity management.

Furthermore, the manager should know new learning and communication methods, including wikis, virtual worlds, online simulations, blogs, platforms for information sharing and also reverse coaching where newcomers are coaching management in new issues (for example in the area of games).

Finnish software project managers detected many co-operation problems with other cultures, and, in conclusion, it was assumed that in large organizations national culture is stronger than organizational culture. This observation is supported by the findings of Hofstede [Hofstede and Hofstede 2005]. On the other hand, it was stated that in big companies tools and methods should be steering the work in the same direction regardless of the national culture. A very interesting observation is also that new team members quite soon behaved in the same way as the native team members.

The components of global software development are presented in Figure 6.

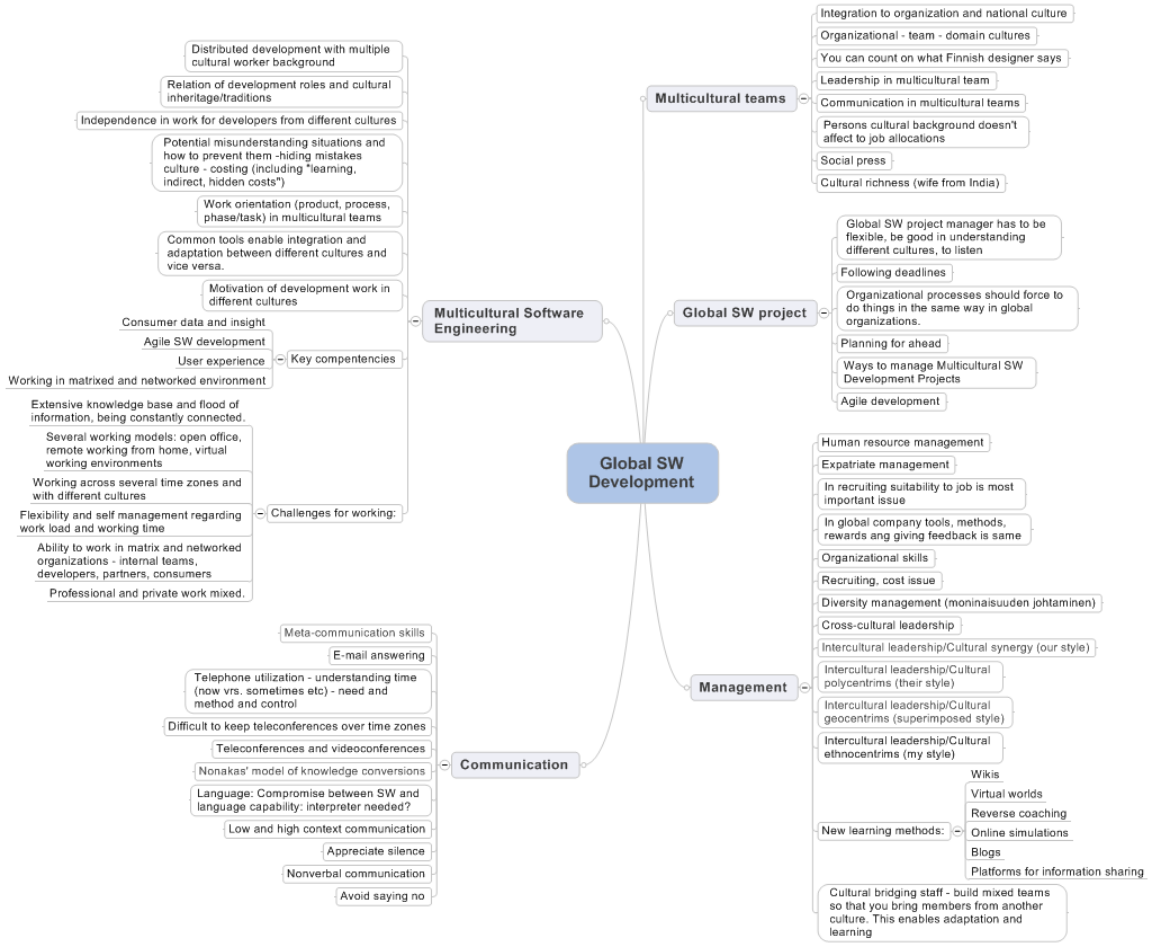

Figure 6: Global software development

7.1.3 Multicultural Software Engineering

There are several potential situations of misunderstanding in global software projects, and in some cultures even hiding one's own mistakes may be typical. Several differences were detected between cultures, at least in the independence of work, work orientation and motivation to development work. Many challenges were identified in working in a multicultural environment, including: 1) extensive knowledge base and flood of information 2) being constantly connected, 3) several working models: open office, travel, remote work from home, 4) virtual working environments, 5) working across several time zones and with different cultures, 6) flexibility and self-management regarding work load and work time, (7) ability to work in matrix and networked organizations – internal teams, developers, partners, consumers, and finally, 7) mixing of professional and private work.

As has been mentioned above, communication presents a challenge in global software development. To begin with, arranging teleconferences and videoconferences can be complicated: it is not easy to find a meeting time if there are several time zones between the development sites. Secondly, there are the problems with answering emails. In some cultures it may take time until the response is sent back if it is sent at all. Moreover, in some cultures the word "no" should not be used – misunderstandings may arise if this is not remembered. To conclude, nonverbal communication and silence (in some cultures) is not so easy to use and understand in distributed software engineering.

