



TAMPERE UNIVERSITY OF TECHNOLOGY

Information Technology Department

RASA STATKAITYTE

**MULTICULTURAL ISSUES IN SOFTWARE
ENGINEERING PROCESSES**

Master's Thesis

Topic approved in the Faculty of Computing and
Electrical Engineering Department Council meeting
on 9th of February 2011

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TIIVISTELMÄ

TAMPEREEN TEKNILLINEN YLIOPISTO

Tietotekniikan koulutusohjelma

STATKAITYTE, RASA: Monikulttuuriset tekijät ohjelmistoprosesseissa

Diplomityö, 120 sivua, 22 liitesivua

Toukokuu 2011

Pääaine: Ohjelmistotuotanto

Tarkastaja: Professori Hannu Jaakkola

Tutkija Petri Linna

Avainsanat: Monikulttuurisuus, ohjelmistoprosessit, ulkoistaminen, virtuaalitiimit, globaali ohjelmistokehitys, kulttuurierot

Globalisaatio, laajemmat markkinat, halvempi työvoima, asiakasläheisyys ja lisääntyvä ICT-asiantuntijoiden tarve ohjaavat ohjelmistosektorin yrityksiä ulkoistamaan ohjelmistotuotteidensa kehitystä. Sen tuloksena tiimit ja projektit koostuvat eri kulttuuritaustaisista jäsenistä. Esille nousevat kulttuurieroihin liittyvät ongelmat, jotka jäävät usein tunnistamattomiksi ja ratkaisemattomiksi kansainvälisissä organisaatioissa.

Tämän työn tarkoituksena on auttaa ICT-yrityksiä kansallisiin kulttuureihin liittyvien tekijöiden tunnistamisessa ja ongelmien hallitsemisessa. Ohjelmistoyritysten toiminta on jaettu ohjelmistotuotannon prosesseihin, joita on kuvattu standardeissa, kuten CMMI ja ISO/IEC-15504 (SPICE). Tutkimuksen pääpaino on ohjelmistoprosessien kulttuuriherkkyyksien arvioinnissa. Ohjelmistokehitys vaatii paljon sosiaalista toimintaa ja viestintää. Vaatimusten keruu ohjelmistoprojektin alkuvaiheessa vaatii paljon myyjän ja asiakkaan välistä kommunikointia. Ohjelmistojen suunnittelu ja koodaus edellyttää runsaasti kommunikointia tiimin jäsenien välillä. Tutkimuksessa on analysoitu ja tunnistettu monikulttuuriset tekijät, jotka vaikuttavat ohjelmistoprosessien tuloksiin tai prosessien sisäiseen toimintaan. Tuloksia on vahvistettu haastatteleamalla maailmanlaajuisesti toimivia ICT-yrityksiä. Vastaajat olivat yleisesti sitä mieltä, että kulttuuriset tekijät vaikuttavat ohjelmistoprosesseihin.

Kulttuuriherkkyyden tunnistamiseen ohjelmistoprosesseista käytettiin CSAM-viitekehystä. Tässä työssä valittiin merkittävimmät ohjelmistoprosessit, jotka voivat olla kulttuuriherkkiä. Tämän työn tulokset ja viitekehys auttavat yrityksiä tekemään omia arviointejaan prosesseistaan ja hyödyntämään sitä esimerkiksi kulttuurikoulutuksessa, strategian suunnittelussa tai jopa ohjelmistoprosessien parantamisessa.

ABSTRACT

TAMPERE UNIVERSITY OF TECHNOLOGY

Master's Degree Programme in Information Technology

STATKAITYTE, RASA: Multicultural Issues in Software Engineering Processes

Master of Science Thesis, 120 pages, 22 Appendix pages

May 2011

Major: Software engineering

Examiners: Professor Hannu Jaakkola

Researcher Petri Linna

Keywords: Multicultural issues, software engineering processes, outsourcing, virtual teams, global software development, cultural differences

Globalization, wider markets, cheaper working force, the vicinity of the client, and wider IT-professional pools are driving software organizations to offshore software product development. As a result, working teams are being assembled of members coming from different cultural backgrounds. Problems, originating in cultural differences, arise and often stay unrecognized and unsolved for years in global organizations.

The aim of this MSc thesis is to draw guidelines for ICT companies for managing cultural issues. The operation of software developing companies is divided into software engineering processes that are described in national standards like CMMI or ISO/IEC-15504. The main focus is concentrated on evaluating cultural sensitivity in SE processes. Software development requires a lot of social activities and communication. In the early stages of software development project user requirements elicitation involves heavy communication between the vendor and the client. Software design and construction rely on the heavy communication among the team members. Many cultural factors impacting the outcomes of the SE processes have been identified as the result of this work. The results were confirmed by conducted interviews in several globally operating ICT organizations. The respondents did agree that software processes are impacted by cultural factors.

Identifying cultural sensitivity in SE processes using CSAM framework, presented in this MSc thesis, provides guidance for software development companies for making their own assessments, which results can be benefited in cultural training, strategy planning or even SPI.

PREFACE

The work regarding this MSc thesis was challenging but rewarding. It started as a research on different ICT-workers' cultural profiles at the beginning of the year 2010 as part of the STEP project and later it was expanded into an MSc thesis.

The research on cultural differences in ICT sector is difficult to conduct unless the ICT companies take part and are willing to share their experiences. I thank all the respondents in globally operating ICT companies for sharing their cultural experiences with us. The knowledge gained as a result on cultural research adds a different flavor to the communication in multicultural environments, helps us to understand each other better, and helps to make the sense of each other's doings and actions. The employees of different cultural backgrounds are the richness of the organization and understanding their cultural values and beliefs contributes to keeping up a healthy spirit in the organization. The different cultural backgrounds of the clients of the organizations shall be recognized and accepted as well, leading to effective mutual understanding.

I would like to thank the examiners of this thesis: the professor Hannu Jaakkola for giving me a position in enthusiastic and competent work team and for assigning me an interesting and challenging task; the researcher Petri Linna for supplying me with various interesting ideas and for guiding my work throughout the writing of this MSc thesis. Timo Varkoi, the research project manager at Tampere University of Technology, receives thanks for giving access to ISO/IEC-15504 standard and for giving tips regarding standard issues.

Tekes, the Finnish Funding Agency for Technology and Innovation, receives my thanks for funding the MSc thesis and the STEP project.

I would also like to sincerely thank my family for great support and healthy humor that I received during the process of this thesis.

Pori, 19.5.2011

Rasa Statkaityte

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TERMS AND DEFINITIONS

Agile Software Development	Group of software development methodologies based on iterative and incremental development, where requirements and solutions evolve through collaboration between self-organizing, cross-functional teams
ASP	Application Service Provider
BPO	Business Process Outsourcing
CMMI	Capability Maturity Model Integrated
CSAM	Cultural Sensitivity Assessment Model
GP	Generic Practice
GSD	Global Software Development
GSE	Global Software Engineering
ICT	Information and Communication Technology
IEC	International Electrotechnical Commission
IRIC	Institute of Research on Intercultural Cooperation
ISO	International Organization of Standardization
ISO/IEC	International Organization for Standardization / International Electrotechnical Commission
SEI	Software Engineering Institute
SPI	Software Process Improvement
SQM	Software Quality Management

Waterfall Model

Used in software development processes, in which progress is seen as flowing steadily downwards through the phases of conception, initiation, analysis, design, construction, testing and maintenance

XP

eXtreme Programming, one type of agile software development

1. INTRODUCTION

This Master's thesis studies the phenomenon of national culture and its impacts on global software development (GSD). The research work regarding this Master's thesis was carried out as part of STEP project, which focuses on problems in GSD from cultural context.

This chapter introduces the research background, defines the research problem and scope, lists the goals, introduces the research method, and outlines the structure of the Master's thesis.

1.1. Research background

This work is carried out as a part of the STEP project (STEPs in Software Business Globalization – Models, Methods and Practices Towards Increasing Competitivity). It started in June of 2009 in cooperation between two Finnish universities: the University of Jyväskylä and the Tampere University of Technology. STEP is funded by TEKES (Finnish funding agency for technology and innovation). STEP investigates the appearance of culture in GSD because cultural factors and its impacts on GSD are not well recognized and understood.

1.2. Research problem and scope

Nowadays ICT organizations disperse their operation globally to gain cost-effectiveness, access wider markets and bigger ICT specialist pools. Business environment becomes multicultural, combining clients and employees of the organizations coming from various cultural backgrounds. These people, often unaware of each other's different beliefs and value systems, are interacting and communicating on a daily basis. The lack of knowledge on cultural differences introduces many problems in communication, causing smaller or larger failures, resulting in lack of trust among team members, unwillingness to communicate, misunderstandings and misinterpretations, etc.

Research is carried out by first inspecting the scientific books and articles on the researches done regarding national culture and cultural issues in GSD. Next the interviews are conducted in several ICT companies, operating in Finland and abroad. As last, the framework of evaluating cultural sensitivity in SE processes is proposed.

The aim of this Master's thesis is to concentrate on software engineering (SE) processes and evaluate their cultural sensitivity. The cultural sensitivity in SE processes

means the strength of cultural factors' impact on particular SE process. The assessment is done by choosing cultural dimensions and evaluating each SE process against these dimensions.

SE processes were taken from ISO/IEC-15504 (SPICE) standard, draft version of 2005. At the time of this research, a newer version of SPICE standard was yet unpublished, so the draft version of 2005 was chosen as available and suitable version at that time.

1.3. Research goals

One of the research goals is to acquaint globally operating ICT companies with the phenomenon of culture and its impacts on ICT companies' operation. Therefore an introduction to culture theories is presented in the first chapters.

Next the scope of the research narrows to investigate the trend of globalization and how it affects the companies that develop software products. The goal is to introduce the cultural issues in the context of GSD.

The main aim, as introduced earlier, is to assess SE processes against cultural dimensions and establish a list of culturally sensitive processes in order to highlight activities that possibly might cause negative outcomes due to the different cultural backgrounds of the employees. Later the list of culture sensitive SE processes might be taken into consideration and preventive actions could be carried out to avoid culture clashes in the future.

This Master's thesis helps the ICT companies to understand the importance of recognizing cultural issues and analyzes how cultural issues impact the operation of the organization, taking into consideration vast employee activities and customer communication.

1.4. Research method

Inspection of the scientific literature was chosen as the main method throughout this Master's thesis. The goal was to create a clear picture on the researches and their results that were carried out regarding the national culture and its impacts on GSD.

Theoretical results alone have little value and that is why interviews in several globally operating ICT companies were conducted to construct a picture on their point of view on cultural matters and to compare them with theoretical results.

1.5. Structure of Master's thesis

Chapter 2 introduces the phenomenon of globalization of software development. It covers globalization factors, problems and challenges and presents an example of ICT companies in Finland and how they offshore software product development.

Chapter 3 covers culture research and definitions. It introduces researchers on culture and their significant works. Attention is also paid to cultural awareness and cultural intelligence.

Chapter 4 focuses on software engineering processes. It introduces several software development life cycles and compares them in the context of culture. The rest of the chapter focuses on international standards on software process improvement, and inspects software process improvement in the aspect of culture.

Chapter 5 introduces a CSAM framework (Cultural Sensitivity Assessment Model). By means of the CSAM framework, the cultural sensitivity in SE processes can be assessed. Also the interview results conducted in case companies are presented.

Chapter 6 examines two cultures, China and India. These two countries are the biggest offshoring countries nowadays and these two cultures are very different from the Finnish culture with big cultural gaps, and therefore they were an interesting object for examination.

Chapter 7 concludes the research work.

2. GLOBALIZATION OF SOFTWARE DEVELOPMENT

Just a couple of decades ago software engineers were developing software in teams situated in same geographic location. Nowadays this view has changed. Software engineers of different cultures and situated at different geographic locations collaborate and cooperate in global software development (GSD) teams. Software development is seen as a global activity and reasons for this are dramatic improvements in software development tools and methods. Also the international migration has played one of the major roles and resulted in multicultural workforce all over the globe (Cater-Steel & Toleman, 2010).

GSD takes different forms and shapes in an organization's perspective. It can be intra-organizational with legally related companies such as IBM. An inter-organizational GSD is also called offshore outsourcing. Recently there has been an increasing trend for a large ICT companies to outsource their software development to firms in countries such as India or China. These countries are especially attractive for reasons such as the cheaper working force, huge IT professional pools, etc. A third approach to GSD is non-organizational or opensource software such as Linux operating system, compilers or editors. The fourth approach to GSD is services over the Web with examples such as Application Service Providers (ASP) or pay-per-use services.

GSD has many issues to address. GSD trend, seen for several decades, has many benefits but also challenges and problems on many levels, from technical to the social and cultural. Distance leads to coordination, communication and management problems across the sites. The most common drivers for GSD according to A. Mockus and J. Herbsleb (2001) are (a) limited pool of trained workforce, (b) necessity of getting closer to customer and localizing products to different countries, (c) locating Research & Development (R&D) facilities in other country as a condition for favorable tax treatment, (d) the difference in development cost and (e) round-the-clock development that might lead to shorter intervals. The benefits of geographic dispersion should not be neglected according to J. Herbsleb and D. Moitra (2001). They discuss the improved time-to-market by using time zone differences in round-the-clock development. Other benefit that drives companies to globalize the business is the cost competitiveness and huge IT professional pools. By quickly forming virtual corporations and virtual teams, the market opportunities can be exploited. Finally, merger and acquisition opportunities can be capitalized more flexibly.

Despite the benefits, multisite, multicultural globally distributed software engineering faces many challenges. J. Herbsleb and Moitra (2001) disclose issues which

occur because of the physical separation among project members: (a) strategic issues, (b) cultural issues, (c) inadequate communication, (d) knowledge management, (e) project and process management, and (f) technical issues. Carmel (1999) mentions (g) lack of trust and willingness to communicate. One more very important challenge according to D. E. Damian and D. Zowghi (2003) is (h) time difference. More information on this matter can be found in section 2.4.

Software firms are forced to comply with recognized software process improvement programs and be assessed by third party in order to prove to the customer their commitment to software product quality. The most adopted frameworks for software process improvements are Capability Maturity Model Integrated (CMMI) , ISO 9001 and ISO/IEC 15504.

CMMI was developed by the Software Engineering Institute (SEI) at Carnegie Mellon University in Pittsburgh. This framework is internationally accepted and used largely not only in USA, but also in other countries such as India or Australia.

ISO 9000 family of standards is maintained by International Organization of Standardization (ISO). ISO 9001 is an internationally recognized standard for the quality management of businesses and the latest version dates to year 2008.

ISO/IEC 15504, also known as SPICE, is a framework for the assessment of processes, developed by the Joint Technical Subcommittee between ISO and IEC (International Electrotechnical Commission).

CMMI and ISO/IEC 15504 standards have two dimensions, the process dimension and capability dimension. In order to be applicable all over the globe, despite geographic locations, the standards have been developed as "culture-free". Nevertheless, GSD teams are multicultural and the national culture differences must be taken into account, otherwise team members run into problems such as miscommunication and misunderstandings.

2.1. Outsourcing

Outsourcing refers to a process of contracting to a third party. In recent years, an increase in offshore software development has been marked. Big IT organizations are outsourcing software development to a third party for various reasons. The most remarkable ones are cheaper working force, access to wider labor markets, reduced costs, improved performance, and wider customer pools.

Outsourcing relationships are complex and difficult to manage. Issues such as tax and political uncertainty become more manageable with time and experience. Others, such as geographical distance, language barriers and culture, remain. Coordinating work across different sites and time-zones is time-consuming and costly; cultural issues, language barriers and differences in working patterns can affect working relationships and cause delays. Communication issues lead to misunderstandings, errors and rework.

2.2. Virtual Collaborative Teams

In 1980s and 1990s it was usual to put all software engineers in one place and start the project. Nowadays the technology has enabled a new type of working team: a virtual collaborative team. It is a group of geographically and organizationally dispersed engineers which work on a common project. They collaborate and communicate via electronic means to achieve common goals. As an advantage the engineers are no longer bound to the physical location in order to work together. Software developers can contribute to the project at any time of the day or night. The "follow the sun" approach can be used enabling teams to work on projects 24 hours per day and in such a way "time-to-market" is improved. The team members do not necessarily belong to same organization, they can be brought together depending on their expertise and the virtual team can be constructed of software development professionals depending on the problem that needs to be solved.

Virtuality changes the ways that teams traditionally work. The space and time is no longer a barrier; traditional group processes need to be modified; the ways to handle information need to be improved.

Despite of the advantages the virtual collaborative teams bring, there are also many pitfalls and challenges that virtual team members have to face. First of all only very limited amount of work is of such a nature that it could be handled virtually from other country. Teleworking can lead to role conflicts especially if a team member is involved in other ongoing projects. Virtual communication can be very challenging in global context and lead to misunderstandings and errors. In order to win these barriers, virtual team members should meet face-to-face and develop social relationships to improve communication and cooperation (Suutari, 2008).

In the future the use of virtual teams will continue to grow. The organizations will more strongly support the existence of such teams because they reduce the travel costs and increase productivity.

2.3. Example of offshoring: ICT companies in Finland

Indian ICT firms have been growing rapidly. The big part of worldwide software products are being developed in India. Indian ICT firms are trying to acquire big Western ICT companies as clients. Software requirements are usually carried out near to the customer, but software coding and testing is done in India.

In a year 2004 5-7 Indian ICT firms operated in Finland. The biggest reason for these companies to come to Finland was Nokia. Almost all these companies are doing or would like to do business with Nokia. The figure 2.1. shows typical work distribution between the client (Finnish company) and the offshore-software company.

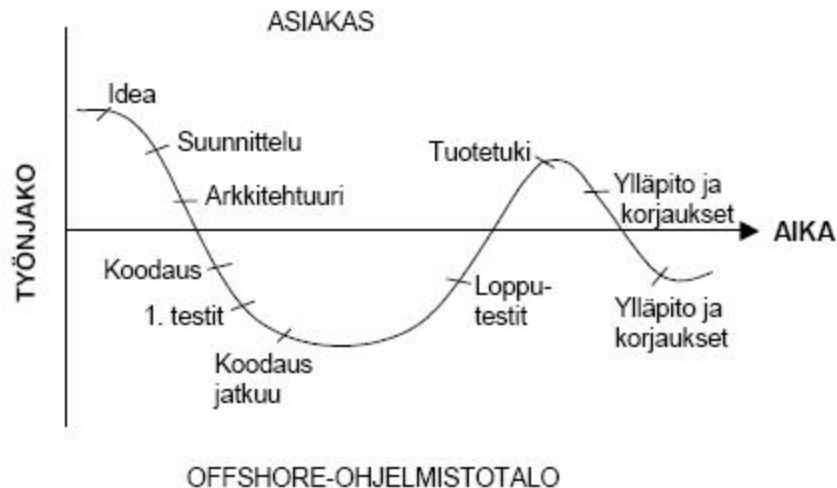


Figure 2.1. Work distribution between client company and offshore-software company (Ali-Yrkkö et al., 2004).

The client company holds the idea and its workers do the software requirement and architectural specifications. The coding and the initial tests are carried out in offshore-software company. The Finnish client company then offers a ready software product to its own clients and carries out needed maintenance works and error fixes. Also in a later phase an offshore company can do the fixes and maintenance works.

It seems that more of Indian ICT companies will expand their activities in Finland in such a way that they will also take part in software requirement and architectural specifications in the future.

2.4. Problems and challenges in GSD

Traditionally the software engineering process has been plan-driven. The usage of “Waterfall Model” (Pfleeger et al., 2006) demanded the software product requirements to be frozen at the early stage of the development. Later iterative and incremental modifications of the waterfall model were adapted in order to be flexible to changing user requirements. Waterfall model has been used in GSD because formal methods and early freezing of documents facilitated work distribution between sites. Nowadays software development models need to support the change in software product requirements in order to be competitive. Agile-based methods have seen increased interest because they offer flexibility and adaptability to constantly changing user requirements. The GSD faces new challenges when moving to agile development, because agile methods rely more on informal rather than formal mechanisms.

The other major problems and challenges in GSD are (Herbsleb & Moitra, 2001): (a) strategic issues, (b) cultural issues, (c) inadequate communication, (d) knowledge management, (e) project and process management, (f) technical issues, and (g) lack of trust and willingness to communicate (Carmel, 1999), and according to D. E. Damian and D. Zowghi (2003), (h) time difference.

- (a) **Strategic issues.** In a GSD project the first issue to come across is a decision of how to divide up the work across sites and countries. Solutions can be made by the resources available and level of expertise at the sites. The best solution would be letting sites to operate as independently as possible and providing easy and flexible communication between sites. Organization's resistance to GSD is another big challenge. Individuals might fear the loss of job, fear of possible relocation and need for extensive travel.
- (b) **Cultural issues.** In GSD, software engineers with different cultural background need to cooperate closely. This might cause conflicts if cultural sensitivity and cultural awareness are not present. Cultures differ on so many critical dimensions, such as sense of time, need for hierarchy and communication styles. These differences might lead to misunderstandings especially if people are located at different sites and have never established an eye contact. This also causes problems for establishing trust. An email, sent from a person using direct communication style might seem rude to someone from different background. Even English language, so widely used in software development, can cause problems to people with different cultural backgrounds.
- (c) **Inadequate communication.** Software projects involve lots of formal and informal communication. The formal communication needs to have clear and well-understood interface. Otherwise such project tasks as project status follow-up, agreeing the responsibilities for different work products can cause loss of time and other problems if the interface is poor and fuzzy. It is known that informal communication, such as "corridor-talk" also plays an important role in software development. It lets software engineers to know what other colleagues are working on and who has expertise in what area. This helps people to work effectively together. If the developers are not located at the same site, they have very little spontaneous, informal conversations and they miss all the background information concerning the project. This can lead to misalignment and rework.
- (d) **Knowledge management.** Effective knowledge and information sharing mechanisms are crucial in GSD. If the project status information is disseminated inadequately, the project members cannot determine the tasks on the critical path. Also poor knowledge and information management can result in teams missing reuse opportunities and can cause loss of time and money. Poor and outdated documentation causes ineffectiveness and ambiguity in collaborative development.
- (e) **Project and process management.** Teams need to be synchronized when handing off processes between sites. For instance, if one team is developing software and the other is testing, then both teams need to have commonly defined milestones and clear entry and exit criteria. The concurrent software development is difficult because of frequently changing requirements,

unavailability of tools supporting collaboration and lack of informal communication.

- (f) **Technical issues.** A fast and reliable telecommunication network is needed for the GSD to be successful. The transmission of critical data using collaboration tools must be carefully planned. Controlling product changes and informing the parties that need to be aware of those changes are much greater in GSD.
- (g) **Lack of trust and willingness to communicate.** The lack of trust can be due to absence of face-to-face meetings and informal events (such like lunch discussions). Building trust takes time if a distance is in question. In case of outsourcing, the lack of willingness to communicate openly across sites is obvious. People are afraid to share expertise if it makes them replaceable and the jobs are threatened.
- (h) **Time difference.** The greater the geographical distance between teams, the greater the time-zone difference. This causes the time interval for synchronous collaboration very short. The synchronous meeting is problematic for at least one team: either too early or too late. The solutions to that can be rotating meeting times or asynchronous communication.

Most of the above listed problems in GSD are linked to collaboration and communication among the sites. People come from different backgrounds, speak different native languages, have different training, and are located at distinct sites. It is clear that the collaboration planning needs to see more effort in GSD projects. Also increasing the level of cultural awareness can ease complexity, confusion and misunderstandings.

3. CULTURE RESEARCH AND DEFINITIONS

Culture has attracted a lot of researches and as a result there are hundreds of definitions and theories of culture. Kroeber and Kluckholm (1952) found 164, and Lonner (1994) found over 200 definitions. The biggest challenge in this culture definition and theory jungle is to find the right ones.

Hoft (1996) has divided culture theories into four meta-models. The best known is the iceberg model of culture. Hall (1976) and Schein (1992) are mostly referenced developers of iceberg cultural models. The model includes explicit and implicit layers. The explicit layer is the top of the iceberg and the implicit layer is under the water. The external part of the culture (upper part of the iceberg) includes behaviors and some beliefs. This part is conscious and can be easily changed. The internal part of the iceberg is below the surface of society and includes some beliefs and the values and thought patterns that underlie the behavior. This part is unconscious and difficult to change. The pyramid model introduces cultures in a shape of a pyramid. For example, Hofstede and Hofstede (2004) introduce “three levels of Uniqueness in Mental Programming” with layers of personality, culture and human nature. Other pyramid model is introduced by Lewis (2006), where cultural types such as linear-active, multi-active and reactive reside at the edges of the pyramid. The onion model by Hofstede and Hofstede (2004) includes explicit outer layers and inner layers, which are deeper in the mind. The layers are symbols, rituals, icons, and the core of the onion is values. The fourth meta-model is the objective and the subjective model, which identifies the subjective and the objective layers of the culture.

Furthermore, cultures can have different dimensions. Cultures also can be divided into different levels. Same chaos applies here as in culture theories and definitions. For example, King (2007) has divided culture into national, organizational, organizational subcultures, and subunit cultures. Other levels like team, business and project can also be found. Tony Morden (1999) compared six national culture models and found 36 different dimensions. The lack of universal culture theory and definition proves the fact that culture is very wide and complicated subject.

3.1. National culture

There are many fields exploring culture and many culture definitions exist. All these definitions have similar views. Culture is associated with values and behavior that are shared by a group of people and these values are passed from generation to generation.

These shared values and behaviors of population groups differ widely between countries.

Many great culture researches have dedicated their life work trying to establish national cultural characteristics.

3.1.1. Geert Hofstede

Geert Hofstede is the most cited cultural researcher. He is a Dutch social psychologist born in 1928.

Culture by Hofstede: People are thinking, acting and feeling differently around the globe. And even though the variety of people's minds is enormous, there is a structure in this variety and this structure can help us to understand each other. Hofstede calls patterns of thinking, feeling and acting as mental programs. The figure 3.1 shows the three levels of uniqueness in mental programming.

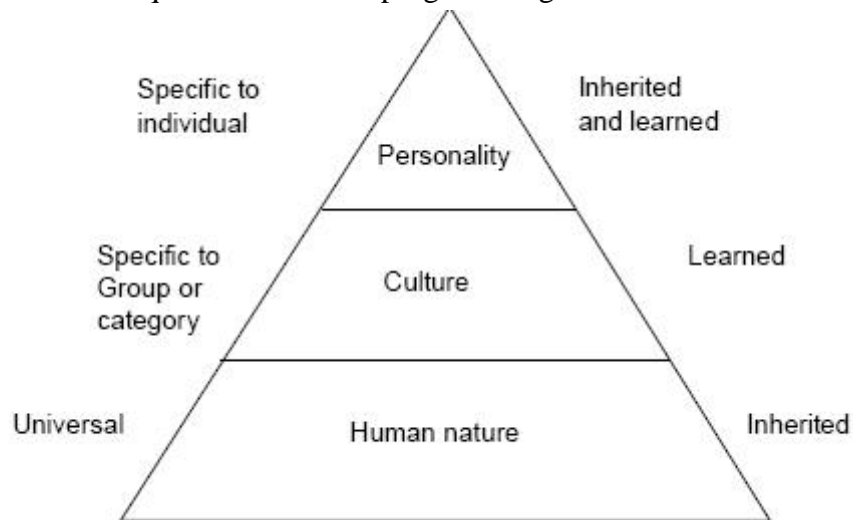


Figure 3.1. *Three Levels of Uniqueness in Mental Programming* (Hofstede & Hofstede, 2004).

