Cross-cultural Aspects in Software Engineering –
Czech Republic versus Taiwan

Mezikulturní aspekty v softwarovém inženýrství –
Česká republika versus Taiwan

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Cross-Cultural Aspects in Software Engineering - CZ vs. Taiwan

Zásady pro vypracování:

Cílem této diplomové práce je na konkrétním příkladu dvou firem ukázat rozdílné aspekty chápání vývoje SW v různých zemích. Pro zpracování příkladu byly vybrány firmy zabývající se vývojem software ve podobně oblasti z ČR a z Taiwanu.

2. Porovnejte kulturní vlivy na vývoj software pro vybrané země (ČR-Taiwan).
3. Popíšte softwarový proces ve vybraných firmách a zhodnoťte kulturní vlivy na tento proces.
4. Proveďte porovnání a zhodnocení obou procesů z vybraných zemí a firem (ČR-Taiwan).

Seznam doporučené odborné literatury:

Dle pokynů vedoucího diplomové práce.

Formální náležitosti a rozsah diplomové práce stanoví pokyny pro vypracování zveřejněné na webových stránkách fakulty.

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Declaration made by the student / Prohlášení studenta

I hereby agree to the publishing of the masters thesis as per the Study and Examination Regulations for Masters Degree Programmes at VŠB-Technical University of Ostrava, Art. 26, Par. 9.

In Ostrava on April 26th, 2012

I hereby declare that this masters thesis was written by myself. I have quoted all the references I have drawn upon.

In Ostrava on April 26th, 2012
Acknowledgement / Poděkování

I would like to express my acknowledgment to a few people who I am grateful for their help. I really appreciate help from Taiwanese professor Jason Chen. I introduced him just a basic idea of theme of my master’s thesis and he greeted me with open arms and arranged meetings for me in the Lager company and others. I also give my thanks to employees of Lager company who allocated time for my questions and provided me information about Lager Company. Furthermore I would like to say thank you to Johnny, Taiwanese student who has become my good friend and was in some cases translator and guide in Taiwan. Last but not least, to Jindřich Strakoš, the senior project leader from Tieto Czech s.r.o. who helped me to answer plenty of questions and arranged for me meetings and place for discussion with Tieto employees.
Abstrakt

V této diplomové práci se zabývám otázkou pohledu na softwarový vývoj v různých zemích a snažím se nalézt kulturní vlivy na softwarový proces. Softwarový proces jako takový je složitá a rozsáhlá sada postupů a metodik, které mohou být ovlivněny různými faktory, jenž mohou mít pozitivní, tak i negativní vliv. Tyto faktory se pak mohou projednávat na kvalitě produktu, doby dodání, přehlednosti komunikace se zákazníkem atd. Mezi hlavní faktory patří kulturní rozdíly zaměstnanců, kteří softwarový proces vykonávají. Hlavní rysy kultur jsem sledoval u zaměstnanců tajvanské a české společnosti. Vlastnosti zaměstnanců, které popisují obě kultury, jsem porovnal, zhodnotil a v závěru této práce jsem navrhl řešení, jak by se mělo k těmto zaměstnancům přístupovat. Dále tato práce obsahuje diskusii na téma spolupráce těchto kultur v rámci jedné společnosti a pojednává o konflikttech, které tímto mohou nastat.

Klíčová slova: Softwarový proces, Kultura, Česká Republika, Taiwan, Organizační struktura, Lager, Tieto, Kulturní vlivy, Lewisův model

Abstract

This paper compares Czech and Taiwanese software processes and tries to point out cultural influence on them. Software process is a complicated and sophisticated procedure which may be influenced by many factors that decrease or increase the quality of the final product. The culture diversity is one of them. In this paper, there is focused on aspects of different cultures. These aspects were observed on employees of Taiwanese and Czech companies. Observed data were analysed and according to the results an assumption of main differences between working of Czech and Taiwanese employees was established. This work contains a discussion about the cooperation between these two cultures within the scope of one company and calls attention to conflicts which may arise.