7.1.4 Multicultural Software Business

When a company is planning to expand its software development to a new country, it has to analyze software business globalization in connection with cultural issues and to consider where to develop the product and where to adopt its business functions (Figure 7).

There are various business strategies which could be used in the globalization process, including outsourcing, offshoring, nearshoring and subcontracting. Consequently, business strategy selection may depend on several issues such as cost structure and availability of resources in the target country. The decision to enter some country requires knowledge about the culture and markets of the target country. Moreover, it is also essential to understand the work infrastructure; market knowledge and experience are needed; and the entry barriers must be known. There are also several product-related requirements, which are country specific, for instance market requirements, product localization, culture-specific customization and language to use.

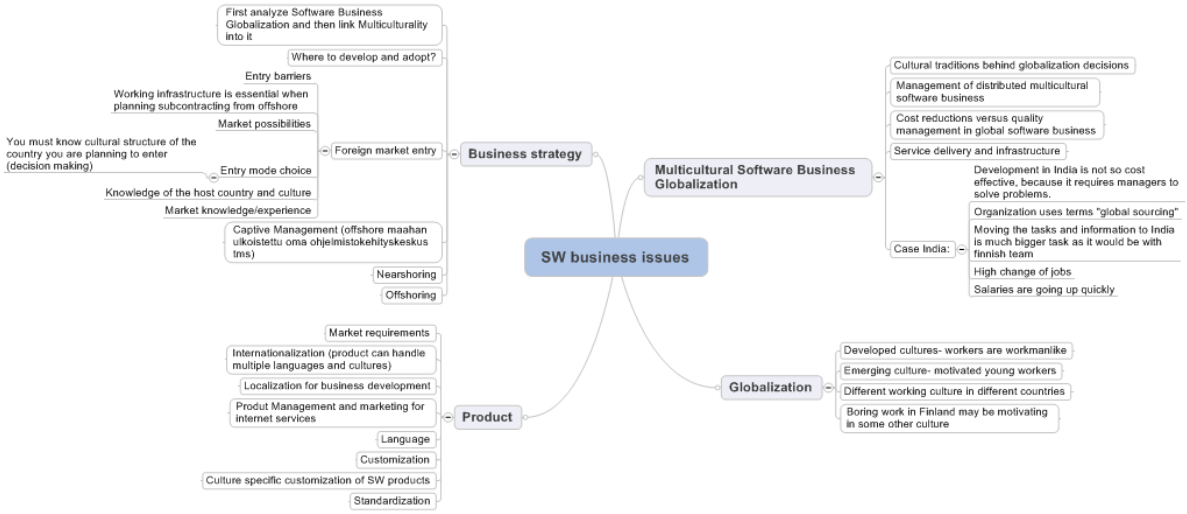

Figure 7: Software business issues

It was stated that emerging cultures often have more motivated young workers when compared to developed cultures where workers are more workmanlike and not always so motivated. The working culture is different in different cultures and, furthermore, the work which is considered boring in one culture may be regarded as motivating in some other culture. When planning software business globalization, the company must pay attention to several issues: management of distributed multicultural software business, cost reductions versus increased quality management, service delivery and infrastructure.

When planning entry, for example to India, the company should give consideration to the fact that salaries are going up quickly in India, that there is quite a high staff turnover and that development in India is not as cost-effective because more managers are needed to solve problems. Furthermore, it was also found that moving tasks and information to an Indian team is a much larger undertaking than it would be with a Finnish team.

7.1.5 Findings of National Cultures

We also obtained some observations from the Finnish interviewees about people from different nations (Figures 8 and 9.)