Human nature is what all human beings have in common, it is inherited in genes and it determines one's physical and psychological functioning such as ability to feel fear, anger, love, joy, shame.

The culture is learned, rather than inherited in genes. It derives from one's social environment.

The personality is the unique personal set of mental programs. It is partly inherited and partly learned.

Hofstede also refers to the *Onion model*, figure 3.2, which describes the manifestations of culture.

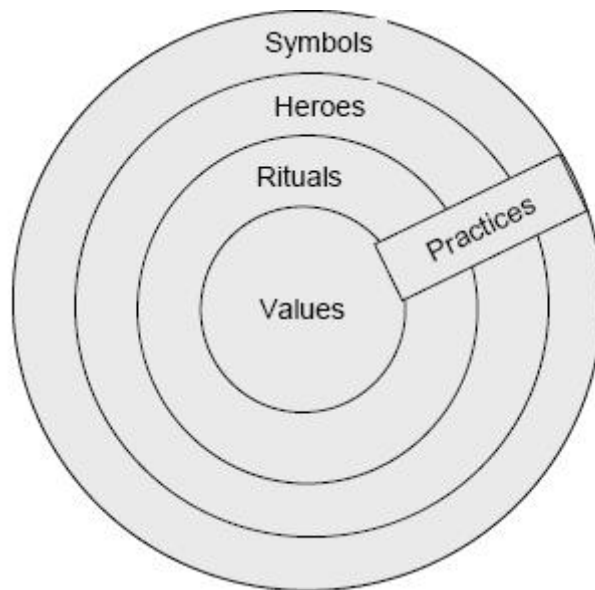


Figure 3.2. *The Onion model: Manifestations of Culture at Different levels of Depth* (Hofstede & Hofstede, 2004).

The four factors describe the culture: *symbols* (pictures, words, gestures that have a particular meaning and are recognized by those that share the culture), *heroes* (persons, alive or dead, real or imaginary, who serve as models for a good behavior), *rituals* (collective activities related to a group of people, such as social and religious ceremonies) and *values* (the core of the culture, deals with preferring certain states over the others, such as evil versus good, moral versus immoral, ugly versus beautiful, etc.). The first three outermost "onion layers" are subsumed by *practices*. Practices as such are visible, but their cultural meaning is invisible to the outsider and their meaning is interpreted and understood only to the insiders.

Hofstede pioneering research on cultures was conducted using research data of IBM employees located in over 40 countries. After applying statistical analysis, Hofstede has developed a set of cultural dimensions. Each country was given an index score for each of 4 dimensions of the national cultures: power distance, individualism/collectivism, masculinity/femininity, and uncertainty avoidance (Hofstede, 2010).

In late 1991, Hofstede found a fifth dimension in a study among students in 23 countries the world using a questionnaire designed by Chinese scholars. Hofstede labeled it as long-term versus short-term orientation.

The sixth dimension, indulgence versus restraint, is presented by Hofstede et al (2010).

Power distance: the power distance index measures the extent to which a culture embraces social inequality. It characterizes the extent to which people consider it natural that power and status are distributed unequally among individuals and this distribution has no high significance in their lives. In a culture with high power distance score, there exists an established hierarchy of power, based on wealth or status. In low power distance countries, the superiors and subordinates consider each other as equal, despite the difference in power, wealth or status. The example of high power distance

countries are India and China. The example of low power distance countries are Denmark and Austria.

Individualism/Collectivism: Individualism versus collectivism characterizes people's esteem of individual activities and successes versus the importance of their belonging to a social group. In a highly individualistic country individual interests take over the collective ones and everyone is expected to take care only of themselves and their families and they remain independent from a group. In a highly collectivistic country people belong to strong, cohesive groups. People are expected to show the loyalty to the group they belong to. The examples of highly individualistic countries are United States and United Kingdom. The examples of highly collectivistic countries are China and Indonesia.

Masculinity/Femininity: Masculinity versus femininity refers to the distribution of emotional roles between the genders. In a more masculine culture men are supposed to be assertive, strong, focused on material success, while women are gentle, caring and concerned for social well-being. Gender roles in a more feminine culture are more at-ease. Both men and women are concerned with modesty, tenderness and improving quality of life. The examples of high masculine countries are Japan and Austria. The examples of high feminine countries are Norway and Sweden.

Uncertainty Avoidance: The uncertainty avoidance index characterizes the people's attitude towards ambiguous, unknown and unstructured situations. An unstructured situation is different, unknown from the usual. In a high uncertainty avoiding countries people feel anxious about unfamiliar situations and that is why they like to establish and follow the strict rules in order to mitigate uncertainty. Also religion plays an important role in such countries, because it offers the absolute Truth. In a culture with low uncertainty avoidance index people are more comfortable with handling unknown events and relies less upon the rules. In a weak uncertainty avoiding countries innovation is easier. The examples of such countries are Sweden and United States. The examples of strongly uncertainty avoiding countries are Japan and Greece.

Long-Term/Short-Term Orientation: this fifth dimension was identified later and it was not included in Hofstede's early work. It was added after a similar study that was carried out by researchers from Asian and Pacific countries. A culture with high long-term orientation index looks forward to long-term commitments and slow results and they are oriented towards the future. In countries with a short-term orientation people are proud of the past, they respect the tradition and they are looking for rapid compensations and fast results. The examples of long-term oriented countries are China and Japan. The examples of short-oriented countries are Canada and Norway.

Indulgence versus Restraint: indulgence stands for a society that allows relatively free gratification of basic and natural human drives related to enjoying life and having fun. Restraint stands for a society that suppresses gratification of needs and regulates it by means of strict social norms.

3.1.2. Richard D. Lewis

Richard D. Lewis work is based on global business and communication. His research covers more than 60 countries and major regions in the world. The results of his research can give managers practical strategies on how to cope with cultural differences and how to work successfully across different business cultures (Lewis, 2006 & 2010).

The cultural behavior, according to Lewis, is the end product of collected wisdom passed down through hundreds of generations and translated into core beliefs, values and action patterns. Cultures cannot be evaluated according to impressions. They are finite and predictable.

R. Lewis uses the LRM model to describe cultural types.

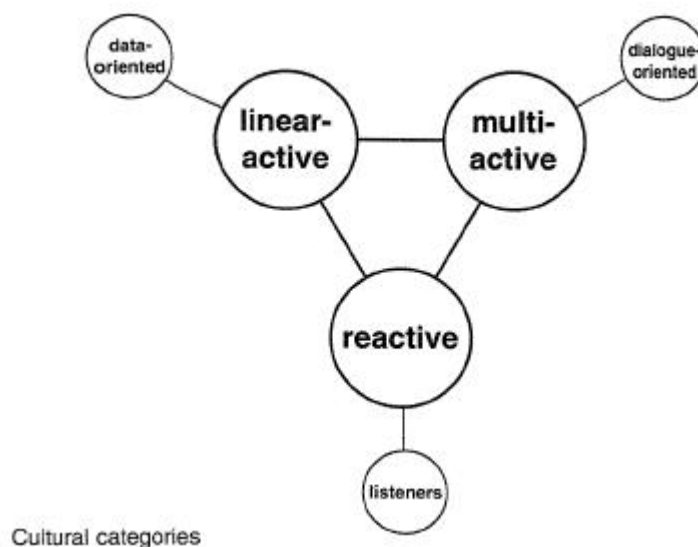


Figure 3.3. The LRM model: Cultural categories (Lewis, 2010).

Cultures are classified in three distinctive categories: *multi-active*, *linear* and *reactive*. The corresponding classifications in information gathering are *data-oriented*, *dialogue-oriented* and *listeners*. Data-oriented and dialogue-oriented are more explicit terms for low-context and high-context cultures, and a third group, "listening culture" is added to describe reactive Asians, who embrace information technology but are also effective networkers.

Multi-active: people from multi-active culture are typically people-oriented, talkative and emphasize interpersonal relationships (i.e. Slavs, Africans, and Latins).

Reactive: people from reactive cultures are typically introverted, respect-oriented and emphasize listening (i.e. Chinese, Koreans, Vietnamese).

Linear-active: people from linear-active cultures are typically task-oriented, highly organized and emphasize planning (i.e. Scandinavians, Australians, and Americans).

Furthermore, cultures are assigned its distinct places at the sides of the pyramid. Lewis' cultural study includes blueprints of genetic and environmental background analysis, starting with base values, taboos, cultural black holes and continuing with

communication patterns, listening habits, leadership styles, space and time, as well as behavior in meetings, gathering information and creating empathy.

3.1.3. Edward Hall

Edward Hall was an anthropologist and cross-culture researcher. He has developed concepts of *High Context* and *Low Context* cultures and also discussed how the concept of time is perceived in the culture (*monochronic time* versus *polychronic time*).

Hall distinguished between two ways of communication. In the first way the information needs to be directly and explicitly stated in order for the communicative event to be effective (low-context), the second way is implicitly derived from non-direct communication (high-context). By Hall's definition, in a high-context culture, most of the information is "preprogrammed" into the external parties involved in the communication. The transmitted message itself contains very little information and it is up to the receiving end to interpret the message based on the factors such as hand gestures, facial expressions, time of communication or the length of silences. On the other hand, in low-context cultures, the messages transmitted are explicit and unambiguous. The sender needs to make sure that the message can be interpreted without confusion.

Hall also examined different time structures in different cultures. The term polychronic describes the ability to attend to different events simultaneously, as opposed to monochronic, the tendency to handle events sequentially. In a polychronic culture, time is considered to be flexible- interruptions are common and multiple tasks can be handled simultaneously. On the contrary the monochronic culture handles time sequentially, schedules are precise and detailed, and one task is completed before starting the next (Kruchten & MacGregor, 2005).

3.2. Organizational culture

Organizational culture helps to establish common values and align behaviors among employees. Many corporations use employee handbooks, written value definitions in order to achieve this kind of alignment.

One can ask how much an organizational culture is based on national culture. The results in this research area are insufficient and a conclusive answer cannot be given. Although it is suggested that national culture may influence the organizational culture, there are also factors that shape the organizational culture.

There is a wide range of company cultures. In the United States, for instance, the individualism is preferred strongly and thus organization culture may reflect the personality of its founder. On the other hand an organizational culture could have been nurtured over a long period of time and they seem to have acquired a life of their own, regardless of the founder.

Other question may arise whether organizational culture may erase the national culture. The research has proved the contrary. According to the Adler (2008), who cites

the researcher Andre Laurent, “cultural differences were greater among managers working within the same multinational corporation than they were among the managers working for companies in their own native country. When working for multinational companies, Germans seemingly became more German, Americans more American, Swedes more Swedish, and so on.” The reasons are not well understood, but it is believed that an employee may be resisting corporate culture if it opposes the beliefs of their one national culture.

In his book Hofstede (2004, p.284) argues, that organizational and national cultures are not identical phenomena. He stresses that these cultures are of different nature. The difference between organizational and national cultures lies in the different mix of *values* and *practices*. National culture contains most of our basic *values*, acquired during the first ten years of our lives. The organizational culture is acquired when we enter an organization as adults, with our values firmly in place, and it consists mainly of the organization’s *practices*.

A research project called IRIC was carried out between 1985 and 1987 and was led by Geert Hofstede (2004, p. 292). As a result six dimensions of organizational culture were produced:

1. *Process oriented versus results oriented*
2. *Employee oriented versus job oriented*
3. *Parochial versus professional*
4. *Open system versus closed system*
5. *Loose control versus tight control*
6. *Normative versus pragmatic*

Dimension 1: in process oriented cultures, people avoid taking risk and put only a little effort into their jobs. In results oriented cultures, people are comfortable with unfamiliar situations; they put a lot of effort to overcome challenges.

Dimension 2 opposes concern for people to a concern for completing a job. In employee-oriented cultures, an organization takes responsibility for employee’s welfare, and important decisions are made by committees or groups. In job-oriented units, there is a strong pressure to complete the job; important decisions are made by individuals.

Dimension 3: in the parochial culture employee derives its identity from the organization. In the professional culture the employee’s identity is taken from outside the organization.

Dimension 4 opposes open systems to closed systems. In an open system cultures it is easy to join the organization, new employees need only few days to feel at home. In a closed system it is difficult to join the organization, only certain kind of people fit in.

Dimension 5 refers to the amount of internal structuring in the organization. In loose control units no one thinks of cost, meetings are kept only approximately, and jokes about company are frequent. In tight control units work environment is cost-conscious, meetings are kept punctually, and jokes about the company are rare.

Dimension 6 deals with customer orientation. Pragmatic units are market-driven, emphasis on meeting the customer needs, and results are more important as correct procedures. In normative units, the emphasis is on following the organizational procedures, which are more important than the results.

Some examples on organizational dimensions are presented in table 3.1.

Table 3.1. (Adaptation Hofstede, 2004, p. 296)

1.	Process-oriented: <i>Manufacturing and large office units</i>	Results-oriented: <i>Research-and-development, service units</i>
3.	Parochial: <i>Traditional technology units</i>	Professional: <i>High-tech units</i>
5.	Loose control: <i>Innovative and unpredictable activities</i>	Tight control: <i>Precision and risky products delivering units (e.g. pharmaceuticals and money transactions)</i>

After presenting the results of an IRIS project, Geert Hofstede concludes that the research data came from twenty organizational units in two northwestern European countries and it should not be claimed that same model applies to any organization anywhere.

3.3. National culture and GSD

This section discusses multicultural impacts on GSD projects.

In the past decade more and more companies have been outsourcing software projects or have been starting their own development centers abroad. As a result GSD emerged. This means that software is being developed at dispersed geographical locations and software developers come from different cultural backgrounds. The new arising issues in such software development projects are not only technical, but also “human”. Global dispersion requires lot of communication and collaboration, and such areas as project management, software processes, artifacts and communication are affected by cultural issues in global software engineering projects.

There is a little research done on how the cultural factors affect global software development. The biggest ongoing project “Intercultural Factors in Global Software Projects” has been started in 2005 at the University of British Columbia, Canada, and is lead by a professor Philippe Kruchten. The aim of this project is try to extract incidents in software processes, where in the lifecycle these issues arise and what artifacts are affected.

Kruchten et al. propose (2005) to develop a repository of critical incidents that can be systematically analyzed. This way the culture issues would be the part of risk management strategy. The results of the analysis would be a pattern language to be used in the risk management process. By identifying patterns of organizational behavior that impact the outcome of global projects, cultural mishaps could be analyzed and eased.

In an article about cultural patterns Kruchten et al. (2005) describe the preliminary results on the research. According to the literature and personal experience of one author they have identified few cultural patterns:

Proxy pattern: Some individuals, that have spent enough time in two cultures, say 5-7 years, makes them to be able to operate at ease in both cultures. Such “bi-coded” individuals can be placed in a position where they can translate between the cultures.

We-are-one-single-team pattern: discusses the definition of a team. For instance, in many agile practices the concept of a team is rather “flat”; hierarchy is minimized and informal; direct communication is encouraged. Team members can openly discuss problems, needs and progress. The pitfall is on how the team rules and norms are defined in different cultures. Some teams may be more hierarchical in some cultures and the idea of the flat team would not work in cultural groups where power distance is high. Other problem area may arise in a team decision making. Developers from less hierarchical culture may feel the decision about some artifact belong to those working on the artifact, on the contrary, developers from more hierarchical cultures report the problems to the management and expect the management to come up with the decision.

The-customer-is-king pattern: throughout the project, the developers need to discuss with the clients about requirements and schedule changes. Less hierarchy dominant culture A may allow direct and open communications between the developer and the client, for instance, via customer-on-site practice promoted by agile methods. On the contrary, in culture B, where hierarchy is high, the developer reports the problems to the management. The management than decides whether to report the issues to the client. The problem arises when developer is unable to implement some features and the client is not informed about the problems. Also the management is forced to make empty promises. The client may also feel communication being ineffective due to the layered communication.

In a position paper on intercultural factors, Kruchten (2004) discusses the need to take a more systematic look on how intercultural factors affect the outcomes of the GSD practices. He attempts to identify pairs [practice + intercultural factor] that are significantly affected. As a source of intercultural factors, he uses the works of Hall, Hofstede, etc. Kruchten speculates that software engineering practices, most likely to be affected by intercultural factors, are not the ones that can be automated, repetitive or close to the code or the bits. The practices affected are the ones that involve lot of human to human communication. As an expert in Rational Unified Process, Kruchten inspects Agile practices and methods in order to find more likely candidates. Agile practices rely much more on person-to-person interaction and less on “following a plan”. Author examines twelve XP practices, among which are planning game, pair

programming, customer interaction, scrum, reviews, inspections etc. To illustrate the approach, Kruchten adds two examples of “practice plus factor” pairs:

Reviews and chronicity: people from monochronic culture tend to end a meeting at the scheduled end-time; people from polychronic cultures tend to end the meeting when the conversation runs out of steam. When these people work together, people from polychronic culture might think the meeting ends up abruptly, before they had a chance to say everything, on the contrary, people from monochronic culture may think that polychronic meetings are ineffective. Other issue that may occur in reviews concerns agenda (implicit versus explicit).

Requirements management and power distance: In cultures with high power distance index, the decision making in requirements engineering take much longer time, according to the research on Thai culture. The tall hierarchy in Thai organizations contributes to bureaucracy and elongated decision-making process.

Kruchten et al. (2005) recognize a number of areas in GSD in which fault lines may appear: (a) the need for cross-cultural sensitivity, (b) communication challenges in mediated communication, (c) difficulty with planning and management of global innovation, (d) differences in work-styles, and (e) power, hierarchy and agency.

Furthermore, in an article about culture assessment tools for SE companies, Linna & Jaakkola (2010) discuss eleven reasons to measure cultural factors. Culture appears to be one of the segments in organization communication and knowledge management models. Other reasons include future workplace, avoiding stumbling blocks, relationship of trust, global human recruitment and need for training, etc. The work in the future will be more and more global, teams will be more multicultural. The manager of globally distributed teams has to be able to control socio-cultural factors. The HR units are responsible for recruiting most appropriate employees for the company and it is in the benefit of the company if those employees already have the knowledge of cultural awareness and are more adaptable to the needs of the global team. Avoiding cultural misunderstandings and conflicts leads to a successful communication. Some of the stumbling blocks that might be avoided by being culture-aware are nonverbal misinterpretations, stereotypes and high anxiety (Shah, 2004). It is very important to build trust among employees, customers and suppliers. This might become a difficult task to achieve, if there is no knowledge about others’ beliefs, values and expectations. A cultural misunderstanding might damage the relationship of trust. The cultural training for employees might bring the needed knowledge of how to collaborate in a global team.

An interesting article by Greg Borchers (2003) describes the affects of three Hofstede’s cultural dimensions on software developers from India, Japan and the United States. The impacts of cultural factors on multicultural development teams are summarized in the table 3.2.

Table 3.2. (Adaptation Borchers, 2003)

		USA	Japan	India
PDI	Project management	“project manager is just along for the ride”	Relationship to a project manager is purely subordinate	Relationship to a project manager is purely subordinate
IDV	Team	Team had what could be considered a good camaraderie; Being singled out for public praise is positive	Close interpersonal bonds within the teams; public praise is disturbing	Close interpersonal bonds within the teams; public praise is disturbing
	Bug fixing	Work only on their assigned bugs		Seemed to fix each others bugs
UAI	Design and analysis	prototyping	“Design upfront” approach; removal of uncertainty through iterative design, consensus reaching, consideration for all possibilities	
	Documentation	Documentation is necessary exercise	Relies on documentation for achieving understanding	Documentation is necessary exercise
	Project management and tracking	Comfortable with knowing that “bug fixing would continue until the product shipped”	High need for project tracking details; requested many times “exactly when will each of the bugs be fixed”	Comfortable with knowing that “bug fixing would continue until the product shipped”
Summary		Iterative development and prototyping; seem to enjoy a chaos;	Strong bonds between individuals in a team; high UAI tends to slow decision making process; seek	Go with the flow, good ability to work with moderate levels of uncertainty; being at risk of “jerked around” by

		before acting; seem to move towards waterfall development styles	changing requirements; form strong bonds between individuals
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Greg Borchers summarizes that “the impact of cultural factors on our software engineering efforts caught us off-guard. Initially, it was thought that rigorous software processes could smooth over any and all cultural differences. However, as we observed on our projects, it was not that simple. It was more successful to adapt and adjust our expectations to the realities of the cultural impacts.”

3.4. Cultural awareness and sensitivity

In a literature regarding cross-cultural communication, terms like “cultural awareness” and “cultural sensitivity” can be often met without being properly defined. This might confuse the reader who is already in a battle with huge amount of new terminology in culture research field.

Peterson (2004) introduces *cultural awareness* (of self and others) as one of the units of cultural intelligence. *Cultural self-awareness*, according to the author, is the knowledge of your own culture. By knowing your own cultural style, it is easier to compare yourself with others, and then it is easier to adjust own behavior to be compatible in cross-cultural settings. *Cultural awareness of others* is the knowledge about differences among people from different cultures and countries.

Cultural sensitivity is defined by Peterson (2004) as “an attitude of respect and acceptance coupled with the skills to put your acceptance into practice in specific ways”. Furthermore, this attitude must be demonstrated through behavior. Sensitivity to other cultures must be demonstrated through positive behavior, showing respect and interest in other’s culture.

3.5. Cultural fluency

Other term that has been circling in the literature about culture is *cultural fluency*. LeBaron (2003) defines *cultural fluency* as “familiarity with cultures: their natures, how they work, and ways they intertwine with our relationships in times of conflict and harmony”. It is the awareness of the ways cultures operate in communication, and ability to respond effectively to cultural differences.

LeBaron (2003) states that all communication is cultural. The important key in effective communication is our relationship with the others. Are we being heard and understood? Do they understand what we are trying to explain? Do they listen? Answering these questions gives us clues about the effectiveness of our communication.

Miscommunication is likely to happen if communicating individuals have different cultural backgrounds. They make different meaning of the world and their place in it.

In the article on cross-cultural communication LeBaron (2003) states that cultural fluency can be cultivated by increasing familiarity in following four variables:

Time and space: time is the central difference that separates cultural ways of doing things. Time in West is measured in units and it reflects the progress. Western cultures are monochronic, the approach that is of linear structure and favors one event at a time. In the East time has unlimited continuity. People belonging to polychronic cultures may attend to many things happening at once, for instance they can be involved in many conversations at once, “talking over” each other as they discuss their things.

Fate and personal responsibility: it is a degree to which we feel being masters of our lives, versus the degree to which we feel being subject to things outside our control. It is the degree of how much we are able to choose and change the course of our lives. This variable can be the key to cultural conflict. If two people coming from both ends of the spectrum meet, the miscommunication is likely to happen. The first person might expect action and evaluate the other person as lazy and dishonest. The second person expects respect for natural course of things. Failing to see this, he might think that the first person is bossy and bad-mannered.

Face and face-saving: face across cultures means power, status and respect. In individualistic societies face means preserving individual’s image with others and himself. It is natural that the individual confronts someone who has wronged him, i.e. it is meeting other party and discussing the matters face-to-face. On the contrary, in collectivistic societies, it is about saving the face of the group and not individual. Direct confrontation with others may disturb the community harmony, so involving a third party is preferred. A third party works as a shuttle between the individual and other people involved in conflict. Face is preserved by indirect confrontation and damage to the group is minimized.

Nonverbal communication: nonverbal communication is very important in interaction with others. It plays a major role when a verbal message stays unclear and then individuals tend to look for nonverbal cues to solve the ambiguity. Such systems as gestures, emotional expression, and physical appearance are understood differently in different cultures. In low-context cultures, such as United States, little emphasis to nonverbal communication is given. People emphasize the literal meaning of the words. In high-context societies, such as Japan, the stress is on the nonverbal components of the communication. Surprisingly, some elements of nonverbal communication are consistent around the globe. Emotions like joy, anger, fear, sadness or disgust, are expressed by people around the world in similar way. It might be difficult to interpret facial expressions in different cultures. For instance in China or Japan, a facial expression that would be recognized as happiness around the world, may actually mask sadness or express anger. Interpreting facial expressions in wrong way may lead to a conflict. If a Japanese person explains her absence from negotiations due to the death in her family, and by doing this she wears a smile, because according to Japanese culture it

is inappropriate to inflict pain or grief in others. A Westerner may translate a smile as a sign of joy and think that the Japanese person's smile is improper and cold, under the circumstances.

Each of above discussed variables influence the outcomes of communication and can be an escalator for a conflict. Cultural fluency helps to understand different ways that cultures operate and it helps to improve cross-cultural relationships.

3.6. Cultural intelligence: CQ

Term *cultural intelligence (cultural quotient) CQ*, has been first described by Christopher Earley and Soon Ang in their book "*Cultural Intelligence: Individual Interactions Across Cultures*" in 2003. Cultural intelligence is a theory in management and organizational psychology, which states that in order to do business globally in an effective way, it is needed to understand how cultural background impacts individual's behavior. It is also possible to measure person's ability to engage successfully in any environment. CQ teaches strategies on how to improve cultural competencies and be able to distinguish better between behaviors, specific to culture and those, specific to individual. Achieving higher levels in CQ leads to better business practices. Cultural intelligence is an issue to expatriates that enter unfamiliar environments. Differences and the unknown in the early stages of arrival may lead to a culture shock. Cultural intelligence builds competencies such as communication skills, tolerance for ambiguity, open-mindedness, flexibility, positive attitude to learning, tolerance for different styles and cultures, cultural knowledge etc., and helps to succeed in culturally diverse environments.

CQ refers to "*a person's capability to adapt effectively to new cultural contexts.*" It is the ability to effectively communicate with the people who are culturally different.

The model of cultural intelligence has three facets: *cognitive, motivational and behavioral*. Cognitive facet means learning your own and other cultures; motivational facet is emotions, gaining strength from success and acceptance; behavioral facet means adapting your body language to blend in a new environment.

Earley & Ang (2003) also propose a framework for cross-cultural training. They have overviewed the different training possibilities available and criticized that methods used are one-sided. In their opinion the training is basically focused on cognitive side, which is the basic knowledge about other cultures and cultural differences, where the trainee is only listening and absorbing the information like a sponge. This type of training does little good to a person who is going to face different culture. Earley & Ang (2003) propose extended training model, which has also motivational and behavioral aspects of cross-cultural interactions (that is improving person's interest and confidence in functioning effectively in culturally diverse settings; and person's capability to adapt verbal (tone, accent) and nonverbal (gestures, facial expressions) behavior to make it appropriate to diverse cultures).