Keywords: Software process, Culture, Czech Republic, Taiwan, Organizational culture, Lager, Tieto, Cultural influence, Lewis model
List of Symbols and Abbreviations / Seznam použitých zkratek a symbolů

IT — Information Technology
CMMI — Capability Maturity Model Integration [20]
ITIL — Information Technology Infrastructure Library [21]
CEO — Chief Executive Officer
PW — Per Week
PM — Per Month
SAP — It is a name of company but shortcut is established from: System Application Products of data processing
W2E — Way To Excellence
IBM — International Business Machines corporation is a shortcut of US company.
MaPIT — Research project by Helsinki university of technology, Tieto as one of the main partners, together with e.g. IBM. It is about Management, Processes and IT support for globally distributed software development.
Preface / Předmluva

Nowadays globalisation, wider market, cheap labour forces and other factors press companies to offshore software product development. These bring a need of creation of multicultural teams. The knowledge base of cultures helps to cooperate in teams and do an international business. The work behind my master’s thesis started at the beginning of the year 2011 when I participated an exchange program in the National Central University of Taiwan. Previously I studied in Finland, competed in international IT competitions. I also work in multinational company where I daily encounter with culture diversity and issues of communication in multicultural team. These are the main reasons why I am interested in this topic which nowadays is coming more and more popular.
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1 Introduction

The idea of creating this paper was risen during author’s study in Taiwan. The main purpose was to create a vision of culture influence on software process. This vision forms an assumption on which aspects the cultural influence is positive or negative and that may be a key to improve maturity of software process and to prevent conflicts.

The culture influence was observed in the Lager which is a Taiwanese company that produces on-line games. During four visitations of this company the software process was discussed and observed data from Lager employees was collected. The similar procedure was made in Tieto Czech s.r.o company in the Czech Republic after author’s comeback. The data are not sufficient to estimate precise results however at least they indicate key points.

This paper is divided to sections. In the first section which is called Related Work, there is defined what the culture is and how it influences a human being. The second section is called Model. It describes a model of this research and its main factors. The third section is called Example section and it contains observed data, organizational culture diagrams and models of software processes from Czech and Taiwanese companies. In the last two sections, conclusion and discussion of data from the Example section are made.
2 Related Work

2.1 Culture

Culture is one of the most important factors which change human behaviour and thinking. There are also other factors as personality and human nature but these are not comparable as samples of Taiwanese and Czech nations.

Hofstede draws an analogy between humans and computers and calls such patterns mental programs. A person’s mental programs can be inspected on 3 levels: human nature, culture, and personality (as is illustrated in table 1).

<table>
<thead>
<tr>
<th>Personality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
</tr>
<tr>
<td>Human Natures</td>
</tr>
</tbody>
</table>

Table 1: Levels of Mental Programming [1], [2]

- Human nature is inherited at birth and shared by all human beings, regardless of background. The human ability to feel happiness, anger, and sadness, and the need for food, shelter, clothing, and love all belong to human nature.

- Personality, on the other hand, refers to the mental programs that belong exclusively to an individual. One’s personality is partly inherited and partly learned through his or her unique personal experiences.

- Culture, lying between human nature and personality, can be considered as the part of the mental “software” that is programmed collectively. It is shared by a group of people but not necessarily by people outside the group.

2.2 Cultural Influence

After we characterized culture, another question has risen up. How the culture influences our behaviour. I am going to focus on the general communication patterns in the Czech Republic and Taiwan. The Lewis Model of Cultural Classification (figure 1) helps to categorize both countries. This model is based on own experiences of the author who speaks twelve languages and being a pioneer in cross-country issues around the world.

The model divides nations to or among three main groups:

1. Linear-active – according to the characteristics mentioned by Lewis in his work [3], linear-active cultures tend to be data and fact oriented. They hold planned agendas and speech is in most cases used to exchange information. Contracts are binding
and short-term profit is most desirable. Their working hours are usually fixed and they are also result oriented. The Czech people principally tend to this group.