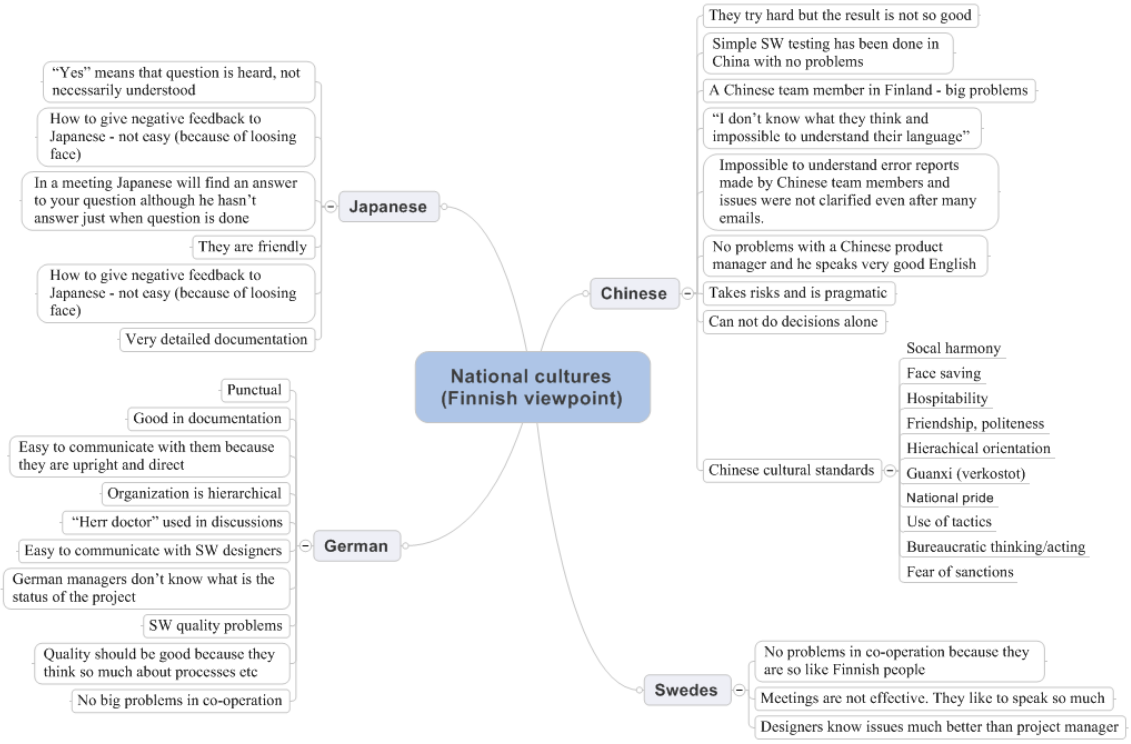

Figure 8: Finland and other cultures

The persons interviewed explained what kinds of experiences they had had when they were working together with foreign people. It must be noted that the sampling rate was not high, and, thus, these comments are only indicative. Most of the comments concerned Indian persons, and the least number of comments was about Swedes. Based on the comments, we could speculate that the interviewees most often had co-operation problems with people from the USA, the UK and India. The least problems in co-operation were detected with people from Sweden, Germany and Japan. Quite a many problems were also reported when working with people from France and China. It should also be noted that the interviewees who had problems with people from the USA and the UK were working in the same organization.

When comparing these findings with Hofstede's dimensions presented in Table 6, we can see that the dimensions for the USA and the UK are quite the same, and that people from Finland were having many problems in cooperating with people from these countries. The greatest difference is in the area of Masculinity/Femininity and also in the amount of Individuality. Many problems were also reported with people from France and India, and it seems that the largest

difference with these countries is in the power distance index which is much lower in Finland. However, when we check these results against the LMR categories, it is not possible to easily discover any reason why there should be so many problems with some nations compared to others. Altogether the sampling rate is too low to make any conclusions based on the comments.