As an example, regarding cultural intelligence, Earley & Ang (2003) describe an incident that happened in early 1990's in Pakistan. Greg Mortenson, the founder of the Asia Central Institute, was kidnapped. He had no contact to outside world and only minimal contact to his abductors. After being three days in captivity, Mortenson became very worried about his fate and thought he needed to do something to improve his situation. So he asked his abductors a copy of Koran and told them that his wife is expecting their first child, a boy. Mortens knew from experience of the local culture that the first child meant good omen and a boy meant good fortune. So killing him would be unluck and bring bad fortune for his executioners. After being 8 days in captivity, Mortens was released unharmed. After 8 years Mortens visited his captors. They discussed the captivity and Mortens got to know that captors did not really believe the story about the wife and son. What they really appreciated was his knowledge about local culture and values. They believed that someone who took time to understand their beliefs and religion had to be respected.

Where all this reflect cultural intelligence? Morten developed a general strategy for creating a good will between him and a local community. Motivational and behavioral facets were exhibited by being highly motivated and demonstrating behavior appropriate to the situation.

Earley & Ang (2003) conclude that in their book they have emphasized on external interventions needed to raise a CQ level. Other factor which plays a major role is an individual's personality. Authors leave it up to HR management to decide which person has the right attitude and personality to secure a better chance of success.

Other model of cultural intelligence has been developed by David C. Thomas, a professor of international management Simon Fraser University, Canada. The concept of CQ is broadly explained in a book by Thomas & Inkson (2004). The basic definition of CQ is consistent with Earley & Ang (2003), i.e. the ability to interact effectively with people who are culturally different. The components of cultural intelligence are demonstrated in Figure 3.4.

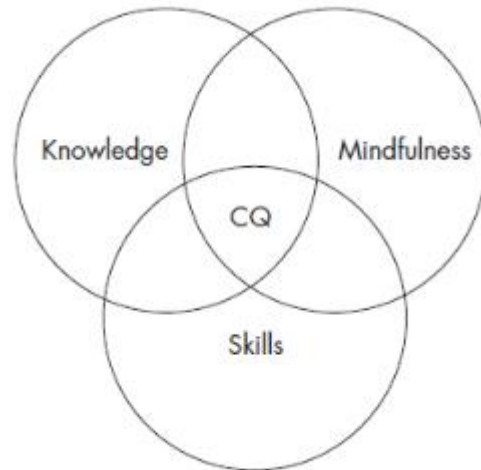


Figure 3.4. *The three facets of cultural intelligence* (Thomas & Inkson, 2004).

In his model of cultural intelligence, Thomas presents three components, similar to earlier definitions. However, the elements differ from earlier definitions in that they form an interrelated system. CQ consists of *knowledge*, *mindfulness* and *behavioral ability*. The knowledge component of CQ means knowing what culture is, how cultures vary, and how culture affects behavior. Mindfulness is awareness of and attention to present reality. A person can be mindful of thoughts, emotions and external stimuli. The opposite of mindfulness is *mindlessness*. It is a semiautomatic behavior, lacking attention or awareness, such as driving a familiar route and not recalling anything about the journey. Mindfulness is actively moving out of semiautomatic mode. The last component of CQ is a behavioral ability. It is the ability to choose an appropriate behavior from a well-developed repertoire of behaviors that are correct for different intercultural situations. CQ summarized consists of cultural knowledge, practice of mindfulness and a repertoire of cross-cultural skills.

Thomas & Inkson (2004) outline a development model of cultural intelligence seen in figure 3.5.

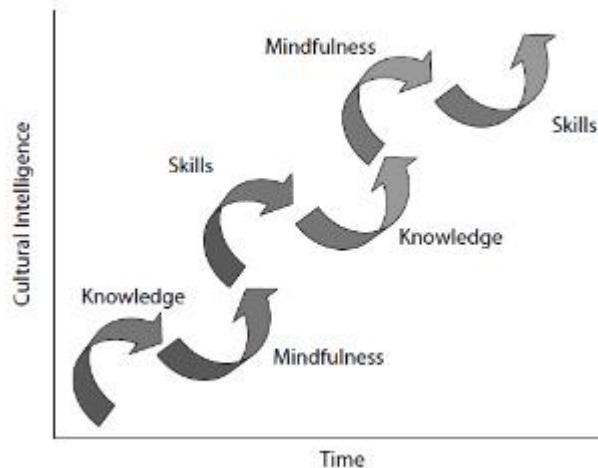


Figure 3.4. *The development model of cultural intelligence* (Thomas & Inkson, 2004).

They state that cultural intelligence develops over time through intercultural interactions and the development is quite slow. It is very unlikely that high levels of CQ would be achieved in short period of time. In addition, the development of CQ is not seen as a linear process. It requires iterative experiential learning. The iterative process can be envisioned as series of S curves, where by consciously (that is mindfully) retrieving and applying appropriate knowledge, person adapts it into behavioral ability.

Thomas & Inkson (2004) conceptualize various stages which individuals pass through while increasing their levels in CQ:

Stage 1: *Reactivity to external stimuli.* Person mindlessly follows own cultural rules and norms. At this stage it is typical to hear “I do not see the difference.. I treat all people the same.”

Stage 2: *Recognition of other cultural norms and motivation to learn more about them.* Mindfulness and experience produce awareness of cultural differences. People often struggle at this stage with overwhelming amounts of information and complex cultural environment. Their behavior is guided by simple rules of thumb.

Stage 3: *Accommodation of other cultural norms and rules in one’s own mind.* People develop a deeper understanding of cultural differences; they begin to recognize which behavioral response is appropriate in different cultural situations. Individuals are able to speak and behave in different cultural situations, but this adaptive behavior does not seem natural to them.

Stage 4: *Assimilation of diverse cultural norms into alternative behaviors.* Individuals adjust to different cultural situations almost effortlessly. A repertoire of behaviors has been developed and individual chooses the right one depending on the situation. Individuals actively experiment with new behaviors.

Stage 5: *Proactivity in cultural behavior based on recognition of changing cues that others do not understand.* At this stage people continuously sample internal states and external cues and they develop ability to sense changes in cultural context. They almost

automatically adjust their behavior in order to interact more effectively in intercultural context.

Thomas & Inkson (2004) conclude that in the future the key factor to interpersonal interactions will remain cultural differences. The effective interaction is a very important part of the work life. Competitiveness requires the individuals to keep their skills up-to-date. Authors believe that the key competency in the twenty-first century is the cultural intelligence, i.e. effective interaction of people with different cultural backgrounds.

A third model on *cultural intelligence* has been created by Peterson (2004). He states that cultural intelligence consists of *knowledge about cultures* (facts and cultural traits), *awareness* (of yourself and others) and *specific skills* (behaviors). This model is very similar to that of Thomas & Inkson (2004), only mindfulness is replaced with awareness. Cultural awareness by Peterson (2004) has been discussed in chapter 3.4. *Specific skills* mean the ability to modify your behavior in an appropriate way in order to interact successfully with people. This includes a set of verbal and nonverbal skills that translate into spoken and written behaviors, such as knowing what to write in an e-mail, or how to manage negotiations successfully. *Knowledge about cultures* is the facts and characteristics of the target cultures.

Peterson (2004) states that the process of increasing the level of cultural intelligence might be lengthy. Cultural intelligence is never finite. There is always to learn more. Increasing cultural intelligence takes years and the learning can be pleasant if one enjoys this process. Peterson (2004) concludes the book with these words: "Like the patient bonsai hobbyist who loves the slow process of growing his miniature trees, you can enjoy the process of increasing your cultural intelligence."

4. SOFTWARE ENGINEERING PROCESSES

This chapter introduces several software development cycles, compares them in context of culture, introduces three international standards on software process improvement, and examines SPI from cultural perspective.

4.1. Software development life cycle models

Software development life cycle models are often called software process models. Ian Sommerville (2007, p.65) defines a *software process model* as an abstract representation of a software process. Software process models can be used to explain different approaches to software development. The three most general process models are (a) waterfall model, (b) evolutionary development, and (c) component-based software engineering. These three models are not mutually exclusive and are often used together. For instance, Rational Unified Process (RUP) combines elements of all these models. Also a glance at spiral development and agile methods will be discussed in the following sections.

4.1.1. The waterfall model

The waterfall method is the most common and classic of the life cycle models. Each stage at this model must be completed entirely before the next stage can begin. The waterfall model has following activities (Sommerville 2007, p.66):

1. *Requirements analysis and definition.* The systems services and goals are established. Then they are defined into a system specification.
2. *System and software design.* System design establishes overall system architecture. Software design identifies software system abstractions and their relationships.
3. *Implementation and unit testing.* Software design is realised as a set of programs or program units. Unit testing verifies that each unit meets its specification.
4. *Integration and system testing.* The individual program units or programs are integrated and tested as a complete system. After testing, a software is delivered to the customer.
5. *Operation and maintenance.* Maintenance involves correcting errors which were not discovered in the early stages of life cycle, enhancing system services as new requirements are discovered.

The advantage of waterfall method is its simplicity. The disadvantage is its inflexible partitioning of the project into distinct stages. Commitments must be made at the early stages of the process and this makes difficult to respond to changing customer requirements.

4.1.2. Evolutionary development

The idea in evolutionary development is to produce an initial implementation, expose it to customer and improve it through many versions until adequate system has been developed (Sommerville 2007, p.68). Activities like specification, development and validation are interleaved, with rapid feedback involved. There are two types of evolutionary development: exploratory development and throwaway prototyping. The advantage of evolutionary development is that specification can be developed incrementally. For small and medium-sized systems evolutionary development might be the best approach of development. For bigger systems a mixed process of waterfall and evolutionary development is recommended.

4.1.3. Component-based software engineering

Component-based software engineering (Sommerville 2007, p.69) approach relies on large base of reusable software components and some integrating framework for these components. The initial stages of requirements specification and validation are same as in other life cycle models, but intermediate stages are different:

1. *Component analysis*. Searching components to implement specifications.
2. *Requirements modification*. Modifying the requirements based on the discovered components. If modifications are not possible, a search for other components continues.
3. *System design with reuse*. Framework of the system is designed or existing framework reused.
4. *Development and integration*. Software is developed if it cannot be externally obtained. Components are integrated to create new system.

Component-based software engineering reduces amount of software to be produced and so reduces cost and risk.

4.1.4. Iterative models

Iterative development makes possible to develop specification in conjunction with the software. In this approach there is no complete system specification until the final increment is specified (Sommerville 2007, p.71). Two fundamental process models that support process iteration are incremental delivery and spiral development. In an incremental development, customer identifies the services to be provided by the system. Then increments are defined, each of them providing a sub-set of system functionality. In spiral development each loop represents a phase of the software process. There is an explicit recognition of risk in spiral model. The first step is to identify and assess risks.

The next step is to resolve risks by more detailed analysis, prototyping and simulation. After risks have been assessed, some development is carried out, followed by planning activity for the next phase.

4.1.5. The Rational Unified Process

The Rational Unified Process (RUP) is an example of a modern process model that brings together elements from all of the generic process models, supports iteration and illustrates good practice in specification and design (Sommerville 2007, p.82). There are three perspectives to RUP: (a) dynamic, that shows phases of the model over time, (b) static that shows process activities, and (c) practice perspective that suggests good practices to be used. There are four phases in RUP:

1. *Inception*. Concerns with establishing business case, identifying external entities that will interact with the system and defining these interactions.
2. *Elaboration*. The goal is to understand problem domain, establish architectural framework, develop project plan and identify key risks.
3. *Construction*. Concerned with system design, programming and testing. On completion there should be working software system and ready documentation.
4. *Transition*. Concerned with moving the system to the user community. On completion there is a documented software system that is working correctly in its operational environment.

The static view of RUP focuses on activities, called *workflows*. All of the RUP workflows can be active at all stages of the process. The nine RUP workflows are as follows: business modeling, requirements, analysis and design, implementation, testing, deployment, configuration and change management, project management and environment.

The six fundamental best practices of RUP are:

1. *Develop software iteratively*
2. *Manage requirements*
3. *Use component-based architectures*
4. *Visually model software*
5. *Verify software quality*
6. *Control changes to software*

RUP represents a new generation of generic processes. The separation of phases and workflows, and recognition that deploying software in user's environment is part of the process, are most important innovations.

4.1.6. Agile methods

In the 1990s a new approach to software development, so called agile methods, emerged. They opposed heavyweight approaches, including careful project planning, formalized quality assurance and controlled and exact software development processes,

which produced a large overhead to small and medium-sized businesses. Agile methods allow developers to focus on the software itself, rather than on its design and documentation. Agile methods are iterative approaches to software specification, development and delivery that support application delivery with rapidly changing user requirements (Sommerville 2007, p.396). These methods deliver working software quickly to customer, who can later propose new or changed requirements to be included in later iterations. Agile methods include extreme programming, Scrum, Crystal, Adaptive Software Development, DSDM, and Feature Driven Development. Agile methods are based on incremental development, but they propose different process to achieve this. Agile methods share common sets of principles:

1. *Customer involvement.* Involving customers closely in development process. Customers prioritise new requirements and evaluate iterations.
2. *Incremental delivery.* Customer specifies requirements to be included in each increment.
3. *People not process.* Development team skills should be recognized and exploited. Team members should find out their own ways of working without prescriptive processes.
4. *Embrace change.* Design a system to accommodate changing requirements.
5. *Maintain simplicity.* Simplicity in software and development process. Eliminate complexity from the system, where possible.

Sommerville (2007) concludes that agile methods best suit the development of small to medium-sized business systems and personal computer products, which do not have complex interactions with other hardware and software systems.

Extreme programming is mostly used and best known of agile methods. The name of this approach was invented by Beck (1999). He developed this approach by pushing recognized good practice, such as iterative development and customer involvement to 'extreme' levels. In this approach, requirements are expressed as scenarios, so called user stories, and they are implemented directly as series of tasks. Programmers work in pairs and develop tests for each task before writing the code. All tests must be successfully executed when new code is integrated into the system. There are number of practices in extreme programming:

1. Incremental development is supported by frequent releases. Requirements in each release are based on user stories.
2. Customer engages full-time in the development team. Customer representative takes part in the development and is responsible for defining acceptance tests.
3. People, not process, are supported through pair programming, collective ownership of the system code, and sustainable development process that does not involve long working hours.
4. Change is supported through frequent releases, test-first development and continuous integration.

5. Maintaining simplicity is supported through constant refactoring to improve code quality, and using simple designs that do not anticipate future changes to the system.

There are two important innovations in XP: test-first development and pair programming. After the user scenarios have been broken into tasks, the unit test can be designed for that task. This type of approach reduces the likelihood of introducing errors into the existing software by new system increments. Pair programming means that programmers develop software by sitting at the same workstation. Pairs are created dynamically so that team members can work with other members during the development process. This means that the whole team is responsible for the code and not the individual. Informal reviews are enacted in a way that at least two people check every line of code and this method discovers huge amount of errors. One might think that pair programming is less efficient but the study has shown that pair programming is comparable to two individuals working separately. This might be due to the fact that programmers discuss before they start working and this means fewer false starts and less rework.

4.1.7. Software development methods and culture

This section presents some thoughts about how cultural issues relate to software development methodologies.

Traditional, plan-driven software development methods concentrate on the process. Heavyweight procedures do not make software engineers happy workers. Human factors have a significant influence on the success of most software projects. In 1990s a philosophy emerged that elevated people over the processes. New agile development methods were introduced. According to Abrahamsson (2008) agile development presents a culturally sensitive view on software development. Agile approach explicitly states values and principles it holds valuable over others. It also provides set of concrete practices that might influence on behaviors of developers, managers and customers. These elements develop an organizational culture. Being cultural sensitive approach causes also challenges to agile development. Abrahamsson (2008) expresses an interest to see how national cultures and customs will either conflict or support agile methods that are open and transparent. Kruchten et al. (2005) discusses other problematic areas in agile methods if software development involves software developers from different cultural backgrounds. The first key issue is exchanging ideas and giving feedback on the daily basis. People with high power-distance cultures expect management to run business and developers carry out the instructions. The developers might not be willing to contradict manager or customer ideas. Other key issue might be with rapid and small releases. Developers from high uncertainty avoidance cultures might feel frustrated to start development without detailed, thorough plan.

Despite the challenges in agile methods due to their cultural sensitivity, agile approach provides a room for adaptation and adjustment to cultural diversity of the project team. According to Boehm and Turner (2004) people feel comfortable and

encouraged with many degrees of freedom available in agile culture. This helps them to define and accomplish tasks their way as long as it serves for the success of the project.

Boehm and Turner (2004) discuss five critical factors that determine relative suitability of agile or plan-driven methods in particular project situation. One of the critical factors is organization culture. It is stated in a book that agility discriminators succeed in such organizational culture where people have many degrees of freedom (thriving on chaos) as opposed to plan-driven discriminators, which bloom in a culture where people roles are defined by clear policies and procedures (thriving on order).

According to Abrahamsson et al (2008), culture offers challenges to software teams as they collaborate globally. Agile software practices through iteration, incremental delivery, and customer closeness can improve cultural challenges in teamwork.

4.2. Standards

The key element in producing high quality software at a reasonable price is a set of so called “best practices” of software engineering. Various industrial and professional standards -making bodies have produced standards and guides, which include “best practices” in making software. Different standards usually target different needs of the organizations. Software engineering standards cover wide range of topics, including software project management, requirements analysis, design, verification and validation, testing, configuration management, and other aspects of software engineering.

The following standards will be discussed in the next sections:

- ISO/IEC 12207 - a standard for system and software life-cycle processes
- ISO/IEC 15504 - a standard of process assessment for information technology
- CMMI - this standard is considered with the process improvement.

4.2.1. ISO/IEC 12207

ISO/IEC 12207:2008 (Systems and software engineering – Software life cycle processes) is a standard that establishes a common framework for software life cycle processes. It applies to the acquisition of systems and software products and services, to the supply, development, operation maintenance and disposal of software products. ISO/IEC 12207 provides a reference model that supports process capability assessment in accordance with ISO/IEC 15504-2 (process assessment). The revision, published in 2008, includes fully harmonized view of the system and software life cycle processes.

ISO/IEC 12207 can be used in following modes:

- *By an organization:* helps to establish desired processes. Organization then can perform and manage its projects and progress systems through their life cycle stages.
- *By a project:* helps to select structure and employ the elements of an established set of life cycle processes to provide products and services.
- *By an acquirer or supplier:* helps to develop an agreement concerning processes and activities.

- *By organizations and assessors:* to perform assessments that may be used to support organizational process improvement.

Each process in this standard is described in terms of following attributes:

- The *title* describes the scope of the process
- The *purpose* describes the goals of performing a process
- The *outcomes* express the observable results
- The *activities* are a list of actions that are used to achieve the outcomes
- The *tasks* are requirements, recommendations or permissible actions intended to support the achievement of the outcomes

The life of a system or software product can be modeled by using life cycle model, consisting of stages. The life cycle model can express the entire life from concept to disposal, or they can represent the portion of the life corresponding to the current project. Examples of these life cycle models can be waterfall, incremental development, evolutionary development, and spiral. A technical report (ISO/IEC TR 24748) provides additional details regarding life cycle models and stages. The figure 4.1 demonstrates the life cycle process groups (ISO/IEC 12207:2008(E)).

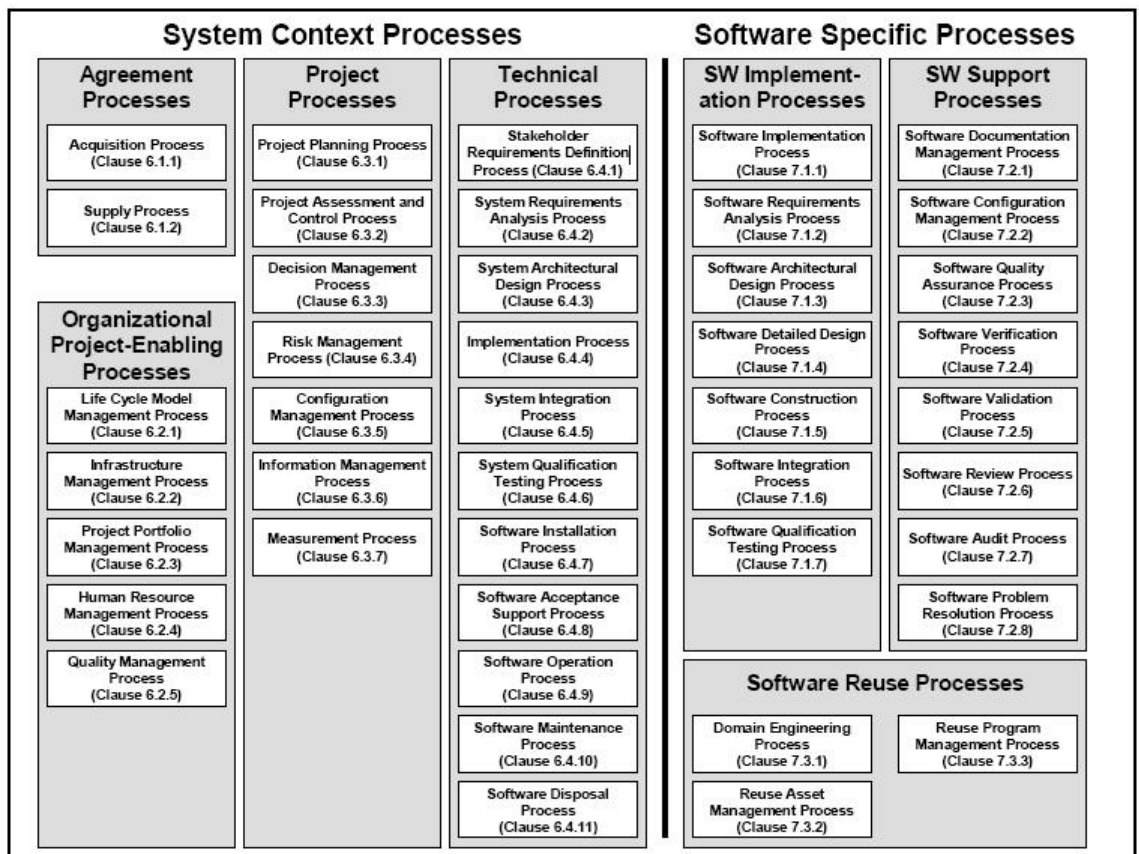


Figure 4.1. Life Cycle Process groups (ISO/IEC 12207:2008(E)).

The processes in this standard are grouped into seven process groups:

- (a) Agreement processes (two processes)
- (b) Organizational project-enabling processes (five processes)
- (c) Project processes (seven processes)
- (d) Technical processes (eleven processes)
- (e) Software implementation processes (seven processes)
- (f) Software support processes (eight processes)
- (g) Software reuse processes (three processes)

Altogether there are 43 processes and some of the processes are divided into sub-processes.

4.2.2. ISO/IEC 15504

ISO/IEC 15504:2005 (Information Technology – Process Assessment), also known as SPICE (Software Process Improvement and Capability dEtermination), is an international standard for process assessment. ISO/IEC 15504 consists of following five parts:

- Part 1: Concepts and vocabulary
- Part 2: Performing an assessment
- Part 3: Guidance on performing an assessment
- Part 4: Guidance on use for process improvement and process capability determination
- Part 5: An exemplar Process Assessment Model

The Process Reference Model defined in ISO/IEC 12207 AMD1 and AMD2 has been used as a basis for the Process Assessment Model in this standard. The process assessment model includes two dimensions: a *process dimension* and a *capability dimension*.

The *process dimension* divides processes into 3 categories: organizational, supporting and primary processes. Primary life cycle processes consists of four process groups: acquisition, supply, engineering and operation. Organizational life cycle processes consist of four process groups: management, process improvement, resource and infrastructure, and reuse. Supporting life cycle processes consist of one process group: the support process group. The figure 4.2 demonstrates the life cycle process groups (ISO/IEC 12207:2005(E)).

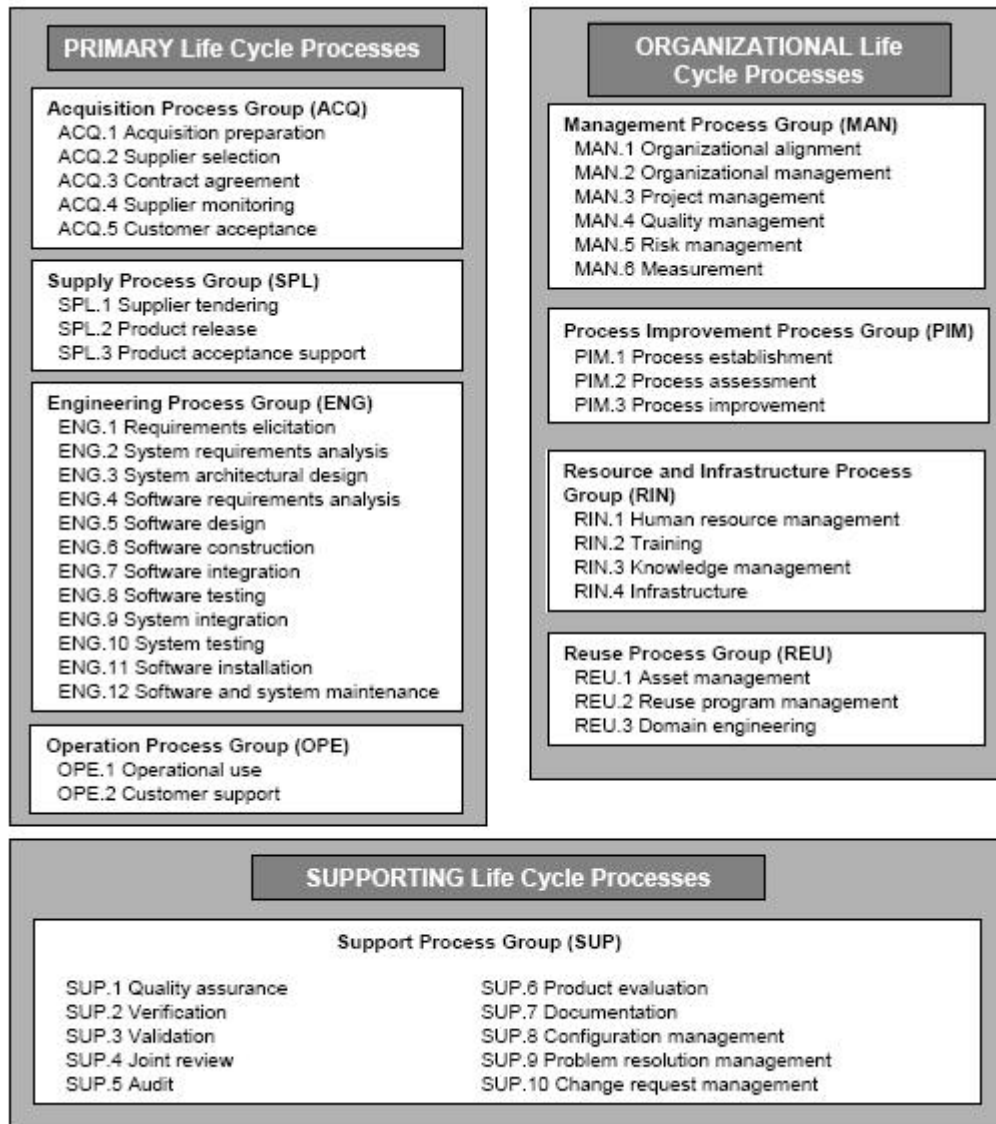


Figure 4.2. Life Cycle Process groups (ISO/IEC 12207:2005(E)).