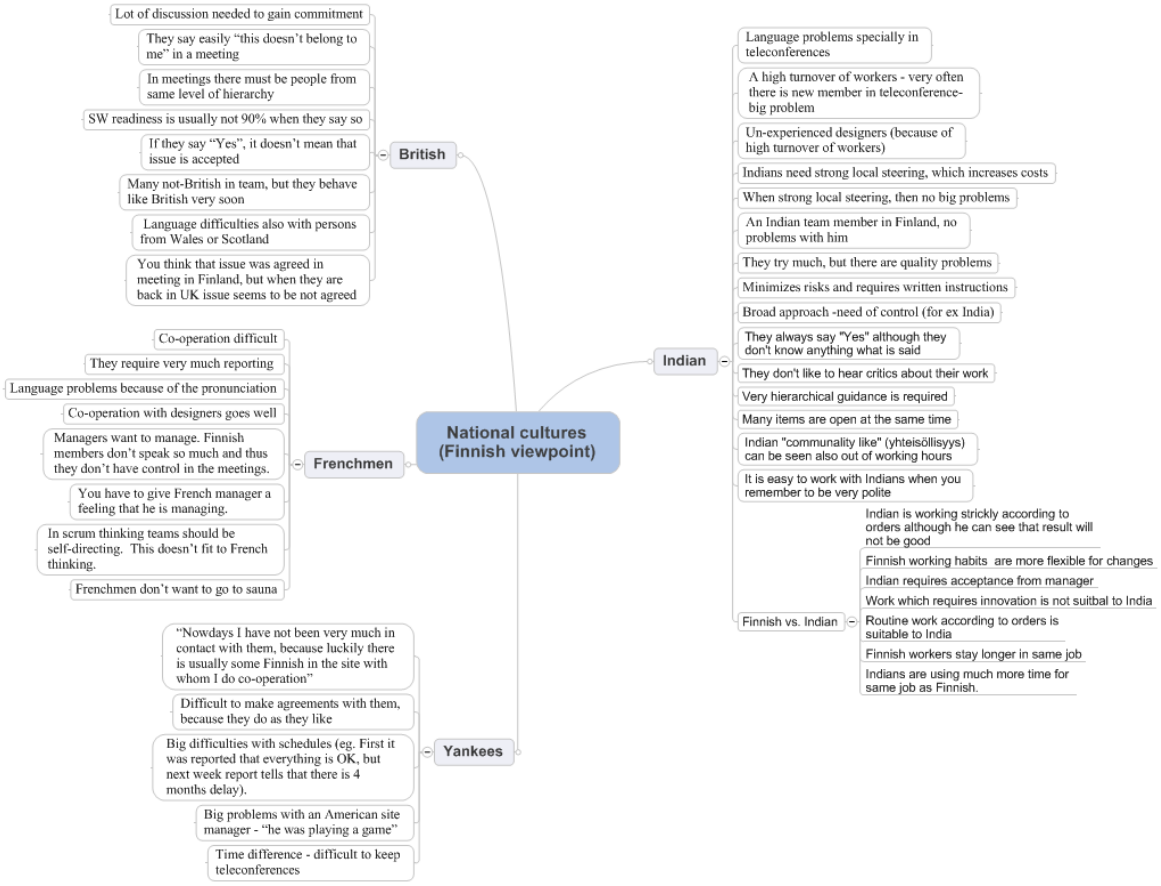

Figure 9: Finland and some cultures with problems in cooperation

7.1.6 Collaboration Model for the Global Software Development Project

Global software development has increasingly been using collaboration technology, not only for communication, but also for project management, software configuration management, document management, error management, requirements management, and for computer-aided design. Successful selection and usage of those tools are thus essential for a software project. By introducing our model, we want to emphasize that collaboration does not only result in the

correct selection of tools, but it also increases cultural awareness and effective ways of working together [Ylikotila and Linna 2011] (Figure 10).

We have divided our model into three phases: collaboration initiation, collaboration planning, and the collaborative project phase. At each phase, there are certain tasks that should be accomplished and some main decisions that should be made in order to move from one phase to another. An organization enters the collaboration initiation phase when a need is identified, to examine whether a software development project should be developed globally.

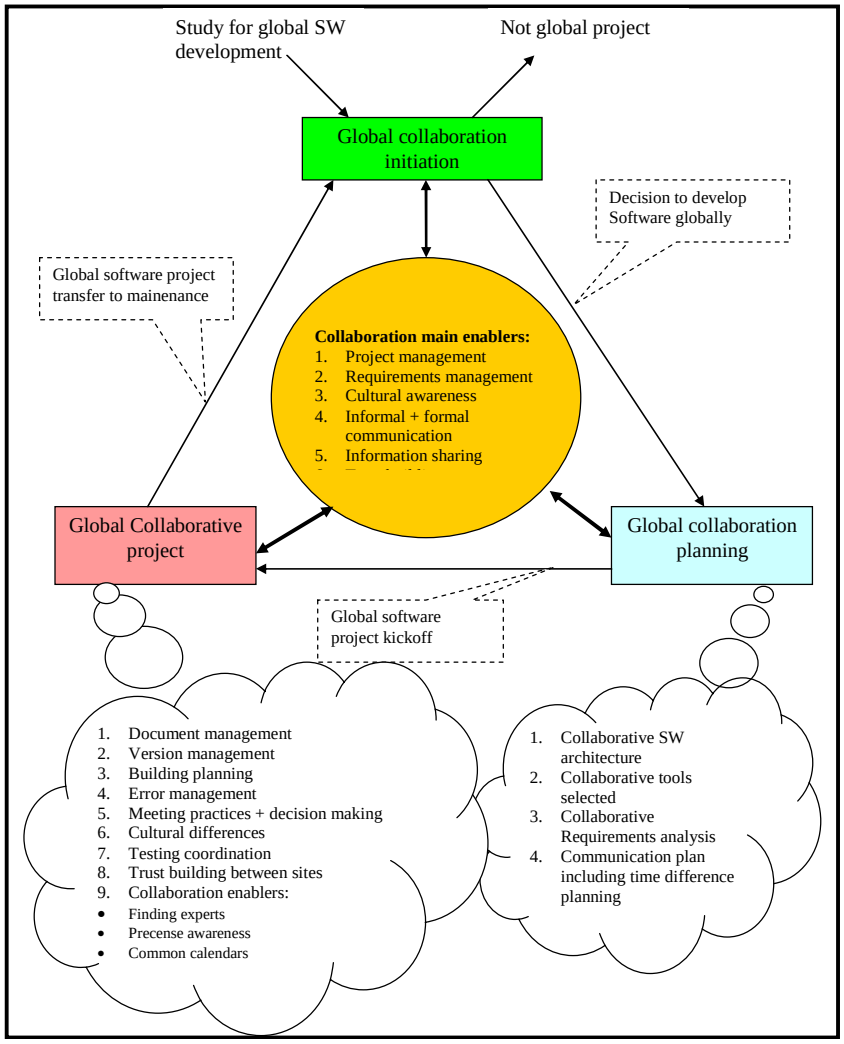

Figure 10: Collaboration model for the global software development project according to [Ylikotila and Linna 2011]

When a decision is made to implement a software project globally, the project is moved to the collaboration planning phase. In this phase, the following collaborative tasks should be performed in the project planning:

- Collaborative software architecture: When planning high level software architecture, it must be noted that software modules should be easily distributable to different sites and interfaces should be well-defined.
- Collaborative tools: Communication, requirements management, version management, etc. tools should be selected for the project.
- Collaborative requirements analysis: At least one representative from each site should be involved in the requirement analysis phase, in order to achieve a common understanding of the requirements and to become committed.
- Communication plan, including time difference: When planning communication for a global software development project, conventions are among the most important things. Both formal and informal communication should be taken into account. If there are representatives from several continents, finding suitable times for teleconferences may be very difficult.