For each process, ISO/IEC 15504 defines a *capability level*:

Level 5: Optimizing

Level 4: Predictable

Level 3: Established

Level 2: Managed

Level 1: Performed

Level 0: Incomplete

A capability dimension consists of set of process attributes, grouped into capability levels. The process attributes provide the measurable characteristics of process capability. There are nine process attributes, defined in ISO/IEC 15504:

- 1.1 Process performance*
- 2.1 performance management*
- 2.2 Work product management*
- 3.1 Process definition*
- 3.2 Process deployment*
- 4.1 Process measurement*
- 4.2 Process control*
- 5.1 Process innovation*
- 5.2 Process optimization*

Each process attribute consist of one or more generic practices. Each attribute is assessed on four-point-rating scale (N-P-L-F):

- Not achieved (0 -15%)*
- Partially achieved (>15 – 50%)*
- Largely achieved (>50 – 85%)*
- Fully achieved (>85 – 100%)*

The assessment process involves following tasks: (a) initiating an assessment, (b) selecting assessor and assessment team, (c) planning the assessment, (d) data collection, (e) data validation, (f) process rating, and (g) reporting the assessment result.

ISO/IEC 15504 can be used for process improvement or capability determination. Process improvement is the subject of part 4 of ISO/IEC 15504 standard. It specifies requirements for improvement programs and includes guidelines for planning and executing improvements. Determining capability might be a way in evaluating supplier's process capability in case of outsourcing.

ISO/IEC 15504 is not available for free download, but must be purchased from ISO.

4.2.3. CMMI

Capability Maturity Model Integrated (CMMI) is a collection of best practices that help organizations to improve their processes. There are three different areas of interest in CMMI: (a) for acquisition, (b) for development, and (c) for services.

CMMI for Development (CMMI-DEV) provides set of guidelines for developing products and services. CMMI supports two types of levels: capability and maturity levels. Capability levels can be achieved using continuous representation and maturity levels can be achieved using staged representation (Software Engineering Institute 2010, p.21). The staged representation uses maturity levels to characterize the overall state of the organization's processes relative to the model as a whole, whereas the continuous representation uses capability levels to characterize the state of the organization's processes relative to an individual process area. Table 4.1 describes capability and maturity levels.

Table 4.1. (Software Engineering Institute 2010, p. 23)

<i>Level</i>	<i>Continuous Representation Capability Levels</i>	<i>Staged Representation Maturity Levels</i>
Level 0	Incomplete	
Level 1	Performed	Initial
Level 2	Managed	Managed
Level 3	Defined	Defined
Level 4		Quantitatively Managed
Level 5		Optimizing

Capability and maturity levels provide a way to improve the processes of organizations.

Capability levels

There are four capability levels, which are numbered 0 to 3:

- **Capability level 0: Incomplete**
An *incomplete process* is performed partially or not performed at all. Specific goals of the process area are not satisfied and no generic goals exist for this level.
- **Capability level 1: Performed**
The *performed process* is such process that satisfies the specific goals of the process area. It also accomplishes the needed work to produce work products.
- **Capability level 2: Managed**
Managed process is such process that is planned and executed in accordance with policy. Controlled outputs are produced. Managed process is monitored, controlled and reviewed.
- **Capability level 3: Defined**
A *defined process* is a process that is tailored from the organization's set of standard processes according to the organization's tailoring guidelines. Defined process has a maintained process description.

The continuous representation enables the organization to be able to choose the focus for the process improvement in certain process areas that best benefit the organization. The processes belonging to lower capability levels are unstable and their operation is not managed. Higher levels in capability mean that processes are more predictable and easier to measure.

Maturity levels

Maturity level provides a way to define organization's overall performance. Maturity levels are numbered 1 through 5:

- **Maturity level 1: Initial**
At this maturity level processes are ad hoc and chaotic. The organization usually does not provide a stable environment to support processes. At this maturity level organizations usually produce products and services that work, but they often exceed the budget and schedule.
- **Maturity level 2: Managed**
At this level the processes are planned and executed in accordance with policy. The process discipline at this level makes sure that existing practices can be retained at the times of stress, so the projects can be performed and managed according to their documented plans.
- **Maturity level 3: Defined**
At this level the processes are characterized and well understood and are described in standards, procedures, tools and methods. At the maturity level 3 the organization further improves its processes that are related to the maturity level 2 process areas.
- **Maturity level 4: Quantitatively managed**
At this maturity level processes are measured and controlled. Quality and process performance is understood in statistical terms and is managed throughout the life of projects.
- **Maturity level 5: Optimizing**
At this maturity level the organization continuously improves its processes through innovative and incremental improvements.

Organizations improve their maturity by achieving control first at a project level and then advancing to organization performance management.

4.2.4. Proposals on extending process improvement methods

Biro et al (2002) proposes to work toward a third, cultural, dimension of CMMI/SPICE architecture, in addition to the process and capability dimensions of the existing models. The authors are considered with the fact that despite the globalization, there is a considerable difference in local outlook and expectations in global team members. Biro et al. are exploring differences in cultural value systems in software process perspective. In order to characterize different value systems, Biro et al. (2002) use Hofstede's work as a basis.

Authors extend CMMI model with a third cultural dimension. They argue that the extension of this kind is valid because the national culture influences the effectiveness of various practices. Figure 4.2. shows the proposed extension for the CMMI model.

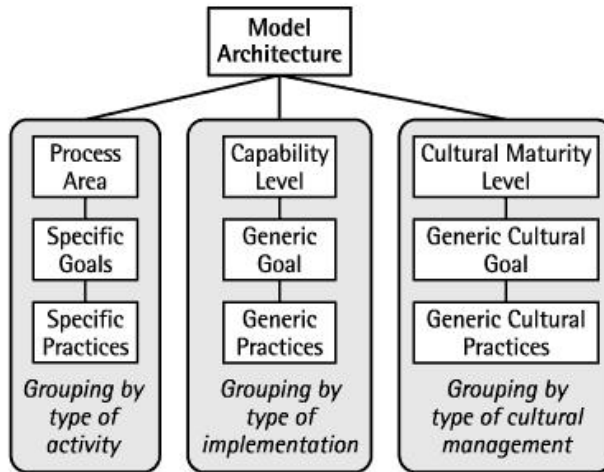


Figure 4.2. CMMI extension (Biro et al 2002).

New cultural dimension would have six maturity levels:

- *Cultural maturity level 0 (closed)*: no differences in cultural value systems are allowed.
- *Cultural maturity level 1 (open)*: open enough to allow the differences in cultural value systems.
- *Cultural maturity level 2 (model based)*: consideration of cultural differences is based on scientifically established model, for instance Hofstede model.
- *Cultural maturity level 3 (comprehensive)*: the cultural model is comprehensively applied to all specific and generic practices.
- *Cultural maturity level 4 (tailored)*: applying the cultural model is based on quantitatively managed business needs.
- *Cultural maturity level 5 (competency driven)*: cultural model is refined, extended, or fully changed on the basis of competency acquired through quantitatively managed business needs.

Each level of generic cultural goals is explained further in the article. As an example in this thesis, level 2 generic cultural goal is introduced: at level 2 the goal is to apply the cultural model to selected specific and generic practices. In the case of Hofstede model, five generic cultural practices (GCP) would be following: considering all five Hofstede' dimension factors (power distance, individualism vs. collectivism, masculinity vs. femininity, uncertainty avoidance, long-term vs. short-term orientation) in selected specific and generic practices. In CMMI, Generic Practice (GP) 2.4 is considered with assigning responsibility. It is strongly related to individualism vs. collectivism dimension. Should responsibility be assigned to teams or people? Biro et al (2002) illustrate this issue quoting researcher Christopher Earley, who performed laboratory experiment on a group of 48 management trainees from China and matched group of trainees of 48 from the United States. Half of participants in either country

were given group tasks, the other half individual tasks. Also, half of participants in either country were asked to mark completed items with their names. The other half turned them in anonymously. The results were following: the Chinese collectivists performed best when operating in a group and anonymously. The American individualist participants, on the other hand, performed best when operating individually and with their name marked.

Authors conclude that CMMI and other process improvement methods should consider the ways how its practices could be performed most effectively in different national cultural environments. The ideas expressed on this topic are only eye-opening and authors are calling to undertake more extensive study, requiring considerable resources and worldwide collaboration.

Richardson et al. (2010) present a research project, dealing with the problems, faced by virtual teams in global software engineering. Three case studies on global firms were carried out and the solutions have been proposed as how to avoid these problems from happening in the future. Authors observed problems with CMMI and ISO/IEC 15504 in global environment, even though these process improvement models work well in local environments. Authors identified twenty five factors to be taken into account when setting up virtual global teams. Furthermore, they developed a software process area, called Global Teaming (GT), similar to the structure of CMMI with specific goals and sub-practices. The explicitly defined processes can be used as a support mechanism for global software engineering (GSE) implementation.

The sub-practices in GT process area pay a lot of attention to multicultural issues. Three culture-related sub-practices in specific practice (SP) 1.2 *Knowledge and Skills* are as follows:

- *Identify the cultural requirements of each local sub-team:* to avoid misunderstandings and to address issues of cultural diversity, team members must have a basic knowledge about each others national culture. Cultural training and face-to-face meetings are important to understand each other better.
- *Identify communication skills for GSE:* developing new communication etiquette is required by the team members as they have to work with people they do not know and whose cultures they might not understand. Policies should be placed to support these new requirements.
- *Establish relevant criteria for training:* evaluating training needs not only for improving specific academic knowledge, but also cultural and linguistic issues should be considered. The most effective training for global team members would be onsite and face-to-face training.

Four culture-related sub-practices in specific practice (SP) 1.3 *Global Project Management* are as follows:

- *Identify GSE project management tasks:* project manager needs to built up his/her knowledge about each team member on their technical and professional experience. This is important in preventing situations like

follows: some competent people in the distributed locations agree to undertake unrealistic amounts of additional work. This can be due to their cultural reasons, which attribute to hierarchy, where requests by superior cannot be rejected.

- *Ensure awareness of cultural profiles by project managers:* project managers should understand religion, gender and power distance issues because they can play a major part in the success of a project. This could be achieved by providing training which addresses national, religious and ethnic issues. Team members would understand acceptable and unacceptable forms of behavior. Gender issues might be dealt with. In some Eastern cultures the female role is seen as subservient to that of a male due to religious beliefs, and in some countries, by the legal system. In virtual team management this might cause an issue, where males from Eastern countries might have a problem of reporting to a female team leader or manager. The respect should be shown by management to gender related cultural values of the team members and so the operation of the team would not be impacted negatively.
- *Establish reporting procedures between locations:* formal procedures of regular reporting should be established. Without implementing such a reporting structure, there is a danger that a remote team will not report correctly due to its cultural background. In some Far Eastern cultures the requests and instructions are accepted without discussion or commenting. People from such cultures avoid conflict at all costs and disagreement is considered impolite. Workers expect hierarchy and when a request comes from an authority figure, they take on tasks even they are unprepared technically.
- *Establish a risk management strategy:* all software projects should have incorporated risk management. Globally distributed software projects have higher risk exposure due to culturally diverse team management, where risks are not understood, underestimated, or not even considered. There is also a culture related risk that software engineer would leave organization because of fear to express negative opinion and as a result undertaking additional activities. This leaves the worker unable to cope with the amount of work.

Two culture-related sub-practices in specific practice (SP) 2.1 *Operating Procedures* are as follows:

- *Define how conflicts and differences of opinion between locations are addressed and resolved:* a mechanism for handling conflict resolution must be established. Different types of conflicts need to be taken into account. Some conflicts are easy to recognize, but types such as lack of trust and developing of “them and us” culture is hard to distinguish. Such

types of culture might lead to uncooperative and obstructive behavior which needs to be addressed in the strategy.

- *Implement a communication strategy for the team:* in globally distributed teams, the loss of face-to-face communication and rely on asynchronous tools impact the levels of communication. Therefore, good communication must be planned, encouraged and monitored. It could be useful to provide training on how to communicate best with remote colleagues, including linguistic and cultural aspects.

One culture-related sub-practice in specific practice (SP) 2.2 *Collaboration Between Locations* is as follows:

- *Identify common goals, objectives and rewards:* reward system should be considered in global teaming because a reward in one culture might be seen as insulting to someone from another culture. Different cultures evaluate differently rewards such as money, status or group achievement. In each situation an appropriate award should be identified. The goal is to develop a motivated team that share common purpose and objectives.

Authors conclude that geographically distributed software development is not only a technical activity. It also needs to address human, social and cultural implications. By addressing these issues the effectiveness of globally distributed teams will increase.

4.3. Culture aspect in SPI

Organizations have been adopting software process improvement (SPI) models such as CMMI, SPICE, Bootstrap, etc. in order to achieve business benefits such as improved quality, lower costs, compressed development cycle times, and increased customer satisfaction (Moitra, 2005). Moitra (2005) debates that software processes have a direct impact on software quality and business performance, therefore it is natural to focus on software process improvement. However, unlike hardware processes, software processes have a strong dependency on human factors, such as knowledge, competency and attitude of people. Unfortunately this is often ignored while designing software processes and considering SPI. Eventually, even though “soft” aspects have a vital role on SPI, software process improvement initiatives often are very mechanical in nature.

Software process improvement is concerned with migrating from current state of process maturity and capability to a desired state by refining procedures, methods and tools. Also a change in individual and team behaviors and attitudes is necessary. The behaviors and attitudes have to be characterized by enthusiasm, commitment and involvement, and these are the crucial elements in the success of SPI program. In the same article Moitra argues that for true software excellence, organizational maturity requires to focus on three dimensions simultaneously: process, people and technology. Usually organizations treat only process dimension in isolation and thus receive only sub-optimal benefits at best.

Moitra (2005) proposes a model for managing organizational change for SPI. Throughout the article author stresses that it is not enough for only the managerial behavior that bears the outcome of the SPI. The vision for a change in SPI can also come from the development staff. In the planning phase, the SPI project plan should be made visible to everybody in the organization, so that people could help to make the change happen. In the planning phase it is necessary to define metrics for reviewing the progress of the SPI program. It is an effective way to involve all the employees in the SPI program planning. Employees also should be told how SPI will help them in terms of efficiency, productivity and performance. The focus on those in front-line of the development is very useful, because when individual performance improves collectively, then the organizational performance improves. Establishing a reward and recognition system might prove handy so that individuals and teams could contribute to the SPI program. This is a way to heighten enthusiasm, commitment and involvement of teams.

Organizations might have different organizational cultures, so specific SPI strategies could be chosen. Later in this section the work of Kerstin Siakas will be introduced. Kerstin Siakas investigates software process improvement from the national and organizational culture perspectives. Additionally, Moitra argues that participatory organizational culture has the most positive influence on SPI. A participatory culture has such positive attributes as enthusiasm, passion, commitment, collaboration, trust, mutual respect, pride, joy, motivation, and focus on excellence, as opposed to negative attributes such as selfishness, hatred, politics, jealousy, internal competition, apathy, command and control, and focus on compliance. Participatory culture means that people are involved in developing and guiding the change. This contributes to emotional involvement and assuming ownership of success. The recruitment is other key element that influences organizational culture. It plays a major role in sustaining organizational culture. The new employees of the organization should have values and orientations that align with company's value systems and culture through an assimilation program.

In summary to Moitra's article, in order to reach a success in SPI initiative, the SPI has to be tightly linked to business benefits and competitiveness. SPI requires a supportive and participatory culture with strong value system and include aspects, like employee motivation and morale, job design and compensation, etc.

Kerstin Siakas, an assistant professor at Technological Educational Institution of Thessaloniki, Greece, has been investigating cross-cultural issues and their impact on SPI. She has conducted a field study in five countries and has identified cultural factors that might affect the successful adaptation and implementation of Software Quality Management systems (Siakas & Georgiadou, 2000 & 2002). As a result, Siakas has developed a self assessment model, called CODES, which assesses the cultural fit between national culture and the organizational culture. CODES model combines two sub-models. The first sub-model is called C.H.I.D.DI topology and is based on Hofstede national cultural dimensions. It tries to predict a suitable software quality system for the organization depending on the country the organization is based on. The second sub-

model is called Top-down, Bottom-up model tries to identify the organizational culture and structure. The overall CODES model tries to investigate to what degree there is a fit between national and organizational cultures and it tries to predict suitable Software Quality Management System. If there is a fit between the national and the organizational cultures, the employees are happier and the problems are solved more smoothly. The dichotomy (= split, duality, gap) is likely to generate dissatisfaction, conflict and failure of SQM function.

Siakas (2002) argues the need for this type of investigation, focused on social issues in SPI. She constructs the main hypothesis stating that “Cultural factors intervene in the successful application of Software Quality Management Systems”. Author states that many SQM systems have been developed with the emphasis on technological elements, but social factors, on which the SPI depends heavily, have been neglected. With the globalization of the software market it will be more difficult to achieve social acceptance for SQM systems. Author argues that the management, that takes the cultural context into account, gains better success.

4.3.1. The C.HI.D.DI topology

The first sub-model of CODES model is called the C.HI.D.DI topology and it uses two Hofstede dimensions, Power Distance and Uncertainty Avoidance, and including cultural and organizational issues, the C.HI.D.DI topology classifies organizations into four dimensions, called Clan, Hierarchical, Democratic and Disciplined. The author then proposes type of organizational structure, orientation, leader’s roles and management style expected in certain national cultures (Siakas & Georgiadou, 2000):

- *Clan*: this type of national culture has strong Power Distance and weak Uncertainty Avoidance. Organization has loose and flexible structure with leaders who are mentors or facilitators. Involvement and cooperation are encouraged. Clan culture promotes in-group orientation (African and Asian countries, except for Japan and South Korea).
- *Hierarchical*: this type of national culture has strong Power Distance and strong Uncertainty Avoidance. It relies on stability and control. Hierarchical organizations have vertical hierarchy with strong leadership and a clear chain of authority and responsibilities are assigned to individuals. There is high degree of formalism and members have respect for status (Latin-America, Japan, South Korea and Arab countries).
- *Democratic*: democratic culture has weak Power Distance and weak Uncertainty Avoidance. Organizations have horizontal hierarchy and emphasize spontaneity and flexibility. Problems are solved by negotiations. Employees contribute to decision-making and development of the organization (Nordic, Anglo-Saxon, Jamaican).
- *Disciplined*: with weak Power Distance and strong Uncertainty Avoidance. Organizations have formal structure and use of formal rules.

Employees are self-disciplined and self-controlled. Organization emphasizes productivity and efficiency (Germany, Austria, Switzerland and Israel).

- *SQM and Clan cultures*: people are in-group oriented and co-operation is based on mutual benefits. Power-holders are accepted to have privilege. SQM system will have to clearly demonstrate the benefits that system can offer to its members. Cooperation can be obtained by persuasion and mutual gain.
- *SQM and Hierarchical cultures*: organizations belonging to this type of culture will resist the change. To avoid failure and losing face there is a need for formal laws and rules. SQM systems will have to exhibit a clear chain of authority and minimize the disturbance to hierarchy and order of the organization. Quality system with formal rules and procedures are suitable. Responsibilities should be assigned to people; order and discipline are important.
- *SQM and Democratic cultures*: people-oriented organization should promote individual responsibility and initiative. Quality management system will be adopted through discussions and negotiations. Motivating factors are delegated authority and flexible system of responsibilities.
- *SQM and Disciplined cultures*: the emphasis is on tasks and projects. Suitable Quality Management system is formal with clear rules and procedures. Productivity should be emphasized and people who contribute to realizing of goals expect to be rewarded. Motivating factors are opportunities to grow for subordinates.

In summary the C.HI.D.DI topology aims to improve the implementation of SQM systems by offering guidelines on SPI for organizations that develop software. National culture influences management practices and it is advised that multinational organizations would adapt to the national culture in which they operate in order to use culture as competitive advantage. Siakas (2002) argues that global organizations would benefit by using the C.HI.D.DI topology in their subsidiaries. The organization culture in mother organization might not be suitable in other countries. The mother organization has to be flexible enough to take into consideration differences between national and organizational cultures in subsidiaries. If the values of employees in mother organization are in divergence with the values of employees in subsidiaries conflicts and dissatisfied employees will most likely be the result. The emphasis of cultural differences should be placed not only on the employees, but also on cultural differences between clients in global market.

4.3.2. The Top-down, Bottom-up model

The second sub-model of CODES model is called Top-down, Bottom-up model. Siakas and Georgiadou (2002) mapped seven fundamental organizational characteristics into a scale of 1 - 6. The organizational characteristics were following:

- Centralized / decentralized
- Tightly / loosely controlled
- Management driven / participative
- Formal / informal
- Deep / flat hierarchy
- Task / people oriented
- Process / product oriented

Then the mean values for each country were calculated. The interpretation of the mean values is that the higher the mean values are, the more Bottom-up is the organizational structure and the lower the values are, the more Top-down is the organizational structure. The Danish (DK) organizations displayed the highest degree of Bottom-up structure (4.8). Finnish organizations (FI) achieved 3.9, the U.K. organizations got 3.5, and the Greek (GR) achieved 3.3. The results show that organizations in Denmark tend to have Bottom-up structure and organizations in Greece tend to follow a Top-down approach.

4.3.3. The fit between the national and organizational culture

As an example, Siakas (2002) demonstrates the value of a self-assessment. If an organization is situated in a culture, having low Power Distance and low Uncertainty Avoidance, it will be classified as Democratic. A flexible software quality system is predicted because the national culture requires participative organizational structure and flexible rules. Organization needs a change in order to introduce a SQM system and it will be accepted only if decision-making is participative. If organization is classified as Bottom-up, then there will be a fit between national and organizational culture. If there is no fit, a deeper investigation is needed, in order to find out what changes are needed to organizational structure or other issues like processes (SPI), responsibilities and motivation.

5. SOFTWARE PROCESSES IN CULTURAL CONTEXT

Huang & Trauth (2007) argue that cultural factors are particularly important in software and information systems development because they influence global virtual teams. Processes in software information systems development are complexly interdependent and iterative. Software products are less tangible (=concrete), and knowledge involved in software development is very tacit (=implicit, indirect, assumed) and fast changing in nature. The uncertainty in software development process requires lots of communication, both formal and informal (ad hoc). A lot of activities addressed in software engineering processes are culturally sensitive, i.e. they are carried out by individuals that come from different cultural backgrounds. Example activities, that can be found in SPICE standard, such as joint activities between customer and supplier, change requests, problem resolution, reporting errors, testing, code reviews, audits, configuration management, team management, risk identification, giving feedback, identifying responsibilities etc. can be carried out in different ways depending on the cultural context. Software development processes involve not only technical skills, but also soft skills through human resources that perform those processes. Furthermore the complex human interaction in software engineering projects can be expressed using *Triple C Model: Communication, Cooperation and Coordination*. Communication involves information exchange; cooperation is concerned with getting with the group; coordination is about efficiency, it could be compared to coordination of our legs and arms in motion (citation Denise, L.). Figure 5.1. illustrates SE process and human aspects through integrated CCC-model.

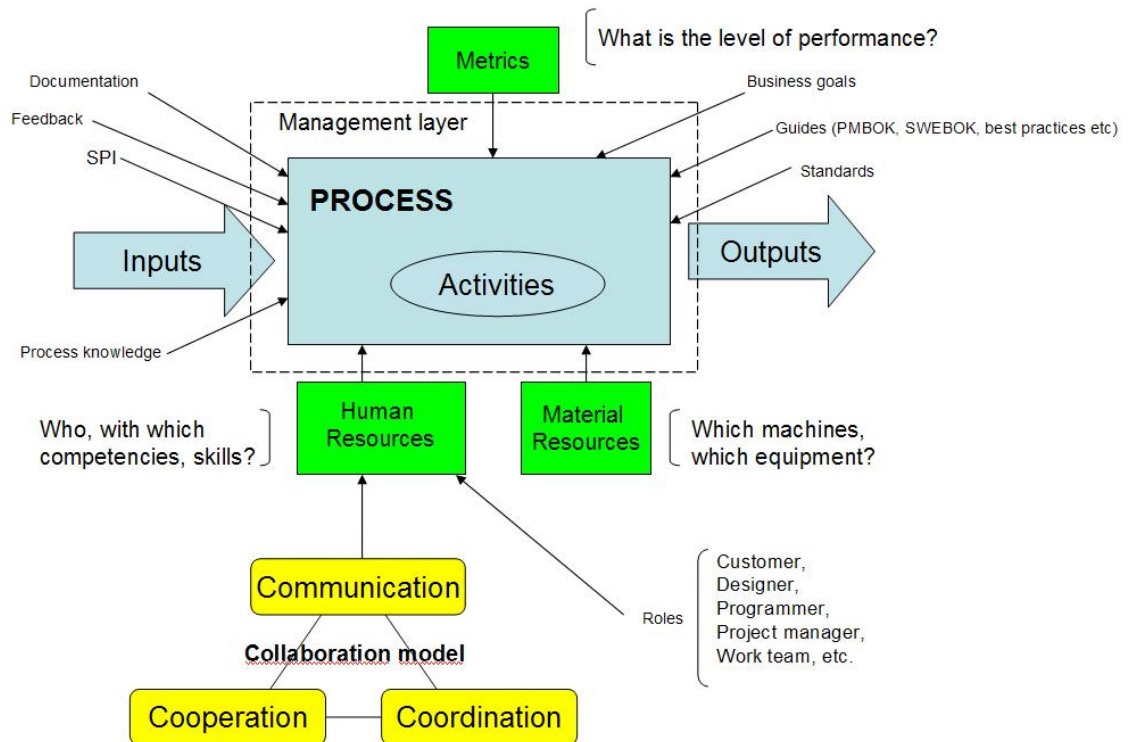


Figure 5.1. Some SE process elements and human aspects (partial adoption from ISO/IEC 12207-2008 process description).