The transition from the global collaboration planning phase to the global collaborative project execution phase should include a global software kickoff event with at least one representative for each site. Ideally, all project members should attend this event, but this is not always possible for the reasons of cost. The event can be a good venue for information sharing and for people meeting each other. It would be a good idea to have also some informal activities in this event, if possible. In the actual project execution phase, there are several tasks in which collaboration between the sites should be taken into account:

- Collaborative document management: Document management practices should be implemented so that documents would be available to all parties.
- Collaborative version management: Version management practices should be implemented so that all parties would have access to the version management system.
- Collaborative build planning: Build planning and practices should be implemented so that all sites are taken into account.
- Collaborative error management: Error management practices should be implemented so that all sites are involved, and it should be decided clearly which site is responsible for certain error-solving.
- Meeting practices and decision-making: Project meeting practices and decision-making should be performed in a way that information about the project situation and decisions would be available to all parties.
- Understanding cultural differences: Global software project members should have the basic knowledge of the main differences in other cultures.

- Testing coordination: Testing coordination between sites should be implemented so that testing responsibilities became clear to all parties.
- Trust-building between sites: This is a difficult issue but an important one and should be understood at least by the project management. The ways to increase trust between sites would include involvement of all sites in meetings and information sharing. Informal communication is also an important way to build trust.

The global collaborative project is transferred to the maintenance phase once all planned tasks in the project have been done. In our model, the project phase is moved again to the Global collaboration initiation, and it must be decided how maintenance will be implemented – is it to be done in one site or globally? If maintenance is arranged globally, this model can be utilized for maintenance collaboration planning.

The most important enabling tasks for the global software project are:

- Collaborative project management: Careful project management practice planning is essential for the collaborative project.
- Collaborative requirements management: Careful requirements engineering and planning throughout the whole project schedule is essential for the global software development project to be successful. All sites should be involved in this work.
- Cultural awareness: Increasing cultural awareness between distant teams is very important to enable members from different sites to understand each other better.
- Informal and formal communication: Informal communication between sites should be encouraged and supported by the management. Meeting practices (e.g. weekly meetings) should be planned and agreed between sites.
- Information sharing: Information sharing practices should be planned, taking into account distant sites.

The collaboration planning for global software projects is supported by our reference model, which should be used by program managers when planning a global software project. The model can also be used for training purposes in order to identify the phases and tasks to be taken into account when planning collaboration in a global software project.

7.2 Summary of Thematic Interviews

1. Personal contact is important. In all interviews, it became clear that one (for example, a project manager) should personally meet those people who are working within the same projects, even when located in other/distant sites. Ideally, these personal meetings should be arranged during projects. It is a

must to have meetings at the beginning of a project. Personal meetings reduce possible problems, including problems in email communication caused by cultural differences, even if those differences are big. The interviewees emphasise that commitment to work/projects increases when one personally knows one's subordinates. Communication with email or through video conferences afterwards will also be freer if people know each other. Companies/employers should actively encourage their employees to arrange personal meetings among people working abroad. This should not be seen as an expenditure but as an investment. In companies that have subsidiaries abroad, it has been quite a normal practice that project managers travel and personally familiarize themselves with the project personnel abroad. Travelling is not free of charge, but it is worthwhile!

2. Telecommunication tools are widely used. All those companies which were interviewed use various kinds of telecommunication tools. Modern telecommunicating tools make real time remote communication possible. Chatting, video-conferencing, Skype etc. are all widely used. They are necessary, cost-effective and no longer expensive. They are considered to be a part of office systems. In companies interviewed, also tools for distributed software engineering were widely employed. Their use is necessary in large software projects. By means of these tools, projects can be divided into parts and followed up to their realization. In multicultural/multi-site projects, tasks should be planned very carefully. Even where telecommunicating tools are available, it is always better to arrange face-to-face meetings – at least at the start of a project.

3. Communication. Communication has proved to be very important in multi-site and multicultural software engineering. There are several technical tools that help in communicating with other sites. However, in the interviews it was frequently mentioned that face-to-face meetings are very important, especially in the beginning of SW projects or when new SW teams start in a distant site. Issues in communication include answering email, telephone utilization, time perception (now vs. sometime), methods for time management, teleconferences and videoconferences, net meetings, compromise between software and language capability, low and high context communication, silence, nonverbal communication, avoiding saying no.

4. First example of cultural differences is motivation. People/workers with different cultural backgrounds have different ideas about motivation and remuneration required. For example, according to one of the interviewees, in India one's title and stable career development are important. Polish people, on the other hand, appreciate mostly financial compensation, i.e. remuneration.

5. Our second example of cultural differences is respect for hierarchy. In Finnish culture, communicating with people, also at higher levels in an organization, is fairly straightforward. This is not the case for example in Central Europe, where the official "chain of command" is often regarded as the only right communication structure. For example, a Finnish team member might not receive any response to an email sent to a colleague in another team member in France. It might have been better if the Finnish team member had first asked his or her superior in Finland to send an email to the superior of the corresponding team member in France asking him/her to forward the original question to the French team member. As mentioned before, it also would have helped if the team members had previously been involved with each other. Respect for hierarchy can also be play part in normal team meetings: a manager at work might tell how things should be handled. The subordinates might not want to interrupt their superior, and they would follow the orders without questioning. This also presupposes that the manager would not want to ask the subordinates about the matters being dealt with since that could be interpreted as a weakness.