Software development involves lots of collaborating activities and these activities rely on effectiveness and quality of communication channels because miscommunication between client and a vendor might cause the failure of the development initiative. Also social and inter-personal aspects among software team members play a major role in software development. In other words communication in software projects is about exchanging messages and negotiating; coordination is about managing people, their activities and resources; cooperation is about working together in a shared workspace. These activities are also the main source of problems in global organizations.

According to ISO 9001 standard a process is set of activities that transform inputs into outputs. Cultural sensitivity in SE processes is understood in ways how process outcomes or internal process functions change when SE process is executed by people coming from different cultural backgrounds. Software engineering standards define *What* needs to be done or achieved, the interpretation of *How* it could be achieved depends on the management layer and people that execute processes and this is where they shape uniquely the outcomes of the processes due to their different ways of thinking and doing things.

5.1. CSAM framework

As the outcome of this thesis, a CSAM (*Cultural Sensitivity Assessment Model*) framework for evaluating culturally sensitive SE processes is proposed. The idea of the CSAM framework was developed during the STEP project (section 1.1). The same type of framework was used in the work of Karttunen (2010). Karttunen (2010) has been evaluating cultural sensitivity of Information Technology Infrastructure Library (ITIL) processes.

The purpose of the CSAM framework is to serve as a tool for global organizations, enabling them to evaluate each SE process against Hofstede cultural dimensions. After discovering culturally sensitive processes that need more attention, organizations can identify possible risks, take preventive steps, improve processes or take other actions with the goal of increasing trust among team members, improving communications, achieving efficiency. By evaluating cultural differences, the global organization emphasizes not only on employees, but also on clients in global markets that have different cultural backgrounds.

The general culture sensitivity evaluation of SE processes will be introduced later in this chapter. The reader has to keep in mind that cultural sensitivity of processes defined in this thesis is not absolute. This is the generalization of the facts collected from various sources found in the literature and also author's own view. Each global company should make own assessment and filter cultural factors in their own cultural context.

The list of SE processes, used in CSAM framework, is taken from ISO/IEC 15504-5:2005 standard. The same processes were used in questionnaires, conducted in four global software development firms. It is not the full list of SE processes that could be found in ISO/IEC 15504 (2005) standard. The example processes that were used in this framework were selected by the author, using author's own view of mostly culturally sensitive SE processes that might require more attention.

Each SE process is evaluated against five Hofstede culture dimensions and given a grade between zero and five. Grade zero means that a process is not culturally sensitive, and grade five means that the process is very culturally sensitive and a lot of attention must be paid to it concerning cultural issues. Table 5.1. includes a list of some standard ISO/IEC 15504 (2005) i.e. SPICE processes and cultural evaluation, based on author's own point of view. The illustrations on cultural differences have been collected from the following literature: Huang & Trauth (2007), Borchers (2003), Kruchten (2004), Prikladnicki et al. (2004) and Abraham (2009).

Table 5.1. Cultural sensitivity in SE processes (ISO/IEC 15504-5, 2005)

	Cultural sensitivity					Hofstede dimensions					
	0	1	2	3	4	5	PDI	UAI	IDV	MAS	LTO
Engineering process group											
Requirements elicitation						X	X	X	X	X	X
System requirements analysis				X			X	X			
System architectural design				X			X	X	X		
Software requirements analysis				X			X	X			
Software design				X			X	X	X		
Software construction					X		X	X	X	X	
Software integration			X				X		X		
Software testing			X					X	X		
System integration			X				X		X		
System testing			X					X	X		
Operation process group											
Customer support					X		X		X	X	X
Management process group											
Organizational management			X				X			X	X
Project management					X		X	X	X		X
Quality management				X			X		X		
Process improvement process group											
Process establishment											
Process assessment											
Process improvement			X				X				X
Resource and infrastructure process group											
Human resource management				X			X	X	X	X	
Training		X									X
Knowledge management		X									X
Support process group											
Joint review			X				X	X			
Audit			X				X		X		
Documentation		X						X			
Change request management			X				X	X			

Engineering process group: SE process that is mostly culturally sensitive in *Engineering process group* is *Requirements elicitation*. The outcomes of this process determine the success or failure of the software project. The elicitation process requires lots of communication between vendor and the customer. This is the process where knowing customer cultural differences gives a competitive advantage.

SPICE standard defines the purpose of *Requirements elicitation* process as “gathering, processing and tracking customer requirements throughout the lifetime of the product”. All of the above activities are culturally sensitive. Requirement gathering means the communication with the customer, as states in one of the process outcomes: “continuing communication with the customer is established”. Other process outcome states that a change mechanism for the requirements should be established, and the base practice ENG.1.BP2 states that it should be ensured that customer requirements should be understood both by supplier and the customer in the same way. Base practice ENG.1.BP3 states that the requirements should be agreed upon. Communication examples can be found later in this chapter in a paragraph *Communication*. The cultural dependence on other activities can be illustrated as follows.

Understanding customer expectations is the critical part of software project. According to SPICE it has to be ensured that customer and the supplier understand the requirements in the same way. If the supplier and the customer come from very different cultural backgrounds, it is hard to make sure that customer expectations will be understood very well. This problem in GSD companies is solved in the way that the requirements engineering is done by the company that knows the customer very well (their cultures are close or same) and the coding and testing parts are done in offshore organizations.

High Power Distance index (PDI) contributes towards hierarchical and bureaucratic forms of decision making and communication processes. For instance, in Thailand decision making takes longer, as every stage has to be reported to management for final decisions. The person’s position in hierarchy might appear to be more important than technical issues. High PDI together with high Uncertainty Avoidance Index (UAI) of Japanese culture tend to slow the decision making process and this can be helpful in projects that require more deliberate (=planned, calculated) software processes. High PDI with high UAI also causes for Japanese teams to “seek for approval before acting” more often than might be the case in other teams. Indian teams with high PDI are at risk of being “jerked around” by changing requirements. If a project leader makes a statement such as “wouldn’t it be nice if a software could do X”. Indian team’s reaction might be to implement that feature before next meeting.

UAI deals with tolerance for ambiguity and uncertainty. Indians (low UAI) work with understanding that there will be frequent requirement changes. They also accept ambiguous statements and implicit understanding of concepts. Japanese (high UAI), on the other hand, being very structured and organized teams, finalize the requirements after a longer and thorough requirements analysis phase.

Individualism vs. collectivism could be illustrated in customer vendor relationships. People coming from collectivistic cultures (India, China) want to build strong social relationships. People that come from individualistic cultures (USA) might see it as too much time spent on building unnecessary relationships, and collectivistic people might think that individualistic people do not wish to settle with the group. In the initial phases

of software development it is necessary to be aware of each others cultural differences what helps in building trust among the parties.

Masculinity vs. femininity could be observed in a situation where the client experience difficulties to trust the vendor representative because of his/her gender or position in organization.

Long-Term Orientation versus Short-Term Orientation dimension is about investing long into the future versus goal to get fast results. One of the theoretical conflicts may arise if client is of Short-Term oriented culture and vendor comes from Long-Term oriented culture. As the client would like to see some results very fast, the vendor might feel that the deadlines are too tight, because vendor would like to take more time on understanding, agreeing and prioritizing user requirements rather than starting with coding right away.

System requirements analysis: according to SPICE standard the purpose of *System requirements analysis* is to transform the user requirements into system technical requirements. The possible culture conflicts may arise in base practices ENG.2 BP3 (analyzing and prioritizing requirements for correctness, completeness, etc.), ENG.2 BP4 (evaluating proposed changes and new requirements for cost, schedule risk, etc.), and ENG.2 BP6 (communicating system requirements to all parties who will be using them). In BP3 activities such as prioritizing and analyzing requirements for correctness might be culturally sensitive. Prioritizing might be prone to hierarchy and prolonged decision making (high PDI), analyzing requirements for correctness might be very important in cultures that tolerate high ambiguity levels (low UAI). For instance Indian software developers might not give a second thought about the correctness and consistency of requirements because they take the text quite literally. Recognized cases exist when Finnish colleagues had to double check the work of Indian colleagues for inconsistency. To get in-depth view on Indian culture, the reader is referred to MSc thesis of Harjamäki & Kostin-Harjamäki (2011).

BP4 is concerned with which changes and new requirements should be taken into upcoming release, and which should be postponed for later releases. In cultures with high PDI software developers might be tempted to be willing to implement too many changes, just to keep their boss happy. In cultures with low PDI developers see the situation more realistically and postpone some features, because they want to implement the features with highest priority and they also wish to have enough time for testing them.

BP6 is concerned with communicating system requirements among those that will be using them. The problems with communication are discussed in a separate paragraph in this chapter.

System architectural design: the purpose of *System architectural design* is to identify which system requirements should be allocated to which elements of the system. Three base practices indicate connection to cultural differences. ENG.3.BP1

(describing system architecture), BP5 (evaluating alternative system architectures), and BP7 (communicating system architecture design). There are three cultural dimensions (UAI, IDV and PDI) that might strongly impact the outcomes of these base practices. Individualistic cultures with low PDI have the potential of innovation as opposed to collectivistic cultures with high PDI. Indian software professionals are technologically wise very strong, but lack inability to come up of creative design options. Indians follow precise instructions. This is due to curriculum in India, which promotes learning and doing by the book. Western education involves assignments, use of references, practical experiments i.e. experiential learning and working compared to theory based education in India.

Teams with high UAI (such as Japan) remove uncertainty through iterative design, consensus reaching, and consideration for all possibilities. Teams with low UAI (USA) relieve natural tension through prototyping. This is a case where desire to avoid uncertainty works together with desire to get started.

Documentation is an important part of system design. Cultures with high UAI, such as Japan or Anglo-Saxon cultures, provide and expect clear and precise documentation. For American or Indian teams the documentation is only a necessary exercise.

Software requirements analysis: the purpose of *Software requirements analysis* process is to establish the requirements of the software elements of the system. The cultural sensitivity of this process is similar to that of *System requirements analysis*. Activities such as defining and prioritizing functional and non-functional requirements of the software elements could be prolonged due to high PDI (high hierarchy and bureaucracy); documenting software requirements could be associated with UAI, where cultures with high UAI tend to document with more precision and detail whereas countries with lower UAI feel that documentation is only a necessary exercise. Activities like analyzing software requirements for correctness, completeness, consistency, etc. might need to be double-checked in cultures that can tolerate high ambiguity levels (example of Indian developers discussed in the process of *System requirements analysis*). Activities of evaluating the impact of proposed changes for cost and schedule, and approving or rejecting changes could be associated with PDI dimension. In low PDI cultures the tendency is to be more realistic, postponing changes to following releases, in order to have more time to testing; on the other hand in cultures with high PDI there is a tendency of making superior happy and not being able to say 'No', which leads to implementing new features till the very last moments before release and shipping to the customer a poorly tested release version. Furthermore, base practices BP5 and BP6 are concerned with the communication with the customer and communicating updated requirements to all parties that will be using them.

Software design: the purpose of the *Software design* process is to provide a design for software that implement and can be verified against the requirements. Similar cultural issues concerning this process can be found in process of *System architectural*

design. Activities of establishing consistency between software requirements and software design might need more attention in cultures with low UAI (India). BP1 states that when describing software architecture, alternative software architectures should be evaluated. In countries with low PDI and high IDV teams are more innovative and can come up with creative designs, on the other hand in cultures with high PDI and low IDV teams are only following the rules and have little or none creativity. The software design process also consists of documenting activities, which includes specifying software units and interfaces. As discussed earlier, documentation could be associated with UAI and a need for precise and detailed documentation to achieve understanding versus seeing documentation as a necessary exercise.

Software construction: the purpose of the *Software construction* process is to produce executable software units that properly reflect the software design. Culturally sensitive activities in this process are developing unit test cases, developing and documenting executable code and performing code reviews. Unit test case development might be a subject to UAI and tolerating ambiguity where developed test cases might lack completeness and correctness. Code development might be associated with PDI and IDV dimensions. IDV dimension describes the type of working teams. Team members, representing high IDV cultures, are seen as individuals and they are expected to take care of themselves and make their own decisions. In collectivistic societies team members develop strong inter-relationships and expect their bosses to make decisions. In collectivistic societies, developers expect tasks to be precisely defined. For instance, Indian developer finds it difficult to move on and make his own decisions if tasks are not defined in detail (high PDI). Also due to collectivistic culture in India, the transparency of the progress in software development is hard to achieve. The praise is other issue that has to be considered carefully in multicultural teams. In cultures with low PDI and high IDV (example U.S.) public praise is viewed positively if developer is performing well. On the contrary, in collectivistic countries, such as Japan and India, a public praise might be seen as disturbing.

Due to inability to say “No” (high PDI) to the customer and superiors, Indian developers try to implement as many features to the software before the delivery as they can (considering little about the cost and schedule). This results in situation where poorly tested software is delivered to the client.

The impacts of MAS dimension cannot be recognized in certain code development activities, but the impacts of MAS dimension could be inspected in software development activity as a whole. Masculinity dimension is about the distribution of values between the genders. In feministic societies (i.e. Nordic countries, Spain) the workers are balancing between work and family, whereas in masculine societies (i.e. India, Japan, German speaking countries) work prevails over families and thus people tend to work longer hours. Masculine societies show ambition in completing tasks and meeting deadlines, they can work under unpleasant conditions. They “Live to Work”. More feministic societies prefer quality atmosphere in working place and they “Work to

Live”. Thus software developers in masculine cultures tend to work long hours and they are achievement oriented. If achievement oriented software developers work together with developers who have more of a quality of life orientation (Feminine culture), a frustration based on greater expectation for urgency might emerge.

Code development activity includes lots of informal communication (even this is not exclusively stated in SPICE standard). Informal communication activities might include consulting a colleague while trying to solve some issue.

Software integration: the purpose of *Software integration* process is to combine the software units, producing integrated software items. The main activities in this process are developing software integration strategy, developing tests for integrated items, integrating software items and testing integrated software items. Other culturally sensitive activities, like ensuring consistency and documentation, have been discussed in previous processes.

There are bigger complications in software integration process if software project is distributed globally and globally distributed teams work on different parts of the software. The biggest problem that arises in software integration is the responsibility issue on integrated software units. In task oriented cultures (might be due to high PDI) the responsibility is valid as long as the task is being executed. Taking responsibility vanishes upon the task completion (for instance in Indian culture). This might cause the situation where more error prone code is being developed because after task completion the piece of code is in somebody else’s responsibility. The responsibility issue might be a question of IDV dimension. In collectivistic societies the responsibility is in team’s hands, and in more individualistic societies the individual takes responsibilities. Other problem area in integration is the amount of communication in GSD. Developing software modules might not necessarily cross cultural boundaries, but integrating them certainly crosses those boundaries and then the team’s ability to communicate with other multicultural teams is being put into test.

Software testing: the purpose of the *Software testing* process is to confirm that integrated software product meets its defined requirements. The activities in this process are developing tests and testing integrated software product. Documentation includes recording test results and updating user’s documentation.

Two cultural dimensions are to blame why software testing is so different in different cultures. In India (low UAI) the test cases are prepared strictly by the requirements. They tend to look it from a pure software development angle and not from a domain perspective. The test cases might lack completeness and correctness. Other UAI impact can be seen in error fixing: Indian and American teams (low UAI) are comfortable knowing only that “bug fixing would continue until the product shipped”. Japanese teams on the other hand (high UAI) request for estimates “exactly when will each of the bugs be fixed”. The IDV dimension has an impact on roles and responsibilities in testing and error fixing. Western counterparts like clear distinction in

roles and responsibilities. They might say in response “sorry, this is not my module, and therefore not my responsibility”. They also take ownership of the issues that are their own. Indian teams tend to fix each other’s bugs (due to collectivistic culture), which impacts negatively the overall progress of the project. Indian developers also have difficulties in taking ownership of issues.

System integration: the purpose of the *System integration* process is to integrate the system elements to produce a complete system that will satisfy the system design and the system requirements. The activities in system integration involve developing system integration strategies, integrating system elements and testing system elements. The cultural sensitivity of this process is very similar to that of *Software integration* process. It is about taking responsibilities and amounts of communication. In high IDV cultures software developers take ownership of the issues that are their own, in collectivistic societies it is in group’s responsibility. The communication problems were shortly discussed in *Software integration* process and testing issues were discussed in *Software testing* process. Documentation was discussed in previous processes and communication is discussed in the separate paragraph in this chapter.

System testing: the purpose of the *System testing* process is to ensure that the implementation of each system requirement is tested for compliance and that the system is ready for delivery. The activities involved in this process are developing tests for system, testing integrated system, recording the results and communicating system test results to all parties. The activity of developing tests is sensitive to UAI dimension and tolerating high levels of ambiguity (the test cases might lack correctness and completeness). Ways of testing in different cultures was discussed in *Software testing* process.

Engineering Process Group includes two processes that are very culturally sensitive and they need a lot of attention. These processes are *Requirements elicitation* and *Software construction*. *Requirements elicitation* needs a lot of communication with the customer and therefore the knowledge about the customer’s cultural background could be vital. The *Software construction* phase is impacted by at least four Hofstede cultural dimensions, and therefore a thorough process examination needs to be performed in order to avoid possible cultural clashes.

The impact of LTO dimension on *Engineering Process Group* is hard to recognize due to the short life cycle of software products.

Operation process group: the purpose of *Customer Support* process is to establish and maintain an acceptable level of service through assistance and consultation to the customer to support the use of the product. The activities involved in this process are establishing product support, meeting support needs, determining customer satisfaction with the product and the service, and communicating customer satisfaction. The

Customer support process is highly culturally sensitive because it involves a lot of communication with the customer, and therefore in order to understand customer expectations in receiving service, customer cultural differences need to be understood. This process has impacts of at least four Hofstede cultural dimensions, i.e. MAS, IDV, PDI and LTO. Establishing service support might cause a problem in customer support, if only one, “universal”, customer service model is used. For instance, in countries like Spain and Italy, customers might like to take longer phone calls and want more personalized conversations. They do not value speed and efficiency critically. On the other hand, in countries like Germany or UK, people value efficiency and speed, and therefore the service provider is expected to act quickly to solve the problem.

MAS and IDV dimensions might be used to explain how different cultures can tolerate negative incidents. For instance, Americans are highly individualistic, which means that self-interest and achievement is put above everything, and because of high masculinity they are assertive and idealistic. In case of negative accident Americans complain a lot and they expect that complaints will lead to service improvements. People coming from collectivistic societies do not complain even services do not meet expectations. This is due to own face saving and saving the face of other’s.

In cultures with high PDI the stress is on hierarchy and rigid communication styles. The problem may arise if customer takes high position in hierarchy and at the service provider end the employee is of low rank. In this situation the customer expects to communicate with the person that is of high rank at the service provider’s end. The opposite case, where client is of low PDI culture and service provider of High PDI culture, also causes a problem because in high PDI cultures decision making process is prolonged and the customer might feel frustrated, when problem fixing takes longer than he expected.

LTO dimension is about investing into the future versus achieving fast results. In high LTO cultures customers might be more loyal, once the trust is established.

Above examples illustrate how important it is to understand customer’s expectations and different customer service models need to be established in order to meet customer’s support needs.

Some cultural difference impacts on customer support process were loaned from Becker article, 2000.

Management process group: the purpose of the *Organization management* process is to establish and perform software management practices that provide software products and services and are consistent with the business goals of the organization. Base practices include activities like identifying and providing management infrastructure; identifying, implementing, performing and evaluating the effectiveness of management practices and providing support for adoption of best practices. Two Hofstede cultural dimensions have a direct impact on *Organization management* process, i.e. PDI and LTO. Management infrastructure may include organizational roles and responsibilities, decision-making system, communication mechanisms, and

planning and monitoring business operations. Decision-making is sensitive to PDI, planning and monitoring business operations is sensitive to LTO (are fast results important versus organization's attention to investment into the future), roles and responsibilities also refer to PDI and little to MAS (well-being of employees). Identifying software management practices is again prone to PDI and LTO. In cultures with high PDI identifying software management practices might be carried out by management because subordinates have difficulties with giving feedback. Identifying and evaluating the effectiveness of software management practices is impacted by organization's orientation on long-term versus short term. Organizations that are short-term oriented will not necessarily identify and implement practices that do not bring immediate results.

Project management: the purpose of the *Project management* process is to identify, establish and monitor the activities, tasks, and resources necessary for a project to produce a product, in the context of the project's requirements. There are fifteen base practices defined in this process, among which defining project cycle, estimating project attributes, defining project activities and tasks, defining knowledge and skills, allocating responsibilities, reporting and reviewing current status, and documenting are influenced by cultural dimensions. Selecting a life cycle is impacted by UAI, where in high UAI cultures teams avoid uncertainty for instance by choosing incremental development. In low UAI cultures prototyping could be used. Evaluating feasibility of achieving the goals of the project with available resources might be influenced by PDI dimension, where in cultures with high PDI the tendency is to promise too much because of inability to say "No" to the client. Estimating project attributes might be prone to LTO dimension because determining business goals for the project might depend on the organization's orientation in long-term versus short-term. If organization is long-term oriented, then it might be possible to run a project that does not necessarily bring fast results, as opposed to short-term oriented organizations, where results are being checked every quarter and unprofitable project might be rejected. Other project attributes, such as effort and schedule might depend on skills and knowledge of the software developers. In India there is a high turnover rate of the employees, which means that team members might change frequently. It is said that two Indian developers are equal to one Finnish developer (Helsingin Sanomat, 2010). For the cultural influence on project quality, the reader is referred to Siakas CODES model in sections 4.3, 4.3.1 and 4.3.2. Employee turnover could be considered in project risk estimation. Employee loyalty is hard to estimate through cultural dimensions. It might be due to higher levels of UAI. For instance, in Japan and Finland employees are quite loyal or very loyal, whereas in India with low UAI, employee turnover is very high. The turnover might be explained in other terms than culture. The phenomenon of high turnover rates is seen in *emerging cultures* where the gap between the attainable level and the current level of welfare is larger than in *mature cultures* or countries. In such cases there are foreign companies offering attractive job positions and better salaries, and therefore motivation to switch to other working place is higher.

The activity of identifying knowledge and skills for the project requires cultural knowledge to be taken into account in GSD. The more knowledge on cultural differences team members entail, the better is the project success. The activities of allocating responsibilities and ensuring that commitments are understood and accepted are influenced by IDV and PDI dimensions. IDV is about individual responsibilities (high IDV) versus responsibilities of a team (collectivistic societies). In case of high PDI cultures, the employee might encounter difficulties to accept tasks, assigned to him, that are not defined in detail.

The activities of reporting and reviewing current status of the project are prone to communication, discussed in later sections.

Quality management: the purpose of the *Quality management* process is to achieve customer satisfaction by monitoring the quality of the products and services, at the organizational and project level. The activities include establishing quality goals, defining strategy and quality criteria, establishing quality management system, collecting feedback and monitoring the performance of quality. BP1: *Establishing quality goals:* there are three view points of quality: organizational goals, project goals and customer expectations in quality. Customer expectations can vary from culture to culture. The situation is similar to that of process of *Customer support*. In cultures with low IDV customers might accept products of lower quality (where saving face of other's is important), as opposed to cultures of high IDV (where saving one's face is important and therefore using quality products are part of self-image).

The activity of establishing quality management system is highly connected to the work of Siakas (2000, 2002) on Software Quality Management systems, and therefore the reader is referred to section 4.3 of this thesis.

The activity of collecting feedback from the customer and personnel for verifying continuous improvement in quality might be challenging, if customer or employees are experiencing difficulties in giving negative feedback due to low IDV and high PDI. In this case using a third party might prove useful, because it saves the client or employee from "breaking the bad news" face-to-face.

Process Improvement Process Group: *Process establishment* and *Process assessment* processes will be omitted with regard to this MSc thesis due to the lack of data and related studies on the subject.

The purpose of the *Process improvement* process is to continually improve the organization's efficiency through the processes. The focus is on the establishing commitment, identifying issues, prioritizing improvements, planning and implementing process changes; and evaluating and communicating results of improvement.

The hypothetical impact of LTO dimension on *Process improvement* could be inspected through commitment to SPI. The cultures of high LTO score might be more committed to SPI because they do not expect immediate results, but rather invest to build up strong market positions. In short-term oriented cultures the importance is paid

to the results of the past month, quarter or past year, and therefore so short time interval might not necessarily bring immediate results on SPI.

Identifying issues and prioritizing improvements might be the subject to PDI. In cultures with high PDI the subordinates might not necessarily take part in SPI projects because it is the task of the management. This might cause the attitude problem in subordinates to accept the changes in processes.

For more issues on organizational culture perspective and effective SPI initiatives the reader is referred to section 4.3 (Moitra, 2005). On the national culture issues in accordance to the SPI the reader is referred to sections 4.3, 4.3.1 and 4.3.2 (Siakas, 2000 & 2002).

Resource and Infrastructure Process Group: the purpose of *Human resource management* process is to provide organization and projects with individuals that possess skills and knowledge to perform their roles effectively and work together as a cohesive group. The activities in this process combine identifying needed skills and competencies, recruiting qualified staff, developing staff skills and competencies, defining the structure and operating rules for the teams, empowering projects teams, evaluating staff performance, providing feedback on team performance, and maintaining staff records. Globally operating organizations need staff to be aware of cultural differences, especially the management side. Therefore in staff recruitment this point should be taken into account. In defining team structure and operation different team member backgrounds need to be taken into consideration. Team members might have different attitudes towards hierarchy (PDI), different expectations on integrating into groups versus loose ties between individuals (IDV), uncertainty avoiding individuals might be intolerant for difference in opinions (UAI), in feministic cultures people work to live versus masculine cultures, where people live to work.

In globally distributed teams the mechanisms for effective communication must be chosen carefully because these teams suffer from the lack of informal communication and the lack of trust due to insufficient face-to-face communication. More information on different types of trust from culture perspective can be found in Aramo-Immonen et al (2011).

Evaluating staff performance in globally distributed and multicultural teams is an important activity. The feedback from team members must be collected and discussed. The team members that have difficulties with speaking up must be encouraged to develop assertiveness because their colleagues that use direct communication style might find them lacking confidence or lacking technical skills.

Training: the purpose of the *Training* process is to provide organization and the project with individuals that possess the needed skills and knowledge to perform their roles effectively. The activities include developing a strategy for training, identifying training needs, training personnel, maintaining training records, and evaluating the effectiveness of training.

The activity of developing a training strategy is impacted by LTO cultural dimension. The organizations that are long-term oriented might be more committed and willing to invest in training activity. Organizations that are short-term oriented might see the training as activity that does not bring immediate results and therefore unwilling to invest in training.

While identifying the needs for training, a multicultural organization must recognize the need for cultural training and must provide it. During the cultural training the team members would learn about cultural backgrounds of their colleagues and would understand better their ways of doing things. Cultural training would also help in building trust among team members and prevent miscommunication.

Knowledge management: the purpose of the *Knowledge management* process is to ensure that individual knowledge, information and skills are collected, shared, reused and improved throughout the organization. Activities include establishing and maintaining knowledge management infrastructure for identifying and exchanging knowledge assets, creating the network of knowledge contributors, developing knowledge management strategy, capturing knowledge, and disseminating and improving knowledge assets. The activity of knowledge exchange might face difficulties in sense that employees might be not willing to cooperate in knowledge exchange due to the fear of losing the working place because after the knowledge transfer the individual status changes to replaceable. Knowledge sharing is complicated in distributed and multicultural environments in the way that there exists a lot of dependency on written documentation. One more difficulty to be faced in multicultural environments is in the way people exchange messages: low context cultures versus high context cultures. In high context cultures a lot of things in a message are left unsaid and are assumed to be understood by the in-group. In low context cultures the messages have to be more explicit, including lots of details.

As explained in previous process of *Training*, developing a strategy (in this case a knowledge management strategy) depends on LTO dimension.

Supporting Process Group: the purpose of *Joint review* process is to maintain a common understanding with the stakeholders of the progress of the project. Joint reviews are at both project management and technical levels and are held throughout the life of the project. Activities include identifying, preparing for, and conducting joint reviews, distributing the results, determining actions for review results, and tracing actions for review results.

During the schedule identification, the monochronic and polychronic cultures should be considered. Swiss and German are particular about time, while for Indians specifying time means specifying a time period. This means that Indians will usually show up late for the meetings. This is understood as a rude gesture by many. An Anglo-Saxon colleague is more likely to show up 5 minutes prior to the meeting than 5 minutes later. If they are delayed, they would inform by calling or sending a quick mail.

The Swiss are very precise in timekeeping. The problems might arise also when monochronic and polychronic people (section 3.1.3) tend to end up a meeting. M-time people tend to end up a meeting at a scheduled end-time, P-time people tend to end up when the conversation runs out of steam and rarely at the scheduled end time. When working together, P-people may think that meeting ends up abruptly, before they had a chance to say their opinion. On the other hand, M-people may think that polychronic meetings are ineffective.

In participant identification, PDI could be considered. In high PDI cultures, subordinates might encounter difficulty to speak up in the presence of managers. Other fact has to be taken into consideration in high PDI cultures: the persons that will make important decisions will not be necessarily the same that took part in the meetings. These persons are only for delivering messages further up in hierarchy.

While preparing for joint reviews, it would be wise to consider how much of information is needed to be presented. People coming from cultures with relatively high score in UAI might need detailed information and they also expect others to be well prepared for the reviews (for instance Anglo-Saxon cultures). In low UAI cultures outlined information might be enough.

For conducting joint reviews the reader is referred to Lewis (2006) book where communication ways of more than sixty countries are described.

Audit: the purpose of *Audit* process is to determine compliance of selected products and processes with the requirements, plans and agreements. The activities include developing and implementing audit strategy, performing audit, preparing and distributing audit report, and taking corrective actions. Activities like performing audit and preparing audit report might be impacted by IDV dimension. In collectivistic cultures saving face of others is important and therefore the transparency of the audit results might be in question. Also IDV dimension plays the role in taking corrective actions. In high IDV cultures the responsibility is assigned to the person and in collectivistic cultures the responsibility is most likely assigned to the group.

PDI dimension influences the length of command chain. In high PDI cultures the command chain will be longer, passing by several managers. On the contrary, in low PDI cultures the command chain will be very short.

Documentation: the purpose of *Documentation* process is to develop and maintain the recorded information produced by a process. The activities include developing documentation management strategy, establishing standards for documents, specifying document requirements, identifying documents to be produced, developing, distributing, and maintaining documents.

The main focus in the analysis of *Documentation* process is the amount and the contents of documentation. The amount and the contents both are impacted by UAI dimension. In societies that strongly avoid uncertainty there is a need for rules, laws and structure. This might lead to higher amounts in documentation and the contents of documentation to be very precise and in detail. In the countries with low UAI there is an

emotional horror of formal rules. In such countries people think that rules could be established only in absolute necessity. Therefore only the documentation that is absolutely necessary might be produced, with less precise contents.

Change request management: the purpose of the *Change request management* process is to ensure that change requests are managed, tracked and controlled. The activities include developing a change management strategy, recording requests for change, assessing the impacts of change, approving and implementing changes, and reviewing the implemented changes.

In high uncertainty avoiding cultures (for instance Japan) the team members might be unwilling to introduce and implement changes to software. They spend a lot of time in the initial stages of the software project in carefully planning and designing a software product, and introducing a change in software product means re-planning and re-designing. In the countries with relatively low UAI (for instance India) software engineers expect that there will be lots of changes and they accept it. High PDI results in subordinates being unable to refuse the manager's orders.

Some additional information on communication, behavioral styles and turnover rates can be found in the next paragraphs:

Communication: Japanese and Germans tend to talk to the point, but Indian is more likely to be vague and less precise. Westerners greet everyone and make direct eye contact with whom they speak. Indians avoid direct eye contact and greet only those whom they know well (high PDI) and this confuses non-Indian counterparts. A German colleague observed, that Indian Colleagues come in the morning and say "Do this, do that", but no "Hi, how are you!". Not greeting is understood as rude and impolite. This creates distrust among colleagues and impacts the work. Indians nod their head to confirm understanding, but it is hard to tell if nodding means "Yes" or "No". A mumbling "Yes" rather than a strong "Yes" is received to confirm that they understood the explanation. It is hard for an Indian to be direct in business dealing. Indians do not want to offend others by saying "No, I do not understand" and they are afraid that the client might think they have not listened carefully enough. The rule in India is "in private, appreciate in public". Indians find it hard to confront others due to high PDI. They obey authority without asking too many questions. If a German says "I do not understand", it means he needs more explanation. German colleagues found it frustrating that after explaining a new concept to Indian colleagues and afterwards asking if colleagues understood, the response from Indian was a background discussion instead of openly addressed clarifications. Germans felt that Indians did not understand but would not acknowledge it. The language and accent are also very important in communication. North Americans tend to speak slowly, while British speak very fast. Indian English is also very unique: pronunciation differs depending on the region they come from. In general Indians tend to speak heavily accented English very fast and it is difficult for foreigners to follow conversations. It is critical in training or telephone

sessions. Indians also tend to invent new words to suit their work: ‘Updation’, ‘Inputted’, ‘prepone’ a meeting, etc. Call centers provide extensive training to improve this issue, but in software houses this issue is still to be taken up actively. In addition to inefficiency in English language, Chinese IT developers have introverted type of personality and this attributes to unwillingness to speak up. Avoiding conflict and maintaining harmony are the values taught in Confucian school. The indirectness and quiet demeanor of Chinese team members might be seen as lack of confidence and lack of technical capability by their American counterparts. This has a negative effect in building trust between distributed team members.

Behavioral style: words ‘Please’ and ‘Thank you’ are often missing in Indian’s verbal communication. This does not mean that they are impolite; they are translating literally from their native Indian language and speak the same in English. If a foreigner colleague says ‘Thank you’ to an Indian colleague, the response ‘There are no ‘Thanks’ among friends’ might follow. This means that a friend is trying to make a relationship formal and this upsets Indian counterparts. This reveals strong inter-personal relationships expected and followed by the Indians. The following example illustrates how the difference in masculinity index can cause frustration. Germany ranks as 11th in MAS and India ranks as 28-29th. A German lady questioned an Indian, who was dependant on input from European individual. Instead of responding to German lady, unconsciously, he spoke to the other colleague making eye contact with him. This infuriated the German colleague and was seen as “autocratic, male-chauvinistic” behavior. The Indian colleague was probably unaware that his behavior was received this way. The above circumstances do not have a direct impact on software development, but they do have an indirect impact on client-vendor relationships and contribute to a project’s success.

Turnover rate: there is a huge turnover rate in software industry in India. Indian software developers change their working places frequently, as there are better paying companies that offer better benefits. Multi-national companies establish offshore centers in India with their cutting-edge technologies and this attracts Indian software engineers to ship from one job to another at a more frequent cycle than their Western counterparts. This is in direct contrast to a long established German, American, or Japanese firm where people work in an organization for more than 15 years. The indicator for success for Japanese, for instance, is a pride of working for a well respected organization, and not the salary. A successful career for Indian software professional is work experience in a developed country and in the latest technology. Salary is also an important criterion for an Indian software developer. A key indicator of success for European or American is personal fulfillment and recognition.

5.2. Benefits of CSAM framework

The cultural sensitivity of software processes has been established. What are the next steps?

After discovering culturally sensitive processes that need more attention, organizations can identify possible risks, take preventive steps, improve processes or take other actions with the goal of increasing trust among team members, improving communications, achieving efficiency. By evaluating cultural differences, the global organization emphasizes not only on employees, but also on clients in global markets that have different cultural backgrounds.

Detecting cultural issues in software engineering processes can be beneficial for the organization in at least three areas: in discovering the kind of cultural training that is needed; discovered risks could be considered in strategy planning; and detected cultural issues might raise the need for establishing a knowledge base, that would hold knowledge on various cultural profiles, best practices, etc. and would serve as a tool for teams and management of the organization in preventing and solving cultural problems. By continuously exercising in cultural sensitivity evaluation, maintaining cultural knowledge base, and providing cultural training, the organization would move toward higher levels of cultural maturity, build up cultural competence through intercultural interactions and develop its cultural intelligence, and thus increase the effectiveness in doing business globally.

5.2.1. Knowledge base

Establishing a cultural knowledge base might serve as a tool in dealing with cultural issues. The types of knowledge stored in the base could be basic cultural profiles, cultural issues specifically related to software engineering (for instance, culture sensitive processes and detected cultural problems), and best practices (how the issues were solved). Keeping up such a knowledge base would mean a continuous maintenance, requiring the commitment of team members and management for updating and introducing new knowledge, but it would serve as a powerful tool for managing cultural issues among employees and the clients. For instance, in project planning the cultural knowledge base could serve as a helping hand in task allocation, responsibility assignment, risk identification, and quality assurance. In strategy planning the knowledge base would help to identify problems in competence transfer, or help to make a decision on process distribution among the mother organization and its subsidiaries or offshore companies.

The cultural knowledge base would serve also as a cultural training tool and improve cultural competency of the employees.

Knowledge base could also be established in the form of culture-wiki. During the STEP project, five cultures have been analyzed and results are exhibited in STEP (2011).

5.2.2. Training

After conducting the culture sensitivity assessment and recognizing the culture related problems, cultural training that focuses on the specific cultural issues could be developed. Software processes could be measured before and after the cultural training, in order to assess whether the efficiency of a process has improved, for instance if time taken for a particular process to be completed has shortened (beneficial for SPI).

5.2.3. Strategy planning

In strategy planning the CSAM framework would help to detect problems in competence transfer, especially in knowledge transfer (language barriers, communication, trust and openness). Without the culture sensitivity evaluation now detected risks and problems would stay uncovered and unsolved, resulting in ineffective competence transfer.

The CSAM framework and detection of culture sensitive processes can help in making decision on process distribution. Less culture sensitive processes that require less communication, for instance, could be executed in offshore units and culture sensitive processes could be executed there, where culture competence is sufficient.

5.3. CASE firms

Company A is one of the world's leaders in technology, outsourcing and consulting services field. The company has around 110 000 employees, of which a thousand is located in Finland. Company A has concentrated its business areas in Europe, North America, Asia and the Pacific countries. Overall turnover of 2010 was around 8.5 billion EUR.

Company B is a leader of IT services in Northern Europe. It provides IT and product engineering services. More than 17 000 employees are mainly located in Asia and North-East Europe. Overall turnover in 2010 was around 1.7 billion EUR.

Company C developed and maintained travel management software. Company C provided its software in Finland and other Nordic countries.

Company D provides wide range of technology and business consulting solutions and services. Company D has more than 100 000 employees in over 55 countries. It generated 4.1 billion EUR of annual revenues in 2009-2010.

5.3.1. Questions

The purpose of the questionnaire (Appendix 1) was to find out to what extent globally operating companies are familiar with existing cultural differences in global environments. The respondents were asked general questions about their awareness of cultural differences, communication problems, differences in feedback and decision-making, training, standards and life cycle models. The second part of the questionnaire included *Cultural Sensitivity Assessment Model* and the respondents were asked to

evaluate cultural sensitivity of software engineering processes belonging to ISO 15504:2005 standard.

5.3.2. Answers

The respondents were asked if they are aware of cultural differences and if the respondents are familiar with Hofstede cultural dimensions. All respondents answered positively to familiarity to cultural differences, but only two respondents were familiar with Hofstede cultural dimensions.

The second question was about working in virtual teams and problems in communication, meetings, etc. All respondents (except one) admitted working in virtual teams and encountered difficulties in communication every day. The biggest encountered difficulties were language problems and body language interpretations. The biggest problems were between Finnish and Indian colleagues. Language problems, differences in attitudes towards hierarchy and knowledge sharing, inability to say “No” were everyday struggles.

There were no greater problems detected in the technical side of communication. Companies used email, telephone connections, blanks, extranets, video conferences, etc. to support everyday communication.

The next questions were about differences in communication styles, feedback and decision making. There were no big differences detected in Nordic cultures. On the other hand many differences were encountered in Finnish and Indian cultures. Finns prefer written documentation, Indians prefer verbal communication. In Finland decisions are made in teams, in India decisions are made by managers. Indians are cautious with giving feedback. Due to collectivistic culture, Indians save other’s faces and therefore they are subtle in giving negative feedback. Also colleagues have to be cautious in giving negative feedback to Indian team members.

The answers about the cultural training were alarming. The cultural training was at best one day long. Most of the respondents were of the opinion that the best training is achieved with the experience. It looks like only now the companies have noticed that the cultural differences are the source of arising problems in communication and that there is a need for a proper cultural training.

The next question was about organizational values. Most of the companies replied that organizational values are documented in English language because it is the common language in all departments. Only two respondents confirmed that organizational values have been reviewed in local languages, too.

Companies use ISO, CMMI and ITIL standards, and mostly “waterfall” model as life cycle model is used. One company mentioned using agile methods and agile methods appeared to be desired in the future instead of “waterfall”.

Global companies gain operational efficiency by distributing resources across the globe. The companies were asked a question about software process distribution in their organization. The answer was that the type of distribution depends on the situation. Most of the respondents acknowledged that the client interface is taken care of in

Finland and technical development is shipped to cheaper development countries. In some cases software products were developed completely in Finland, most likely due to unavailable know-how in overseas.

Further on the respondents were asked to analyze standard software processes. The analysis did not reveal any surprises. The company, dealing with Nordic partners, evaluated one software process as value *three* process (*Customer support*), and the rest were culturally sensitive in level *one* and *two*. This is not surprising that Nordic cultures, like Danish, Finnish, Norwegian or Swedish, have close scores in cultural dimensions, and therefore little cultural differences exist. Companies, dealing with India, presented different results. *Customer support* standard process was evaluated as level *five*, where supporter's status, understanding and will to help the client had the most impact on cultural sensitivity. The *Requirements elicitation* process was second most culturally sensitive process, situating at level *four*. The issues impacting on it were clients culture (how much differing from vendor's culture), requirements' precision, and future usage. Third most culturally sensitive standard processes were *Software design*, *Organizational management* and *Project management*, situating at level *three* in scale from one to five. The rest of the standard processes were evaluated as level *one* or *two* processes.

The companies were asked about the usage and helpfulness of the CSAM framework. The respondents admitted that it requires the knowledge of cross-cultural models. The CSAM framework is especially helpful tool for assessing software processes in cases where collaborating cultures experience big differences in cultural indices and therefore there is a bad fit from the collaboration point of view.

5.3.3. Analysis

The respondent companies deal with different cultures. Some of them make a good cultural fit (appear in the vicinity of cultural indices) for collaboration, and other cultures experience big cultural gaps and the cross-culture knowledge is needed for improving relations, communication and trust. Respondents shared their experiences from the Finnish point-of-view and therefore a much wider research, including wider variety of respondents coming from different cultural backgrounds, should be carried out in order to research issues that are experienced in global collaboration.

The cultural sensitivity analysis of standard software engineering processes revealed two processes that are very sensitive to cultural issues, i.e. *Requirements elicitation* and *Customer support*. They include a lot of communication with the customer and understanding customer expectations is of great importance.

The cultural sensitivity of the software processes established in this MSc thesis is not absolute. The sensitivity depends on the way global organization operates, depends on the distribution of the software processes and customer cultural backgrounds. Organizations have to assess cultural sensitivity in their own software processes and make own realizations and considerations.

A conclusion based on the answers of respondents can be made that organizations are just starting to realize the source of the problems that arise in everyday communication. It took several years in some organizations to recognize that people coming from different cultures have different ways of thinking and different working patterns. These differences lead to misunderstandings and lack of trust among team members. Only now the organizations start to recognize the importance of understanding each others cultures and the need to take cultural differences into account, instead of forcing everybody to work by same template. The first step in organization is to give cultural training to the staff. The next step is to consider cultural differences in subsidiaries. During this step standard software processes of the organization could be analyzed and cultural sensitivity evaluated. More culturally sensitive processes need more attention and consideration. Global software companies are using various standards to achieve efficiency and quality in software products. The paradox is that cultural issues are removed from the standards, so that they could be applied all over the globe. But globally operating organizations create the environment were many different cultures collide, and therefore cultural differences need to be taken into consideration.

6. EXAMPLE OF CULTURE ANALYSIS AND WORKING PATTERN

The analysis of two selected cultures is presented in the following sections. China and India cultures were chosen because they form a big cultural gap with the Finnish culture. India especially attracts our attention because it is one of the biggest offshoring countries in the world.

Indian and Chinese culture analyses are taken from Culture-wiki, which has been developed during the STEP project and can be viewed at STEP (2011). Different cultures have been presented and analyzed. Culture analysis includes basic cultural patterns, based on works of Hofstede (2004) and Lewis (2006) and working patterns in ICT field.

6.1. China

6.1.1. China by R. Lewis

Reactive culture: culture, whose people prefer first to listen to the other's position and then react to it before they initiate anything. Such people rarely initiate discussion or action.

China is the world's most populated country and also planet's oldest civilization, formed on Yellow River 5000 years ago. China was an isolated country, which never formed a lasting relationship with distant countries. For two millennia Chinese empire was a universe of its own, sucking in Korea, Vietnam and other neighbors, spreading its culture for many centuries throughout East Asia.

In the "Opium wars" Chinese lost Hong Kong to Britain. France, Germany and Russia soon followed the British and later Japan annexed Taiwan. This explains how Chinese view the foreigners. Foreigners are barbaric, corrupt, disloyal, "devils". But they appreciate the efficiency of British, French and Nordic political systems, American technological progress. But Chinese feel superior in moral and spiritual issues. Chinese criticize Western societies because they see them as declining, decaying, and spiritually disintegrating.

Business culture

In China Confucian principles hold power. Confucian model in corporations or government strongly reminds of family structure. Family is the prototype of the whole

social organization. People are members of a group, not individuals. Stability in society is based on unequal relationships: father - son, older brother - younger brother, male - female, ruler - subject, senior friend - junior friend. Harmony in society is achieved by loyalty to the ruler, strict ethical rules, protection of the weak, and calmness. People stay moderate in all situations. They stay calm and avoid extremes (group member, not individual).

Westerners, who wish to deal with Chinese, should take Confucianism into account. Also there are other several factors that Westerners should take into account:

- Taoism (healthy lifestyle, vegetarianism)
- Buddhism (meditation)
- Ancestor worship (past figures influence present action)
- Feng shui (wind and water; decisions on building and arranging furniture)
- Animal years (giving an individual the qualities of his or her birth animal)

For instance, Chinese might think that you are unlucky if your office has two doors in a straight line (not in accordance with feng shui), but they will not tell you that because courtesy is their feature. They will agree in a compliant manner to your business proposals, especially if you are very keen on making them, just to avoid discordant note (disharmony). They may let you wait in a bus stop half an hour rather than disappoint you with the news that the bus has left just before you arrived.

Collectivism is very strong in China. It is originated from the teachings of Confucius and is not a product of communism. A Chinese person belongs to four basic groups and is to some extent a prisoner: work, family, school and community. They oblige to these groups and this means that Chinese has no geographic or social mobility. Westerners do not understand how much Chinese hands might be tied up if he is to make a decision requiring a sudden change or independence of action. Lack of mobility gives a Chinese of an added problem of losing face. If an American loses face, he can easily move to another working place, but Chinese has to deal with same people, same working place, same academic environment, say for 40 years.

How business culture is affected by Confucian beliefs:

- Large power distance; inequalities are desired and expected
- Powerful people are to protect less powerful and to take care of their careers
- Parents, teachers, bosses must be obeyed
- Wide salary range between the top and the bottom of the organization
- Privileges for managers are popular
- Subordinates expect to be told what to do
- Individualism is a taboo
- Confrontation is avoided; harmony and consensus are the goals
- Long term orientation and terms are advisable

Another aspect of Chinese culture that has ties to business culture is *guanxi*: linking two people in a relationship of mutual dependence. It involves gifts and favors. This can be nice but can be dangerous because the person that receives expensive gift might be

sure to be asked shortly a huge favor. It might comprise a business situation and cause embarrassment to those who are restricted by their companies in the area of discounts, arbitrary pricing, etc.

Consensus is highly valued in China. In companies controlled by state a leadership group will decide policy. In capitalist-style companies leaders are emerging with reputation of competence; also locally elected officials (e.g., mayors), are becoming influential in the business sphere. In Chinese family business, the senior male is the patriarch and follows the usual nepotistic (favoring relatives) structure.

Culture values

Modesty, tolerance, patience, loyalty, family closeness, tradition, patriotism, resistance to corruption, respect for hierarchy, sense of duty, pride (not losing face), friendships, wisdom, hard working, in harmony with each other (good team members).

Concepts

Communication pattern

The Chinese are polite and considerate listeners, but they are more direct than the Japanese. They use polite manners and ask you bluntly how you feel about certain important matters. This helps them not to contradict your opinions. Although they will express any criticism of their partner indirectly, a general pleasant openness helps Westerners feel they know where the conversation is going. Mild flattery is appropriate from both sides.

Listening habits

Nowadays traditional Chinese suspicion of Westerners is gradually changing to more open minded and especially young Chinese try to gain access to American and European modernity. Finns and Swedes are well received in China because of their modest and caring speech styles. However Latins and Americans often talk too much for Chinese tastes, though flexible Italians have great success in establishing their brand names in Beijing and Shanghai.

Behavior at meetings and negotiations

- Meetings are formal, although dressing is comfortable
- Seating is according to hierarchy; business cards are exchanged
- The senior man must be shown great respect, though he has little power; it is the deputy or vice chairman is often a decision maker.
- The meeting is for information gathering; the decisions will be made elsewhere
- The negotiations are slow and usually take too long for Westerners
- Politeness is observed; confrontation and loss of face must be avoided

- Chinese rarely say no, they only give a hint on difficulties
- Decisions have a long-term orientation. The goal of negotiations is to foster relationships and to decide if the people on the other side of the table are suitable partners for the long run
- They consider you as technically competent but otherwise inexperienced in business relations
- They dislike the U.S. eagerness to sign a contract
- Deal-oriented Americans and many Europeans agree to perform specific tasks over a period of time; the Chinese, looking beyond the deal, prioritize mutual trust in the long term
- They are cautious and patient. You have to match their patience and stamina, otherwise deals will be lost
- Once they have decided who, what, when, they are very trustworthy

Manners and taboos

As far as meetings are concerned, it is necessary to make appointment one or two weeks in advance with officials, only a day or so with entrepreneurs or acquaintances. And you should turn up on time. Usually Chinese arrives 15 minutes early and say they can finish the business before the meeting is scheduled to begin, just not to waist your time.

Chinese taboos are loudness, arrogance and lack of consideration for others.

China and the twenty-first century

Asians are destined to be world leaders in industrial, economic and trade growth in this century. China, with her mammoth population and land area, will be the dominant force in the region. Breathtaking development and growth in China are already underway.

The return on investment, provided it is a long-term, will be staggering. China will be the world's biggest producer, manufacturer and possibly leading exporter. It will also be the world's biggest consumer.

How to establish a position and image in Chinese eyes? Policy and planning must be long-term; otherwise you will be wasting your time on relatively unimportant ventures.

6.1.2. China by G. Hofstede

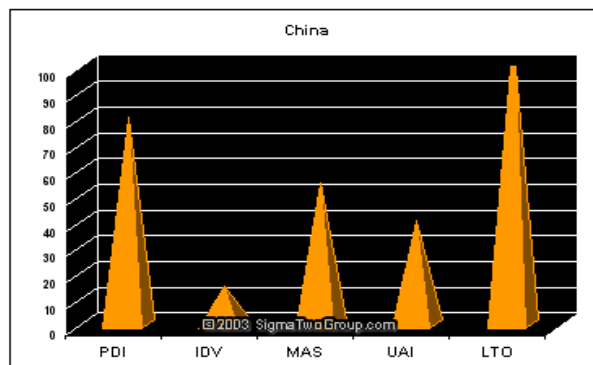


Figure 6.1. China's five dimensions by G. Hofstede (2010)

China has Long-term Orientation (LTO) the highest-ranking factor (118), which is true for all Asian cultures. This dimension indicates a society's time perspective and an attitude of persevering; that is, overcoming obstacles with time, if not with will and strength.

The Chinese rank lower than any other Asian country in the Individualism (IDV) ranking, at 20 compared to an average of 24. The low Individualism ranking is manifest in a close and committed member 'group', be that a family, extended family, or extended relationships. Loyalty in a collectivist culture is paramount. The society fosters strong relationships where everyone takes responsibility for fellow members of their group.

Of note is China's significantly higher Power Distance ranking of 80 compared to the other Far East Asian countries' average of 60, and the world average of 55. This is indicative of a high level of inequality of power and wealth within the society. This condition is not necessarily forced upon the population, but rather accepted by the society as their cultural heritage.

Behavior

- Personal contact must be avoided at all costs
- Giving gifts is a more commonplace in business world, though giving gifts to a government official is illegal
- Always arrive on time or earlier if you are a guest
- Do not discuss business at meals
- As a cultural courtesy, you should taste all the dishes you are offered

6.1.3. Chinese as IT-workers

As mentioned above, Chinese culture is based on collectivism. The team members can work together in harmony, they do the job in great care, and supposedly they are given very good directions. The negative side is that they do not make decisions (their

managers do) and if they see an error, they will be afraid to tell about it, so that he/she or the other would not lose the face.

Also giving a negative feedback to a Chinese is hard (again, because of losing face). According to the pre-interview results, carried out by T. Ylikotila (STEP project), Chinese are hard workers, but the results are not so good. Simple software testing has been done in China with no problems. Bigger problem was a Chinese team member in Finland. There appeared to be a language barrier, it was difficult to understand the speech. It was also difficult to understand the error reports made by a Chinese team-member and the issues were not clarified even after many emails.