6. Our third example of cultural differences is respect for authorities. The Poles, for example, have strong respect towards authorities (they might even fear them). One of the interviewees thought that maybe that is the reason why they also are very committed to work. In China, authorities are also highly respected. This has advantages and disadvantages. In China, workers expect strong leadership. The superior at work tells, exactly and clearly, what subordinates should do. Chinese are good at listening, but "not so good" at asking for advice or help. Irish (also German and French) management culture is more top-down than Finnish management culture. The manager's word is the law in those countries, and it is not to be questioned. In India, workers are very committed and work hard. It is regarded as natural that one stays at work late in the evenings and also works during weekends.

7. Our fourth example of cultural differences is saying things "as they are". Polish employees keep insisting, almost to the end, that everything is alright, until finally they are forced to make their worries known. In India, workers like to display their excellence, which sometimes leads to hiding any problems; they like to show that they can do the job and that they are on time. In China, the fear of losing one's face motivates towards the same kind of behaviour. Advice might not be asked, even if needed. As in India, workers in China seem to expect that their superior is completely in control of the work underway and is able to give detailed advice on it. In China, there are therefore good reasons to organize events and/or meetings where subordinates are given the chance to ask questions or request help. (In Finland, a superior who constantly keeps asking about the progress of a project might give cause to irritation.) Finnish outspokenness (particularly in emails) is not always the best possible way to communicate because the direct tone of the message might be misinterpreted by the respondent. On this Finns have much to learn about. A general observation from our thematic interviews is that it is important to recognize cultural differences to ensure that the contents of messages are understood as meant and that they do not seem insulting or hurting. For example, Chinese “yes” affirmative does not necessarily mean that the person has understood you. Similarly, an Englishman’s “yes” does not necessarily mean that he has committed himself for doing the job.

8. Setting up a site abroad. Safety and infrastructure are the basic requirements when selecting a target country where to set up a site or a subsidiary. When selecting the country, it would be a good idea to find out where the other companies in the field and/or competitors are located. Finnish foreign trade support organizations, among them Fintra, Finpro, and Ministry of Foreign Trade, have good networks, and should be used when planning to establish a site abroad. It may be wise to send a Finnish manager to supervise the founding of the site or subsidiary, for example for the first 3-4 years. On the other hand, it was mentioned in several interviews that local workers appreciate the company having a local management. This has to be taken into account when recruiting new personnel. In general, it has been observed in interviews that foreigners, especially those in Finnish companies, are respected for example as partners and employers in China. As important as recognizing other cultures' special features is that we recognize our own special cultural features and are able to talk about these and share ideas about them in our new site or subsidiary. As a result,

efficiency at work will be increased, and this may help in avoiding unnecessary conflicts.

9. First steps in internationalization. The first thing when planning to internationalize our activities is to learn English. A useful way to learn and to use English is by creating internal reports in English and participating in meetings conducted in English. One of the interviewees told that hiring a foreign employer in Finland may be a good start to internationalization. If there is a software product which we want to sell to a new market, one possible way to do that is to set up a site or subsidiary in the target country. It is important to define our own processes and start to apply them domestically well before moving to internationalization. Clear and well-defined processes help in setting up foreign activities. From the very start, software must be designed to support multiple languages. If possible, some strategically placed companies may be utilized to help in the internationalization process.

10. Going to international markets. When considering the question about whether the home market is too small, companies often contemplate expanding their customer basis across national and cultural boundaries The domestic market in Finland is limited, so internationalization is a way to grow business, and a global access to clients is needed. At what stage are we regarding internationalization? If you plan to internationalize, start your internationalization process at once; the process will not be easy and require a long-term solution. The internationalization process is a process of integrated and gradual learning, not simply a series of actions, decisions and business deals. Do we lack know-how and skills related to marketing, sales, communication, and internationalization? – There are several organizations in Finland that can help a company in its way to become an international business.

11. Subcontracting and production abroad. If the necessary processes are well defined, it is possible to transfer them abroad. It would not be advisable to start creating these processes in a hurry. Requirements specification must be clear and carefully done if software engineering is planned to be outsourced. This extra care in requirements specification will also cause extra work and costs. The more exact the specification, the more expensive it will be. It is important to plan carefully which parts of the production will be outsourced. Basic programming and testing, for example, can be outsourced, whereas

requirements specification or customer relations and customer services are more difficult to outsource. For business reasons, it is also wise to keep the latter in one's own hands. One of the interviewees told that problems in subcontracting are always the fault of the buyer: requirements specification, implementation, its supervision or something else that has not worked properly.

12. Management of multiple-sourcing relationships. Multiple sourcing is seen important for the future. In multiple sourcing, context management is one of the main challenges. There isn't enough experience of either models or tools.

13. Organizational culture and team culture. Within an organization, the transition phase from one team to another may also require cultural competence and adaptability from the teams.