On the contrary there was a positive feedback about the Chinese product manager: good English; taking risks and pragmatic, but does not make decisions on his own.

IT-outsourcing in China

A recent study by McKinsey (2005) concluded that China's IT outsourcing industry, often mentioned in the same breath as India's these days, will not pose a threat to its continental rival for many years. According to the study, "the Chinese must consolidate their highly fragmented industry to gain the size and expertise needed to capture large international projects".

Savio S. Chan (2010) cannot disagree more. He presents statistics that speak for themselves:

- IT services revenue is to reach \$8,9 billion in 2006
- The Chinese software industry has developed rapidly, software exports have grown a whopping sevenfold during the past five years
- 90% of China's IT work services are done locally (in comparison only 30% of India's IT work is done domestically)
- The talent pool in China is growing fast. According to the research, there are 2 million software developers in China. In addition, there are currently 5.86 million engineering graduates. Moreover, many China-born, U.S. educated business people and IT executives, are going back to China to start their "China dream"
- Multinational companies, such as IBM and Microsoft are spending hundreds of millions dollars to train Chinese software specialists

China is becoming a largest IT outsourcing player, which powerful market cannot be ignored.

6.1.4. Summary

Chinese culture differs from western cultures very much. Collectivism, hierarchy, extended family and belonging to 4 basic groups are the basic China culture features. When a Westerner wants to do business with Chinese, he has to really understand the Chinese values and act according to them.

Chinese society is seen as lacking innovation, though. There is a little trust among the Chinese, unless they belong to the family or extended circle and this factor weakens the ability to innovate. China's culture is such that people place a high priority on a group and maintaining harmony, so the experimentation or innovation by individual is discouraged.

China has risen to become an economic powerhouse. It is estimated that by 2050 the global economy will be characterized by the integration of East and West. Companies that take advantage of cross-cultural talents have a better chance to succeed.

6.2. India

6.2.1. India by R. Lewis

Multi-active culture: culture, whose people tend to do many things at once, often in an unplanned order, usually people oriented, extrovert.

By the middle of the 21st century India is going to pass China in terms of numbers of inhabitants, making it the most populated nation on earth. The country is developing rapidly in the technological and service sectors. English is a lingua franca in the region because many of the local languages are mutually unintelligible (not understandable).

India is benefiting from extensive outsourcing of services from Britain and US. Outsourcing companies have been growing rapidly in India because inhabitants speak adequately fluent English to perform services involved (also Chinese are outsourcing, but they lack the required language skills).

During the last 20 years (since 1990s) India has been surging ahead in the field of high technology. Bangalore is now another "Silicon Valley", where software and other high-tech products are being created.

Culture values

British left social and cultural influence on many Indians: cricket, tea, Oxford and Cambridge elite, titles of nobility, a democratic constitution, English language, a legal system and respect for property.

India's culture varies considerably from other East Asia cultures. Indians are more talkative than the Chinese or Japanese and they are dialogue-oriented as most Latins. As India's culture is multi-active, people have created a society where privacy is rarely favored; they make little attempt to conceal their feelings - these are expressed without restrictions.

Family orientation, honor of family and group, material success and creativity, problem solving, risk-taking and experimenting, loyalty to a group, do-it-yourself mentality, savvy (clever) at business.

Concepts

Leadership and status

Indians accept a hierarchical system. The boss must be humanistic and initiate promotion for his subordinates. In family business older son carries on the trade of the father. But first good education must be provided then the next step will be indicated.

The power within the organization tends to be of autocratic style (ruled by single individual with unrestricted authority). Managers tend to appeal to the emotions of their staff when trying to persuade them. The authority of managers is often based on wealth and family background, but it also can be based on specific technical expertise.

Strong work ethic is visible in Indian commerce; however, Indians do not work by the clock.

Indians accept foreigners in business dealing; however they are suspicious of the iniquity that the foreigners may bring with them, perhaps loss of national identity.

Nepotism (family business) is a way of life in traditional Indian companies. Family members work closely and hold key positions.

Space and time

People are used to living and working close together, though certain restraints are visible. Women are clearly subordinate to men. There is also a question of class consciousness.

The concept of time in India is cyclical (consisting of repeating ages that happen to every being of the Universe between birth and extinction). Opportunities need not always be seized greedily. Time is cyclical, so such opportunities will inevitably reoccur (perhaps in another life!).

Cultural factors in communication

Communication pattern

Indian English is old-fashioned and verbose. Language is sympathetic, showing respect to the listener, generous in praise and reluctant to criticize. Indian English sparkles with ambiguity, truth and appearance are a subject to negotiation.

Listening habits

The key to Indian attention is to be simple and respectful. They listen at length in order to develop a relationship and their aim is to make a friend of a speaker. They do not make a difficult audience, but their experience must not be underestimated.

Behavior at meetings and negotiations

Indians remain polite while modifications are proposed, and repackage energetically to reach an agreement. They hate turning down any business. Indians are superiors in negotiating style. Although highly collectivist in their local group, they develop

individuality and brilliance when dealing on their own with outsiders. They are clever at buying and selling.

There are trickeries that Indians use. They get disappointed if you do not engage in bargaining with them. First benefits of the purchase must be elaborated and price must be determined last.

In negotiating these points must be remembered:

- They are very skillful and can fool you
- Be simple
- Avoid sarcasm and irony
- Be patient - few Asians like to decide things quickly

Their negotiation concept is win-lose, but they are very flexible.

Manners and taboos

Indian's social behavior is dominated by Hinduism. Women show great respect to men. Dress is extravagant, often pedantic. Brothers and sons generally live under one roof, which results in fragmentation of the land.

6.2.2. India by G. Hofstede

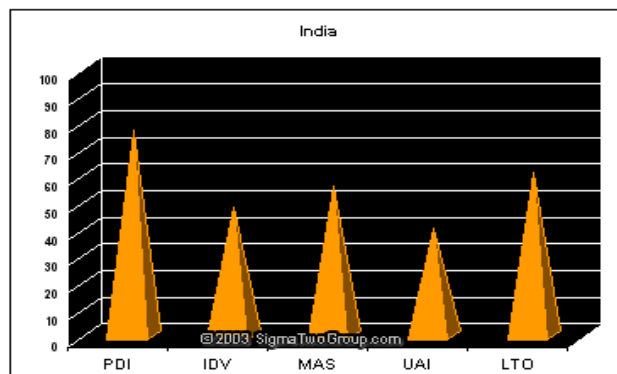


Figure 6.2. India's five dimensions by G. Hofstede (2010)

The Geert Hofstede analysis for India shows a large power distance society and all other measures are relatively moderate. This would be indicative of the fact that India is in the midst of change. The traditional caste systems has been outlawed, however the large power distance score indicates that the attitudes still remain.

India's Power Distance (PDI) ranks 77 compared to a world average of 56.5. This Power Distance score for India indicates a high level of inequality of power and wealth within the society. This condition is rather accepted by the population as a cultural norm.

India has Masculinity as the third highest ranking Hofstede Dimension at 56, with the world average just slightly lower at 51. The higher the country ranks in this dimension, the greater the gap between values of men and women. It may also generate a more competitive and assertive female population, although still less than the male population.

India's Long Term Orientation (LTO) Dimension rank is 61, with the world average at 48. A higher LTO score can be indicative of a culture that is persistent and parsimonious (stingy).

India's lowest ranking dimension is Uncertainty Avoidance (UAI) at 40, compared to the world average of 65. On the lower end of this ranking, the culture may be more open to unstructured ideas and situations. The population may have fewer rules and regulations with which to attempt control of every unknown and unexpected event or situation, as is the case in high Uncertainty Avoidance countries.

Behavior

- The head is considered the seat of the soul. Never touch someone else's head, not even to pat the hair of a child
- Gifts are not opened in the presence of the giver. If you receive a wrapped gift, set it aside until the giver leaves
- Business lunches are preferred to dinners. Hindus do not eat beef and Muslims do not eat pork

Communications

- There are more than fourteen major and three hundred minor languages spoken in India. The official languages are English and Hindi. English is widely used in business, politics and education
- Do not thank your hosts at the end of a meal. "Thank you" is considered a form of payment and therefore insulting
- Titles are very important. Always use professional titles

6.2.3. Indians as IT-workers

As so much work is being outsourced to India, let's take a look at an Indian IT worker paying attention to both positive and negative sides.

- Flexible and adaptive. They are easy-going and working with them is straightforward
- They are exact. Delivery precision and quality in good level
- Young workers are well-educated
- On the other hand they need clear instructions. There are good reasons to develop their expertise
- Shy at first, but after gaining speed they are brave to ask
- There is a high risk of change in personnel
- Older people are respected highly in organization, also those that have more expertise or are higher in hierarchy

- Also older and more experienced have a responsibility to guide and support younger and less experienced
- Indian tries very hard to give a positive result, even he is not very sure of his tasks, hoping, that things will “click” to their places. This kind of behavior causes a situation where Indian doesn’t necessarily tells openly about the risks
- Decision making might take time in India when they consider different possibilities
- “No” is told very seldom straight in India. This “no” has to be read between the lines

Most of the outsourced work done in India is Application development. The outsourcing company supplies architecture specification, coding standards and other directions, so it is actually very hard for a coder to show innovation.

IT-companies in India are advertising their ability to meet deadlines (fast results) and high quality of services. The truth behind this is that in order to meet deadlines everything is done by adding more people to the team and this causes the quality to suffer.

6.2.4. Summary

With it’s Western-country-like culture, ability of English language, plenty of talent, business know-how achieved in USA, with it’s 65% of world’s CMM level 5 companies, with it’s huge grow in IT-sector for the last 20 years, India has become a very attractive destination for Application Software Development and Business Process Outsourcing services (BPO) and that’s why so many international brand names are establishing their presence in India. India can offer competitive prices and high quality IT services.

7. CONCLUSION

The purpose of this MSc thesis is to emphasize the importance of recognizing cultural issues in multicultural environments. Cultural issues do affect globally operating organizations in various ways. The impacts can be both positive and negative. The aim of this thesis is to encourage and urge global organizations to emphasize on cultural differences of its employees and clients and turn these cultural differences into a competitive advantage.

The focus of this MSc thesis is placed on ICT companies, globally developing software products. Their employees work in multicultural teams, where team members have diverse cultural backgrounds. Without the knowledge on cultural differences it is hard to survive the everyday communication without misunderstandings, wrong interpretations and confusion. The development of software products is carried out by executing software engineering processes which are described in international standards, like CMMI or ISO/IEC-15504. These international standards do not pay attention to cultural differences, leading to the fact that global software development companies are unwilling to recognize the issues caused by cultural factors. Jaakkola (2011) observed a paradox in organizations. The higher the maturity the more unified are its processes along organization. The approach is effective in homogenous organizations, but in the case of heterogeneous organizations problems may occur, and these problems could be related to different cultural backgrounds of the employees.

The main aim of this MSc thesis was to assess software processes of ISO/IEC-15504 standard from the national culture perspective. The national standards define the activities and tasks that must be carried out in a set of processes covering the life cycle of the software product. People coming from diverse cultural backgrounds interpret and perform software processes in different ways and thus the outcomes of the processes vary.

As a result, a CSAM framework has been proposed as a tool for software companies for making self assessments in their software engineering processes. In this thesis the processes were assessed taking into consideration very wide view on cultural differences and the results should not be used as absolute. In case of software companies, a smaller count of cultures in question will be most of the case. Own assessments shall be carried out, using the results of cultural sensitivity assessment in this MSc thesis as a guide.

The results of cultural sensitivity assessment in software engineering processes can be further used in advancing towards cultural maturity of the organization and building cultural competence (look section 5.2). Knowing culture differences of the client adds a

competitive advantage to the organization. Also taking cultural differences into consideration makes employees happier and helps in building the trust and openness inside the teams.

CSAM framework could be improved in various ways in the future research. One way is to add a feature of capability to assess each cultural dimension on a scale 1-5 and therefore the overall assessed culture sensitivity grade would gain more accuracy.

The CSAM framework should not be limited to Hofstede (2004) cultural dimensions. Other cultural dimensions shall be freely chosen, for instance dimensions acquired from Globe project (2004). The SE process list can withhold the processes that are defined in the organization and shall not be limited to ISO/IEC 15504 standard process set.

The following ideas concerning future research implications are proposed by the author: (a) developing a Culture Maturity Model and (b) establishing a Public Global Cultural Knowledge Center.

A Culture Maturity Model could have similarities to CMMI or ISO/IEC-15504 models and would comprise of five levels. By progressing through five capability levels a global organization would advance towards cultural maturity.

A Public Global Cultural Knowledge Centre would serve as a knowledge base in a form of online tool of free access. Global organizations could share their cultural experiences and at the same time acquire knowledge on experiences and best practices of the others. A Public Global Cultural Knowledge Center would be a tremendous assisting service for multicultural organizations, providing rangy knowledge on cultural matters and help us in understanding each other better.

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APPENDICES

Appendix 1. The questionnaire for ICT companies

Mistä kulttuurista(-eista) teillä on kokemusta? (Mainitkaa, mistä kulttuurista on kyse, jos teillä on kokemusta useista eri kansalliskulttuureista)

Hofstede dimensiot:

PDI (valtaetäisyys): tämä dimensio kuvaa sitä miten yhteisön jäsenet suhtautuvat vallan jakautumiseen epäyhtenäisesti. Vallankäytön ollessa korkea hierarkia tarkoittaa olemassa olevaa eriarvoisuutta, myös vanhempia ihmisiä pelätään ja kunnioitetaan. Tällaisissa kulttuureissa alaiset myös olettavat että esimiehet kertovat heille mitä tehdään. Vastaavasti vallankäytön ollessa matala hierarkia merkitsee enemmänkin roolien eriarvoisuutta ja alaiset olettavat esimiesten konsultoivan heitä.

UAI (epävarmuuden välttely): kuvaa sitä mikä on yhteisön epävarmuuden sietokyky. Korkea pistemäärä tarkoittaa vakautta, rakenteellisuutta sekä tarkkaa johtamista. Epävarmuutta pyritään välttämään ja siihen suhtaudutaan uhkana, jota vastaan taistellaan. Vastaavasti yhteisöissä, joissa epävarmuudenvälttämisen pistemäärä on matala, ihmiset tulevat toimeen epävarmuuden, epävakaiden tilanteiden ja laveiden johtamistapojen kanssa. Epävarmuuteen suhtaudutaan välttämättömänä elämässä ja jokainen päivä otetaan niin kuin se on.

IDV (individualistisuus vastaan kollektivistisuus): kuvaa yhteisön suhtautumista yksilöön ja ryhmään. Individualistiset kulttuurit rohkaisevat jäseniään olemaan itsenäisiä ja huolehtimaan itse itsestään. Tehtävät voittavat suhteet tällaisissa kulttuureissa. Kollektivistiset kulttuurit korostavat ryhmän vastuuta yksilöstä. Tällaisissa kulttuureissa suhteet voittavat tehtävät.

MAS (maskuliinisuus): kuvaa arvoja, joita yhteisössä suositaan. Maskuliinisille yhteisölle on ominaista rahan ja tavaroiden arvostus; työ voittaa perheen ja vahvuutta ihailaan; myös tunteelliset ja sosiaaliset roolit ovat erilaisia eri sukupuolten välillä. Feminiinisille yhteisöille on ominaista suhteiden, elämän laadun ja huolenpidon arvostaminen; arvostetaan tasapainoa työn ja perhe-elämän välillä sekä osoitetaan sympatiaa heikompia kohtaan; eri sukupuolten välillä ei ole suurta eroa tunteellisten ja sosiaalisten roolien suhteen.

LTO (lyhyen aikavälin orientaatio vastaan pitkän aikavälin orientaatio): kuvaa sitä miten yhteisön jäsenet suhtautuvat heidän materialististen, sosiaalisten ja emotionaalisten tarpeiden viivästytykseen. Kulttuureille, joille on ominaista pitkän tähtäimen orientaatio liike-elämässä, vahvojen asemien rakentaminen on tärkeää eikä tuloksia odoteta välittömästi; elämän tärkeimmät asiat tapahtuvat tulevaisuudessa; myös ominaista säästäminen ja investoiminen. Kulttuureissa, joille ominaista lyhyt LTO, tulokset ovat tärkeimpiä. Esimiehiä arvostetaan tuloksentehtävyyteen pohjautuen; tärkeimmät asiat ovat tapahtuneet menneisyydessä tai tapahtuvat parhaillaan; on ominaista kuluttaminen eivätkä he suosi rakenteellista ongelmien ratkaisua.

1. Oletteko te tietoisia kulttuurieroista? Oletteko te tietoisia kulttuuridimensioista? (Hofstede: valtaetäisyys (power distance, PDI), epävarmuuden välttely (uncertainty avoidance, UAI), individualistisuus vastaan kollektivistisuus (individualism versus collectivism, IDV), maskuliinisuus vastaan feminiinisyys (masculinity versus femininity, MAS), lyhyen aikavälin oriantaatio vastaan pitkän aikavälin oriantaatio (long-term orientation, LTO).
2. Työskentelettekö te virtuaaleissa globaaleissa tiimeissä (tiimin jäsenet ovat eri maantieteellisissä paikoissa ja kuuluvat eri kulttuureihin)? Onko työskentelyssä ilmentynyt ongelmia, kuten kommunikoinnissa, palavereissa tai tiimeissä (väärinkäsityksiä, sekaannuksia kehon kielestä, Englannin kielestä johtuen)?
3. Yrityksen infra: onko laitteistot, ohjelmistot ym. välineet tukemassa kulttuurien välistä työskentelyä (puhelimet, video-konferenssit, sähköpostit, on-line kalenterit, etä-pääsy (remote access), asiakirjojen, tiedostojen jakaminen, ohjelmistokehityksessä kommunikointia ja viestintää tukevat viralliset ja epäviralliset väylät jne.)?
4. Oletteko te huomanneet eroja kommunikaatio tyyliissä (esim. suosii s-postin käyttöä, välttelee katsekontaktia jne.)?
5. Eroja palautteen antamisessa (hienovarainen (subtle), epäsuora, epähyökkäävä tapa, välttää ”kasvon menetystä” (losing face) vai suora ja itsevarma (assertive) tyyli)?
6. Eroja päätöksien teossa (kuka tekee päätöksen: yksilö vai tiimi?; päätöksiä tehdään nopeasti vai hitaasti?; yksilön vastuu vai tiimin vastuu?)?
7. Onko henkilökunnallenne annettu koulutusta eri maiden kansalliskulttuureista ja niiden eroista?
8. Onko organisaatioarvonne käännetty muille kielille? Ja pyritäänkö organisaatioarvoja pitämään vahvoina ja samoina eri osastoilla?
9. Mikä elinkaarimalleja teillä on käytössä (perinteisiä, kuten vesiputousmalli vai ketteriä (agile))?
10. Miten otatte huomioon globalisaation muutoksen (esim. asiakkaat verkostoituu, tuotekehitys verkostoissa, Open Source jne.)?
11. Miten ohjelmistoprosessit on hajautettu Suomen ja ulkomaiden välillä, siis mitkä prosessit ohjelmistokehityksestä suoritetaan kotimaassa ja mitkä ulkomailla?
12. Käytättekö standardeja ohjelmistokehityksessä (esim. ISO-perhe tai CMMI)?

13. Voiko kulttuuriongelmia kohdistaa erityisesti joihinkin ohjelmistoprosesseihin?
 (Jos SE prosessi on teidän mielestä kulttuuriherkkä, niin arvioi se 1-5 laittamalla ”x”; 1-> vähän herkkä, 5-> tosi herkkä; 0-> SE prosessi ei ole kulttuuriherkkä.
 Jos prosessi on kulttuuriherkkä, niin yritä arvioida mistä Hofstede dimensiosta/oista se on riippuvainen). Esim:

Koodaus						x	x			x			Selitys...
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	Merkittävyys arvo (vain x)						Hofstede dimensiot (voi olla useita x)					Muu/selitys	
	0	1	2	3	4	5	PDI	UA I	ID V	MAS	LT O		
Engineering process group													
Requirements elicitation													
System requirements analysis													
System architectural design													
Software requirements analysis													
Software design													
Software construction													
Software integration													
Software testing													
System integration													
System testing													
Operation process group													
Customer support													
Management process group													
Organizational management													
Project management													
Quality management													
Process improvement process group													
Process establishment													
Process assessment													
Process improvement													
Resource and infrastructure process													

group															
Human resource management															
Training															
Knowledge management															
Support process group															
Joint review															
Audit															
Documentation															
Change request management															

Kiitos ajastanne!

Appendix 2. Main observations

Appendix 2 includes main observations and findings of this work.

Globalization

- Various factors, mainly globalization and cost-effectiveness are driving software companies to offshore software development.
- Part of Finnish software development companies have mainly shifted software product development to North-East Europe, countries like Russia, Poland, Lithuania, Estonia, or Czech Rep.
- Acquisitions have also taken place in Finland. Foreign ICT companies have acquired Finnish software houses and distributed software product development in the following way: client interface is mainly taken care of in Finland and the coding is done abroad.
- Geographically scattered and multicultural teams face various difficulties in their everyday work, some of which are cultural issues.

Culture

- The works of G. Hofstede and R. Lewis give in-depth knowledge on various cultural patterns and cross-cultural communication.
- The familiarization with terms *cultural awareness* and *cultural intelligence*, and providing cross-cultural training helps global organizations to manage problems, which arise because of cultural differences.

Cultural issues in SE processes

- Agile methods, as opposed to traditional, plan-driven software development methods, provide a room for adaptation and adjustment to cultural diversity of the project team.
- International standards, like CMMI or ISO/IEC-15504, do not consider cultural issues in SE processes in any way.
- Nevertheless, the results of this work prove the opposite. Software engineering processes are impacted by cultural factors.
- The bigger the cultural gap between team members, the bigger cultural issues arise.
- Requirements elicitation, software construction, customer support, and project management processes, including lots of communication, are very culture sensitive.
- Own cultural sensitivity evaluation assessments in SE processes should be carried out and sensitive entries should be put to consideration. The results of evaluation can further be benefited in culture training, software process improvement or in advancing towards cultural maturity of the organization.

- Knowing cultural backgrounds of the client adds a competitive advantage to the organization and helps in finding mutual understanding.
- Taking team members' cultural differences into account helps in building trust and openness inside the teams.
- There is a great need for building a Public Global Cultural Knowledge Center in form of free online tool. Global organizations could gain access to a wide and concentrated cultural knowledge, cultural patterns, experiences and best practices of the others. Organizations could also share their experiences on cultural issues in global software development.

Appendix 3. Culture analyzes

Culture analyzes of German, Polish and Taiwanese cultures are presented in the following appendices. The same information can be found online from culture-wiki of the STEP project (2011).

Appendix 3.1 Introduction to multicultures

This report gives a short introduction to a study on multi-cultures and shows how different cultures influence the work of software engineering. The main resources used in this research are major works done by Richard D. Lewis and G. Hofstede. Richard D. Lewis book “When cultures collide” is a guide to working and communicating across cultures, it explains how cultures influence the ways we organize our work, think and feel. G. Hofstede study includes the interactions between national cultures and organizational cultures. His study demonstrates that there are national cultural groupings that affect the behavior of societies and organizations, and those groupings are very persistent across time.

Intercultural studies are becoming more and more important in global business environment. Companies that head towards global markets need to be aware of the target country’s national and business cultures. This study on multi-cultures is addressing software industry companies which are outsourcing software development abroad. They need to be aware of organizational and national culture differences, also they need to know how national cultures affect the way employees do the job (in this case software development is in question). This knowledge helps to perform better in international dealings, for instance this knowledge helps to predict the reactions in negotiations, helps to manage communication more effectively in different markets.

There is one more goal in the study of multi-cultures and their effects on software development. By using the outcomes on different countries, a company can compare the results on how the software development differs from country to country and this knowledge might ease the decision in choosing the most suitable country to head for.

Cultures by Richard D. Lewis

Richard D. Lewis work is based on global business and communication. The book “When Cultures Collide” covers more than 60 countries and major regions in the world. The book gives managers practical strategies on how to cope with cultural differences and how to work successfully across different business cultures. R. Lewis uses LRM model to describe cultural types. Multi-active, linear-active and reactive culture types lie at the edges of the pyramid. Each country is assigned its place on the sides of the pyramid.

Linear-active: People from linear-active cultures are typically task-oriented, highly organized and emphasize planning.

Multi-active: People from multi-active cultures are typically people-oriented, talkative and emphasize interpersonal relationships.

Reactive: People from reactive cultures are typically introverted, respect-oriented and emphasize listening.

Other resource, used in this study, is a website CultureActive at “<http://www.cultureactive.com>”. This resource provides national culture profiles of 96 countries. National culture profile includes geography, history and politics, culture, culture: communication and culture: interaction data. This website also provides a possibility to compare two cultures on chosen topics.

Cultures by G. Hofstede

During the 1960’s and 1970’s Geert Hofstede conducted major intercultural studies as part of a research project commissioned by IBM. His first book “Culture’s Consequences” was published in 1980, based on his findings. It was studies on the subject of culture. His second book, “Cultures and Organizations”, was published in 1991 (with several updates since). It is based on his original work as well as on the findings of several others in the field. It aims to help its readers to understand the differences in values and resolve the differences in practices between cultures. G. Hofstede presents a comprehensive model to describe culture as a concept and to identify the characteristics of specific societies. There are more than fifty countries mapped out with descriptive data. The categories which describe the differences (the five dimensions) are:

Power Distance: an extent to which an unequal distribution of power is accepted.

Individualism: whether a society is based on loose cooperation of individuals, as opposed to integrating people into cohesive groups.

Masculinity: focuses on the degree the society reinforces, or does not reinforce, the traditional masculine work role model of male achievement, control, and power. A High Masculinity ranking indicates the country experiences a high degree of gender differentiation. A low masculinity ranking indicates the country has a low level of differentiation and discrimination between genders.

Uncertainty Avoidance: the extent to which uncertain or unknown situations are seen as a threat. High uncertainty avoidance means a country has low tolerance for the uncertainty. This creates a rule-oriented society that institutes laws, rules, regulations, and controls in order to reduce the amount of uncertainty. In low uncertainty avoidance countries the society accepts change and takes more and greater risks.

Long-Term Orientation: focuses on the degree the society embraces, or does not embrace long-term devotion to traditional, forward thinking values. High Long-Term Orientation countries prescribe to the values of long-term commitments and respect for tradition. However, business may take longer to develop. In low long-term orientation countries changes can occur more rapidly.

Other G. Hofstede resource, used in this study, is his website at “<http://www.geert-hofstede.com/>”. More than 50 countries with their scores and analysis on cultural dimensions can be found in this website.

Appendix 3.2 Germany

Germany by Richard D. Lewis

Linear-active culture: People from linear-active cultures are typically task-oriented, highly organized and emphasize planning. Northern European and North American cultures are mainly linear-active (both Finland and Germany).