14. Project manager is the key person. Our research emphasizes the importance of the selection of software project manager in distributed software development. The project manager has to be a very flexible and culturally sensitive person.

15. Cultural bridging, i.e. creating shared understanding. We can also recommend the use of the "cultural bridging" method when a company is planning to expand its software development to a new country. Every culture is made up of unique elements of habit, behaviour and belief. In order to bridge differences, the most powerful approach is to build a new culture which is an extension of the two different cultures that are being bridged. Safe contexts can be created that allow people from different cultural backgrounds to explore differences in world view and ways of operating. They are then able to generate an integrated new culture that supports strategic organisational objectives.

16. Tacit knowledge. Models, methods and tools for tacit knowledge transition from persons' heads to companies' collaborative memory are seen interesting and important in general and from the multicultural viewpoint as well.

8 Conclusions and Issues for Further Research

Our study started by defining the terms which are used in the context of multicultural software development. Also an exhaustive literature research on cultural issues in distributed software development was conducted. A list of interesting companies and organizations which participate in global software development was composed. Pre-interviews of thirteen key persons from these organizations were carried out in order to explore issues and questions for later and more detailed interview sessions. Around twenty companies, representing a wide range of software production in Finland and abroad, participated in the actual interviews. Some of these companies have software product(s) of their own and some are specialized in software engineering. All of them have already taken at least their first steps in internationalization. The enterprises included SME's as well as very large corporations. The pre-interviews were conducted as informal and unstructured sessions, where the persons interviewed had the possibility discuss their experiences about global software development. The actual interviews were based on themes which emerged from the pre-interviews.

In our report, we have introduced and analysed the kinds of challenges global multicultural software development is currently facing. We found that many problems in global software development projects are initially related to communication. In order to strengthen the planning and execution of global multicultural software projects, we have introduced the collaborative model. This model points out issues and tasks that should be taken into consideration during project planning and execution. The model includes cultural factors that should also be considered in global projects. By utilizing our model, companies can easily detect those issues and tasks which are important in the planning of a global software development project.

The principal aim of our research project is to support the globalization of Finnish software development in multicultural context. The main objective of our research is to create new knowledge which supports software business in globalization processes. It is evident that putting effort into collaboration planning and increasing cultural awareness would benefit global software projects.

Here we also relate our study to two important comprehensive studies:

1. Äijö, T., Kuivalainen, O., Saarenketo, S., Lindqvist, J. and Hanninen, H. 2005. Internationalization Handbook for the Software Business. Lappeenranta University of Technology, Centre of Expertise for Software Product Business. 152 p. + appendixes.

2. Marttinen-Deakins, H. and Nuutinen, E. 2009. Software Business Models in Asia. Finpro and Tekes Survey.

The main focus of the first study is on general steps towards internationalization [Äijö et al. 2005]. Below we summarize the ten main questions presented in that study to help companies to position themselves in the global arena. We notice that multicultural competence and skills arise from and are embedded in several issues and phases towards internationalization.

Where are you now?

- How much general business experience do we have?
- How much international business experience do we have?
- How important is it for us to grow and internationalize?
- What are the motives and specific objectives for our internationalization?

Are you ready?

- Do we have the necessary skills and resources?
- Can our managers and employees succeed in international business?
- Are our owners and board members fully committed to internationalization?
- Is our product ready? Do we have financing, sales and marketing, production, delivery and channels in place?

How well do you know the global business environment?

- Do we know what the major trends in the global business environment are?
- Are we aware of how companies in our industry are changing their way of operating?
- Are we capable of adjusting to and capitalizing on the emerging trends?

Where to go?

- Do we know what target country is the best for us? Is our product right for the target market?
- What is the level of demand, life-cycle, stage, and growth in the target market?
- Do we know competition in the target market? How easy is it to enter the market?
- Do we know our chances of success in the target market?

How to get your product over there? .

- What type of entry mode into the target market should we have?
- What are the suitable channels in the target market? Does our product suit the channel?
- What type of co-operation should we have? How do we find a suitable partner?

Who are your customers?

- Who are your customers? Who are your end users?
- Who have the most influence to the decision-making by the end-users? What is their purchasing process?
- What need does your product fulfill?
- Does our product concept fit the end-customers' needs?

How tough is the competition over there?

- Who are our direct and indirect competitors?
- How strong are the competitors? How does our product match up to the competition?
- What is the structure and level of competition in our target market?

Do you see the forest from the trees?

- Where are we strong or weak in relation to our competitors?
- What are the biggest strategic challenges and risks? What are our strategy choices?
- What is the basis for our international success?
- What are the threshold factors of our intended customers?

International market research

- What is the stage of our internationalization maturity?
- How can we collect the data most efficiently?
- What else do we need to know? Relevancy from multicultural competence viewpoint is very high.
- Where can we find extra information?
- Are we ready to formulate detailed plans for growth and international expansion?

Internationalization strategy

- Do we need a business plan for investors, customers or partners?
- How clear is our competitive superiority?
- How easy is it to copy?
- How can we defend it and guarantee our long term competitive edge?
- What type of strategic plan and planning system should we have?
- How can we maintain our competitive superiority? Relevancy from multicultural competence viewpoint is very high.

The second study, Software Business Models in Asia, was conducted by Finpro and Tekes. Business models in the software industries of India, China, and Japan are changing rapidly. In addition to having a strong subcontracting industry, China and India are generating an increasing number of innovation partnerships between companies, as well as development work aimed at creating embedded solutions. Self-sufficient Japan, too, is opening up to global partnerships in the software industry.

The aim of this survey was to chart the software business models used, and changes in them, in the software industries of India, China, and Japan. In addition, business opportunities available to Finnish companies were investigated. No longer satisfied with being only subcontracting countries, India and China are developing their own software industries intensely. In Japan, companies have usually carried out their software development work themselves or in very close cooperation with a subcontractor. Now Japanese companies are also looking for global "innopartnerships".

The role of India is changing. There are now large R&D centres, making use of local know-how, established in the country. India has a lot of expertise that is absolutely top-notch. However, that expertise remains fragmented, which poses a challenge. According to the same survey, there are also new innovative software companies in India, looking for partners in research and product development.

The business prospects for Finnish software companies vary from country to country. In addition to ready-made software, there is a potent trend of providing

clients with consultative, holistic knowledge and skills, as well as design and implementation embedded in the clients' processes and products. Examples of possible business prospects for Finnish companies are the game industry in Japan, product development in India, and embedded solutions in China.

Our study has focused on communication styles in Japan and in Finland, because we think that Finnish software industry will have good opportunities in innopartnerships in Japan – and vice versa – within the next five to ten years.

As a summary, we can state that global software development companies need to understand that culture impacts many levels in the company. Culture affects national, organizational, team, individual, customer, and product levels. At the national level, there are requirements such as the ability to understand each country's management and communication styles. At the organizational level, there are requirements such as the ability to understand working styles or have a good idea about how strong the organizational culture is. At the team level, it is important to understand communication habits. GSD projects need a lot of communication, and in more complex projects, the need for informal communication increases. At the product level, there are requirements, such as product localization and designing of user interfaces, to consider.

Our proposal for a further research agenda includes the following items:

Item 1. Requirements engineering in a multi-faceted world

Software systems in today's multi-faceted world are as diverse as the people who use them. While some are built to conform to rigorous government regulations, others must be delivered quickly to meet time-to-market deadlines or must be responsive to changing business needs. From the requirements engineering perspective there is certainly no 'one-size-fits-all' solution. Diversity is also prevalent across software development teams where end-users, developers, and other stakeholders often come from entirely different cultural, linguistic, religious, and educational backgrounds. Only by understanding and embracing this diversity can we communicate effectively across these boundaries and collaboratively build software systems that meet stakeholders' needs, wants, and desires [RE2010].

In modelling, designing and implementing culture-sensitive information systems and applications, more detailed contextual analysis is needed. An operationally oriented definition of the notion *context*, in computer science for example, states that context is any information that can be used to characterize the situation of an entity. An entity is a person, place or object that is considered

relevant to the interaction between a user and an application [Heimbürger et al. 2011].

Item 2. Cross-cultural communication and computing: Japan-Finland case
In our study, we have discussed communication styles in Japan and in Finland, because we think that Finnish software industry will have good opportunities in Japan – and vice versa – within the next five to ten years. More in-depth systematic analysis is needed. See also Item 3 below.

Item 3. Cross-cultural smart spaces
Cross-cultural knowledge spaces, such as meeting rooms especially designed for cross-cultural teams, are personal and collaborative virtual working environments on the fixed or ubiquitous Web and in physical worlds. The space can include applications such as knowledge management services, team calendars, project monitoring functions and electronic cultural assistants running in personal and collaborative information systems.

Item 4. Tacit knowledge
Models, methods and tools for tacit knowledge transition from persons' heads to software companies' collaborative memory are seen interesting and important in general and from the multicultural viewpoint as well. Persons have explicit and tacit knowledge. Explicit knowledge is easy to explain and easy to share with others. Tacit knowledge is more difficult to explain to others and is often gained by personal experience. Tacit knowledge includes belief, mental models and perceptions that are taken for granted. Culture can be seen as tacit knowledge. This item is related to Item 2.

Item 5. From culture-sensitive SD towards culture free SD: Zone model
We think that culture sensitiveness is a function of context, i.e. situation and/or task at hand. Let's think software development as a set of concentric circles. We can think these circles as different zones in the software development process. We call the innermost circle the SD Kernel. The Kernel is a culture-free zone with software requirements specifications and the programme code(s) itself. Around the SD Kernel there are several zones, and cultural sensitivity will increase in the outward direction. The outermost circle is thus the most culture-sensitive area: it is the space where the whole project with several stakeholders will start. This item is related to Items 1-3.

Item 6. Agile methods in distributed multicultural projects.

Item 7. Management of multiple sourcing

Multiple sourcing is seen as an emerging key strategy. Multiple sourcing is described as the blending of services from multiple internal and external vendors. Especially in the case of multiple sourcing the management of relationships is complex.

Item 8. Training

There are several training efforts in Finland related to multicultural communication conducted for example by commercial training organizations, departments of intercultural studies, further education units and MBA training programmes in universities. We propose a systematic approach to cross-cultural software development training, which is based on Items 1-4.

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