Business culture

Basic characteristics of business culture are:

- Monochronic attitude toward the use of time. This means that Germans like to complete one action chain before starting the other.
- Germans are straightforward, honest negotiators; they disagree openly rather than use diplomacy and politeness.
- German companies are traditional, slow-moving entities, encumbered by manuals, systems and hierarchical paths. Hierarchy is mandatory, resulting in exaggerated respect for one’s superior or CEO.
- German boss is extremely private person, sitting in a big office with closed doors. Instructions are passed down to inferiors only and kept rigidly with one’s department (as opposed to Americans and Scandinavians, where bosses prefer open door policy, like to wander round the corridors and chat with employees).
- When advertising your company’s product to Germans, put as much as possible in print. Brochures must be lengthy, factual and serious. No matter how boring it is, Germans will read it. They also expect your product to conform exactly to the description you have given.
- German companies are often successful because they have established reliable processes and procedures during their history.

Culture values

Fair, honest, conformist, organized, strong sense of duty, requiring context, Ordnung (order), direct, logical, serious, punctual.

Concepts

Space and time:

Germans need less personal space and independence at work as Scandinavians or Americans. Working and private lives are kept strictly separate. Privacy is important and when the door is closed, you should knock before entering.

In formal situations a polite distance is maintained and shouting hellos is avoided.

Germans are the most punctual of all peoples. Arriving late is seen as a sign of unreliability.

Germans value their leisure time greatly, that's why meetings on Friday afternoons are not popular.

Cultural factors in communication

Communication pattern

The German communication style is frank, open, direct and often loud. Truth comes before diplomacy. Arguments are logical and weighty. When speaking they are serious and often unsmiling. Germans do not seek humor in a work context. The use of formal *Sie* in business fits in well with the expectation of obedience and reinforces the hierarchical nature of the communication.

Germans belong to a data-oriented culture (a culture whose people gather information mainly through formal channels such as print and database) and they like receiving detailed information and instructions to guide them in the performance of tasks.

German Communication Patterns:

Review past history -> statement of context-> examination of facts->frank proposal->
->resistance->absorb counter argument-> offer new counter proposal->
-> cautious, but firm agreement

Listening habits

Germans listen well for information, because they are disciplined and always willing to learn more. They need background information and past history. They take things literally, so better no jokes or hard sell.

Behavior at meetings and negotiations

- Germans will arrive at meeting well dressed and with disciplined appearance.

- They will arrive well informed.
- They will present logical, weighty arguments to support their case.
- They do not change positions easily.
- They generally show a good teamwork throughout. They do, however, argue with each other in private.
- They like receiving apologies, so be prepared to apologize if you have failed in some respect. You may also point their errors frankly, but make sure you are right.
- Use surnames only and show respect for their titles. There are many *Doktors* in Germany.
- Do not introduce humor or jokes during business meeting. For them business is serious. Germans do not have British and American addiction to funny stories and wisecracks.

Working in teams

Team

Each individual has technical competency in some particular area, team members are brought together under a strong leader. Team is expected to know, where and how it fits into organizations hierarchy. (Finns: group of individuals, working pragmatically towards profit)

Team leader

Senior, with experience and education (Finns: competence to complete specific tasks, regardless of age, education, etc.)

Other team members are recruited for their competence in specific area, most tasks lie in their area of expertise. (Finns: general professional competence plus additional expertise)

Decision making

Considerable value is placed on agreement and consultation, subordinate's voice is heard, but the manager makes the decisions; (Finns: decision making is democratic with managers consulting their staff and allowing them to influence the outcome).

Team members work co-operatively, combining special skills (Finns: same); Differences in status will be observed, decision making will reside with senior team members or team leader; (Finns: even status will be observed, team members have the power to influence or finalize the decision); Team working proceeds slowly and methodically, conformance to procedure is regarded important and if decision needs to be made, then agreements from various departments and different levels of organization

are required; (Finns: teams work quickly to complete tasks); Deadlines are regarded as fixed;(Finns: same)

Germany by G. Hofstede

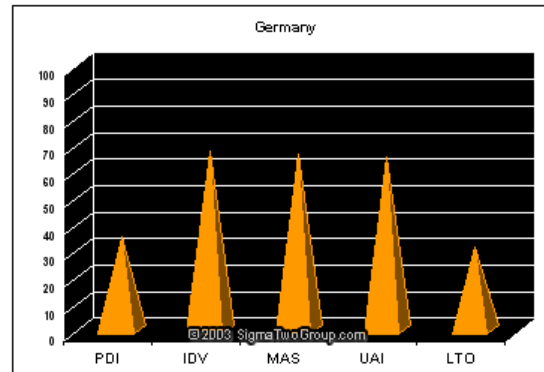


Chart 1: Germany's five dimensions by G. Hofstede

The above figure shows, that individualism (IDV), masculinity (MAS) and uncertainty avoidance (UAI) have scored high; power distance (PDI) and long-term orientation have ranked considerably lower. This illustrates Germany's belief in equality and opportunity for each citizen, as well as its ability to change and adapt rapidly.

PDI is related to the different solutions to the basic problem of human inequality;

UAI is related to the level of stress in a society in the face of unknown future;

IDV versus collectivism, related to the integration of individuals into primary groups;

MAS versus femininity, related to the division of emotional roles between women and men;

LTO versus Short Term Orientation, related to the choice of focus for people's efforts: the future or the present and the past;

Behavior

Germans are strongly individualistic;

German thought process is very thorough, examined in detail, and so very time-intensive. But once the planning is over, project will move on quickly and meet the deadlines.

Germans are punctual. Being late is very insulting for a German executive.

In business situations, shake hands at both the beginning and the ending of a meeting.

Business is viewed as being very serious and Germans do not appreciate humor in a business context.

In business meetings, age takes precedence over youth.

Germans need a personal space around them.

People that have worked together for years still shake hands each morning as if they just met.

German men frequently greet each other with *Herr* 'last name', even when they know each other very well.

Titles are very important to Germans. Address people with their full, correct title, no matter how long it may seem.

Germans as IT-workers

There are some differences (but quite few) in the way Finnish and German people work. Both are very punctual, plan carefully (even Germans are more careful and in-detail as Finns), meet deadlines. The biggest differences what I found are the level, at which decisions are made and the amount of planning that is being done. In Germany decision making is up to the superior, whereas in Finland decision making might be strongly influenced by team members. Also planning is done in a lighter way in Finland, where teams are working quickly to complete tasks. On the other hand in Germany, planning is time consuming because they like lots of information, do background check-ups, follow procedures, but once planning is done, the projects move on faster and the deadlines are met.

There is also a difference in skills of team members. In Germany team members are specialized in specific areas, whereas in Finland team members have more general professional knowledge in addition to any special skills they might have.

In Germany meetings are formal, standard behavior is expected (participants need to be well prepared, are expected to take notes in order to return well prepared for the next session). Finnish meetings are informal, where first names are used and participants may occupy seats they want regardless of status.

What this all means to a Finnish IT-company which offshores its business to Germany? In my opinion Germans can handle all project management tasks as long as they are supplied with as much detailed information as possible, which they will check for errors and do careful background check-ups. Their strengths are avoiding errors, strong sense of duty, reliability and professional competence in particular areas. On the other side their weaknesses are top-down hierarchy (information flows slowly) and conformance to procedures (time consuming).

Summary

After inspecting Richard D. Lewis and G. Hofstede clarifications of German culture, a reader is forced to make a conclusion that both texts support each other and no contradictions can be found.

Appendix 3.3 Poland

Poland by Richard D. Lewis

Linear-active and multi-active culture hybrid: people from linear-active cultures are typically task-oriented, highly organized and emphasize planning. People, belonging to multi-active culture, tend to do many things at once, often in an unplanned order, usually people oriented, extrovert.

Also Polish culture is data-oriented and dialogue-oriented hybrid, which means that people gather information through formal channels, such as print and databases and also through a direct contact with other people.

Poland is a sixth biggest European Union country with a population of 38 million. Its GDP is not small either (23rd in the world), so this country shouldn't be underestimated. As it is continuing to develop, it has considerable political, cultural and economic influence in Central Europe.

There are many positive things concerning Polish economy. The population is well-educated and skillful, economic growth stands currently at 4 %, and foreign investment is high. Poland has a largest consumer market in Eastern and Central Europe.

The negative economy side would be growing unemployment rate and inflation.

Culture values

Culture values include patriotism, bravery, independence, work ethic, catholic attitudes, love of liberty and individual rights and humor.

The family is the basic unit of Polish life, more important than other groupings or church. Parents pay their education, clothes and feeding, share their lives as much as possible until they get married.

Concepts

Leadership and status:

Royals and nobles have figured largely as leaders in Polish history. Gentry (herrasväki) comprised a high percentage of society and established a romanticist lifestyle. Honor and revenge are living concepts in the Polish mind, also fearlessness and gallantry toward women.

Recently, the Nazi suppression and the 45 years of communism erased the influence of the leading Polish families. Nowadays, meritocracy dominates in Polish society, where wealth, income and social status are assigned through competition.

Space and time:

The Polish sense of space is typical Slav, which means that they sit closer to each other than say, Anglo-Saxons or Nordics, and they often touch each other to give reassurance. Men kiss frequently women on the hand. Poland is a large agricultural producer, do its people feel themselves close to the land.

Poles are relaxed about time, but not necessarily unpunctual and they are not so time-dominated, as Germans. Poles can arrive a little bit late for the meeting, but they keep in mind, that time shouldn't be stolen from others. Their concept of time is Polish-Russian (more linear than the Russian, who plan less, but handle chaos better).

Cultural factors in communication*Communication pattern*

Polish communication style is not clearly seen or easily distinguished. They are fond of metaphor and their speech is rich in ambiguity. Irony is used to great effect. The listener has to listen carefully and read "between the lines", because the thoughts are expressed in round-about manner assuming that the listener will understand what the real meaning is. Polish seems to be ambiguous for foreign ears, but Poles seem to be happy with certain amount of ambiguity. This is a problem say, for Germans, Americans or French, who like clarity.

In general, Poles are ready to express their opinion if they feel that the listener needs it.

Listening habits

Poles are good listeners; they are courteous and rarely interrupt. The key in gaining their attention is by placing suggestions and ideas to Polish context, they like visitors to refer to Polish history and achievement.

Behavior at meetings and negotiations

Poles can be pragmatic and sentimental in their behavior. They are friendly and flexible if treated well, but can react strongly if they sense injustice. Their behavior can turn aggressive if severely criticized or insulted. On the other hand, if handled with frankness and delicacy, they quickly try to establish close relationships.

Polish negotiations are not particularly informal. Some distance is maintained between partners. Ideas are often expressed in roundabout manners and you have to read between the lines.

Meetings sometimes tend to be lengthy, because some parties might start private conversations. Managers find it difficult to get used to idea of being asked for their

opinion. Younger people tend to participate more readily than older ones. People are proud of doing things the “Polish way”, so there can be a factor of unpredictability, because they like taking risks. They are well-educated and show knowledge of other countries and cultures.

Working in teams

Decision making

You might not meet the decision-maker in the first meeting. If you meet someone called a Director, so he or she might not be the decision-maker, but a manager, who reports back to the company heads.

Poland by G. Hofstede

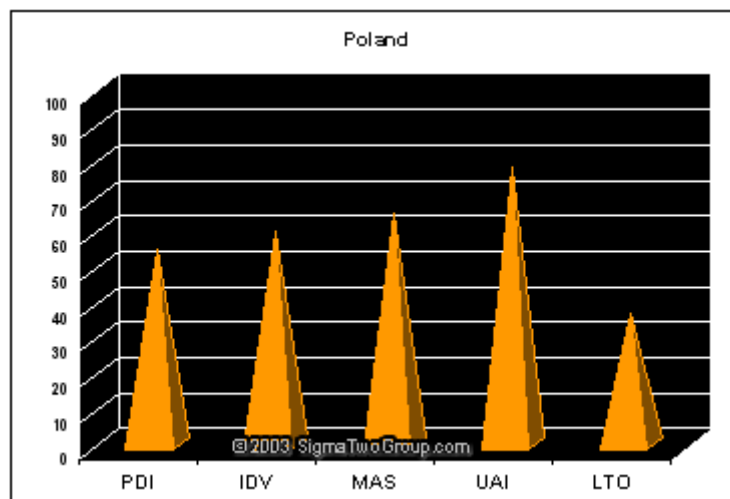


Chart 1: Poland's five dimensions by G. Hofstede

PDI: Poland scores 68, ranking it 27-29 out of 74 countries. Authority of bosses is a visible sign of status in large-power-distance countries. Older superiors are generally respected more than younger ones. Parents teach their children obedience, hierarchy means inequality and subordinates expect to be told what to do. Income distribution is uneven and corruption is frequent.

UAI: Poland scores 93, ranking it 9-10 out of 74 countries, which means that Poland is a country with a strong uncertainty-avoidance. People in such countries change their employers less frequently. The stronger system of rules makes children in such society more often feel guilty and sinful. Family life is more stressful, because feelings are more intense; children and parents express their sentiments more emotionally. People feel comfortable in structured environment. Managers in strong uncertainty-avoiding

countries are more occupied with daily routines, rather than strategic problems. People are worse at invention, but better at implementation.

IDV: Poland scores 60, ranking it 22-24 out of 74 countries, which makes it an individualistic country rather than collectivistic. In individualist countries, speaking one's mind is a virtue. Telling the truth about how one feels is a characteristic of sincere and honest person. Clash of opinions can lead to higher truth, so confrontation is salutary. In family, children are taught to tell the truth, even if it hurts. In individualistic culture people feel the need to talk when they meet. Silence is considered abnormal. Also human rights rate is higher.

MAS: Poland scores 64, ranking it 14-16 out of 74 countries, which makes Poland a masculine country. The working goals for masculine pole are opportunity for higher earnings; get the recognition for a well-done job; opportunity for advancement to higher-level jobs; have challenging work to do, which gives a personal sense of accomplishment. In family, men are supposed to deal with facts and women with feelings. In schools, teacher's brilliance and academic reputation and student's academic performance are the dominant factors. In a workplace, strongest wins in a conflict situation, rewards are based on equity (performance), more money is preferred over more leisure time.

LTO: Poland scores 32, ranking it 24 out of 39 countries, which makes it short-term oriented (fostering of virtues related to the past and present, respect for tradition, preserving of "face", and fulfilling social obligations, effort should produce quick results).

Summary

After inspecting the Hofstede material concerning Poland, I didn't find more precise analysis, but the scores for the cultural dimensions. The assumptions were made based on the scores and rankings and they are more general rather than Poland directed.

Hofstede scores for Poland and Polish culture presented by Lewis do not contradict with each other.

According to Hofstede, Poland ranks high on power-distance, which is true because of the hierarchy. Also uncertainty-avoidance index is high, which means a strong bond between the parents and their children (according to Lewis, the family in Poland is more important than church or other groupings). The higher individualism score is supported by Lewis's claim that status is accorded to great intellectual and artists, such as Chopin and Marie Curie being outstanding examples. High scoring in masculinity supports the Lewis claim that meritocracy dominates advancement in Polish society (status is achieved by competition). Low scoring in long-term orientation is supported by people being fond of Polish history and traditions (doing things the "Polish way").

Poles as IT-workers

IT companies in Poland should concentrate on developing business and project management skills. No doubt these companies have the required technical skills, but lack an understanding of appropriate business culture. From Finnish point of view, Polish workers are not as productive as they could be as team members because of organizational hierarchy and they also don't like to bear responsibility and are afraid of making mistakes. This is due to historical reasons, when people were being punished for mistakes they made.

Outsourcing to Poland

According to Carmel's (2003) "The 4-tier taxonomy" model, which classifies software outsourcing nations, Poland is taking place in Tier-3, titled as Emerging software exporting nation (Tier-4: infancy stage, Tier-2: transition, Tier-1: major software exporting nations).

Benefits of outsourcing to Poland include lower salaries, geographically being near to Finland, big potentials in market and well-educated people. Ofcourse, there are many drawbacks, too. Finnish companies have faced similar problems in public sector as in Baltic countries and Russia, which include the corruption of the public sector and very heavy byrocracy. Biggest challenges concerning Polish working force are inherited from previous Polish social life and are also known in Russia and Baltic countries. The biggest challenge is that employees are trying to avoid the responsibility for the errors they make. Also employees are ineffective when working in teams because of the hierarchy in organization. One of the biggest challenges facing the future is the shortage of working force, because Polish youngsters are moving abroad hoping to find better job opportunities elsewhere.

Resources:

1) "Puola Suomalaisyritysten Toimintaympäristönä"

<http://hsepubl.lib.hse.fi/pdf/hseother/b83.pdf>

2) Offshore IT Outsourcing and Transition Economies:

A Critical Comparison of Poland, Hungary and Ukraine

<http://www.management.ac.nz/ejrot/cmsconference/2007/proceedings/theopenstream/dcruz.pdf>

Appendix 3.4 Taiwan

Taiwan by Richard D. Lewis

Reactive culture: culture, whose people prefer first to listen to the other's position and then react to it and make their own. Such people rarely initiate discussion or action.

Taiwan is a mountainous island lying approximately 250 km off the coast of mainland China and having 23 million inhabitants. It was colonized by the Dutch in the 17th century. Later on Taiwan became increasingly integrated into the Qing Empire. In 1894 Japan possessed Taiwan after China's defeat and became a colony. The island reverted to China's jurisdiction in 1945.

The mentality of modern Taiwanese is still shaped largely by the teachings of Confucius, who lived more than 2,500 years ago. The basic tenets of Confucian thought are obedience and respect for superiors and parents, duty to family, loyalty to friends, humility, sincerity and courtesy.

Age and rank are respected in Taiwan. Younger people are expected to obey the older ones. Older foreign business people are more likely to receive attention than the younger people.

The family is by far the preeminent institution in Taiwanese society. In many ways, Taiwanese view themselves more as parts of the family unit than as free individuals. Most small factories are family-run operations.

Taiwanese are among the most courteous people in the world, especially toward foreigners. Sometimes this can cause problems for Westerners because Taiwanese might say what they think a person wants to hear, whether it is true or not. Almost always, they do this to prevent the hearer from being disappointed, not with malicious intent. Because of the general effect of Confucianism, Taiwanese are not known for their creativity or inventiveness, but on the other hand a visitor can appreciate humaneness, geniality and sense of honor.

Culture values

Confucian values dominate: work ethic, moderation, education. Other values include modesty, respect for elderly, animal years, feng shui (wind and water superstition), pride and patriotism.

Concepts

Space and time:

Taiwanese live very close together; work space is also very limited. Lack of hygiene due to overcrowding is noticeable in most parts of Taiwan.

Taiwanese have a strange attitude towards time. It can be seen in their frequent apologies for taking other's time. If there is a meeting scheduled, it is not unusual for a Taiwanese to arrive 15-30 minutes earlier just in order to be ready with a business before the meeting was going to take place (just not to steal other person's time)!

Cultural factors in communication

Communication pattern

Taiwanese debate is patient and courteous; they indicate great humility and understanding.

In meetings Taiwanese negotiate collectively, but a problem arises to Westerners, because real decision-makers are actually not in the meetings. Patient and courteous discussion follows and everyone protects everyone's face.

Listening habits

Good listening is good manners in Taiwan (listen carefully, no interruption, like structure and guidance). They try to accommodate the other's side wishes in their own proposals. Taiwanese are eager to obtain Western markets for their products and Western know-how, so they listen carefully and patiently in these areas. The manner of the speaker is more important than the content, so one needs to be flattering and protect everyone's face in order to create trust.

Behavior at meetings and negotiations

Elderly leaders still prevail. The leaders of capitalist-style companies emerge with reputation of competence. In family businesses the elderly male is a leader.

Negotiations are carried out in groups and decision-makers are not always present at the meetings. The decisions might be done by leadership group behind the scenes. Time frame is often too long for Westerners. Chinese are aware of the size of their markets and will use this knowledge to drive the prices down. They generally comply with agreements, but might ask for re-negotiation, if unforeseen circumstances arise.

Manners and taboos

The conversation might be opened with the questions about their families, hometown or region's food.

Taiwanese are used to sit-down dinners. Food that falls on the floor might be retrieved and eaten. Host finishes parties in China, not the guests.

Giving gifts is not bribery, it is seen as investment. If you receive a gift, it means they expect a favor in the near future.

Taboos include pressurizing, criticizing, causing anyone to lose face. Avoid giving white gifts, because it is a color for death.

Taiwan by G. Hofstede

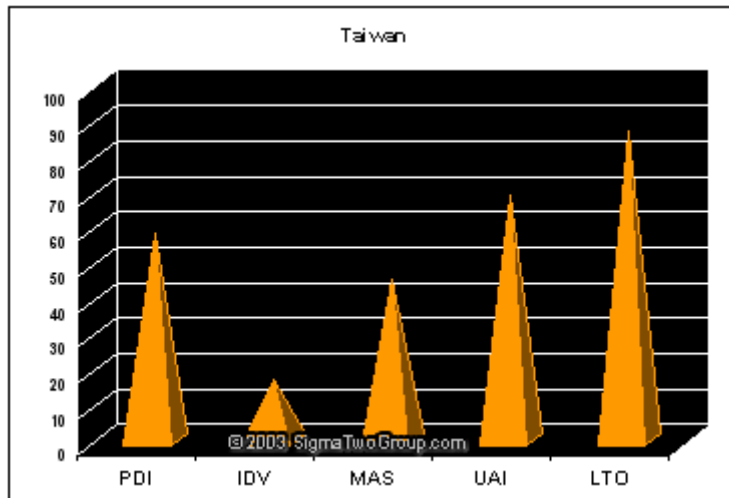


Chart 1: Taiwan's five dimensions by G. Hofstede

PDI: Taiwan scores 58 and ranks 43-44 out of 74 countries (in comparison China's score is 80, higher PDI than Taiwan's). In societies with high PDI parents teach their children obedience, older people are respected, hierarchy means existential inequality, subordinates expect to be told what to do, corruption is frequent, and income distribution is very uneven.

IDV: Taiwan scores 17 and ranks 64 out of 74 countries. This means Taiwanese belong to a collectivist society, in which people are integrated into strong groups, often extended families that continue protecting them in exchange for unquestioning loyalty. In such a society harmony should always be maintained, "We" instead of "I", purpose of education is learning how to do, relationship prevails over task.

MAS: in Masculinity Taiwan scores 45 and ranks 43-45 out of 74 countries. This score ranks Taiwan with moderately low masculinity (in comparison to China, which scores 66 and is a high masculine-scoring country).

UAI: Taiwan has scored 69 in Uncertainty Avoidance Index, ranking 39 out of 74 countries. The score is medium as of all Asian countries (medium to low) other than Japan and Korea. In weak uncertainty avoidance countries anxiety levels are relatively low. This can be explained by lower expressiveness in these cultures. Emotions and aggression are not supposed to be shown. Stress cannot be released in activity and it has to be internalized.

LTO: Taiwan scores 87 in Long-Term Orientation, ranking 3rd out of 39 countries. Values, associated with high LTO are thrift and perseverance (a characteristic of using minimum of something, especially money). The people in such societies believe that the

most important events in life will occur in the future, family life is guided by shared tasks, children are taught to be thrifty (saving, not spending), in business there is a stress on future market position.

Taiwan's ICT industry

Taiwan is the fourth world's largest IT hardware producer. Taiwanese companies produce nowadays three-quarters of the world's PCs and half of the world's liquid crystal displays (LCDs). In addition, Taiwan produces quarter of the world's semiconductors and about one fifth of the world's mobile phones.

Taiwanese companies are also the world leaders in making LEDs and solar cells.

Taiwanese IT industry can be divided into two key sectors, that is software (particularly telecommunications and multimedia applications) and IC design. Taiwan's industrial and innovation systems are presented by dividing labor between government and industry. In this division the public research institutions do most of the R&D work until they get working prototype and then the industry uses these results to do the final development and integrated design. It is this division of labor that is considered to be responsible for Taiwan's leading role in global IT industry.

On hardware side the state established Industrial Technology Research Institute (ITRI) and its two dedicated semiconductor labs: Electronic Research Service Organization (ERSO) and Computing and Communication Lab (CCL). On software side, the role of the public research institution, the Institute for Information Industry (III) is, however, not so clear, and less has been written about its approach to, and interaction with, industry.

The development supported by the government limit the industry to narrow range of activities in the global IT production network. These activities focus only on second-generation innovations, i.e. innovating on designs of products based on technologies developed elsewhere. In software subsector, the private industry and III has a strange relationship, which has played a major role in the weak growth of this sector. Also one of the reasons for the stagnation of the software industry is that both the private hardware industry and the government have not seen software as an independent industry but as a service component needed by other industries.

Taiwanese software industry doesn't offer so many success stories as a hardware industry (sales are about one tenth of sales in hardware industry). The major failure is that Taiwanese software industry is domestic-oriented. As an example, the annual sale revenues of two of the three largest Taiwanese software product companies, Ulead and Cyberlink, are around \$30USD million, which are too small to put them in the league of medium-sized IC design houses in Taiwan, or of large software companies in Israel, India or Ireland.

In contrast to the positive role played by ITRI (electronics and semiconductor sectors), III has no successful stories to tell. III was established in 1979 and was expected to play similar role as ITRI in hardware. In the end result, III transformed

itself into one Taiwan's biggest IT consultancies and software houses, and has been competing directly with private software companies. As to a question about III role, many software firms responded, that III is their greatest competitor. Private firms need to sponsor R&D from their own revenues and III's R&D is covered by the state. One official responded in such a way: "III is a funny organization. It both competes with and tries to assist the local software industry. On a charitable estimate I would say that they compete at least as much as they assist".

There are two types of software companies in Taiwan: 1) older companies focused on the development of software applications for big organizations and fiercely competing with III, 2) newer companies developing software technologies, most of which were founded after the success of the hardware IT industry in the Hsinchu Park. Their products deal with software technology itself, or with new applications of IT technology, i.e. anti-virus software, OCR application, or systems recovery. Many of them are tightly connected to the IT hardware industry.

Overall, the Taiwanese software industry is oriented to the domestic market. Hence, relative to the Taiwanese hardware sector or compared with software in countries such as Israel, India or Ireland, Taiwan's software industry cannot be considered a success.

Taiwanese as IT-workers

Look China.

Summary

Taiwan and the mainland China became two separate political entities since the communist revolution in 1945. During the past 32 years, the two governments have adopted different types of socioeconomic systems. By 1980, Taiwan's per capita income soared up to \$2,278, while the mainland's remained \$256. This gap began to attract world-wide attention. The success story of Taiwan has gained recognition among world's top economists.

Taiwan is ahead of China in various measures and it is a long way to bring China to where Taiwan is. Most Taiwanese identify themselves as Taiwanese and don't accept the level of human rights abuse in China.

Resources:

1) http://papers.ssrn.com/sol3/papers.cfm?abstract_id=753524