- Weakness: too factual, insufficient people-orientation, too much bottom line focus
- Strengths: economy of discussion, speed to market

2. Multi-active – people in this group are dialogue oriented. They like a flexible work schedule and do not hold rules strictly. They love speaking and it is their core communication pattern. The scheduled time is not precise time when they come to an appointment. Relationships are important for them and they care about connections with other people. Mostly they are charismatic people. In business, having a good relationship with a client is deemed more important than drawing up a contract, which is considered more idealistic than realistic. Mexicans, Colombians, Italians, Greeks and cultures from African and Arab represents this group.

- Weakness: feelings before facts, too wordy, argumentative, too many ideas, random agenda
- Strengths: all embracing solutions, lateral clearance

3. Reactive – are polite listeners. They like slow dialogue to have a time to response and may be diffident of fast speakers. They want to live in piece with nature and in harmony with people. Speech is a reflection of their desire to promote harmony in relation. They must never lose face and they are respectful. Work time, free time and life are merged together. In business, long-term profit and increased market share are important. Reactive cultures are found typically in Asia and Taiwan is one of them.

- Weakness: unclear communication, slow decision-making, hampered by face considerations
- Strengths: tranquillity, all-round courtesy, relative harmony

2.2.1 Communication Pattern

Communication is based on speaking between two people so there are two directions of exchanging experiences, knowing, etc. Software development process has many phases as: requirements specification, analysis, design, implementation, etc. In all of these phases there is a need of communication between all participants. Communication is a basis of exchanging information; the right and clear communications affect the quality of developed product. Types of communication patterns:

- visual – seeing and writing
- auditory – hearing and speaking
- kinaesthetic – body language
Communication patterns are modes of communication that we use frequently in certain situations or with certain people. Some patterns may be prevalent, that is, appearing in most communications regardless of the situation, while many are situation-specific, that is, used with certain people (friends, spouse, children, boss) or in certain situations (at work, in conflict, in fear). The figure 2 shows elements of engineers’ communications and procedures in communications. The figure bellow shows the importance of combining different communication pattern together [5].

Communications channels among engineers within a company are:

- **Literature** – Books, professional, technical, and trade fig:icebergModeljournals, and other publicly accessible written material.

- **Vendors, Customers** – Representatives and/or collateral materials of suppliers or potential suppliers of design components.

- **Technical staff** – Engineers and scientists in laboratory who are not assigned directly to the project under consideration.
- **Company research** – Any other project performed previously or simultaneously in the laboratory or organization regardless of its source of funding.

- **Group discussion** – Ideas that are formulated as the result of discussion among immediate project group.

- **Experimentation** – Ideas resulting from test or experiment or mathematical simulation with no immediate input of information from any other source.

- **Other division** – Information obtained from another division of the same company.

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**Figure 2: Elements of Engineers Communications [5]**

Social differences are presumed to carry over to the strategies used to gather information. Milewski explores the effects of national and regional differences on information-seeking among software engineers [18].
3 Model

The Model section represents an outline for the Example section. The Model section is represented by four parts. The first part is an introduction of the described company. The second part contains an example of software process used in the certain company. The third part describes an organizational culture of employees who follow the software process. The fourth part targets to employees, especially to their working process. Their behaviour and habits correspond to their nationality and mentality and cultural background.

![Figure 3: Iceberg Model](image)

3.1 Company Introduction

In the company introduction section I am going to provide basic information about two companies from which I derived software processes, organizational culture and where I was observing employees.

3.2 Software Process

A software process is also called a software development life cycle. There are various types of software processes. They consist of activities, methodologies, sources and tools. Combining all of these attributes with assuring their right order, the software processes
provide a standardized form how to successfully develop a high quality software prod-
uct.
Every company has to find their own software process that will fit to their needs. If a
company is able to determine procedures to develop software product after that company
can save money and risks by following this software process. In this level, a company
usually has a well-defined organizational culture and most of activities are planned and
projects are driven. Both companies which I am going to mention in the example section
are on this level.

3.3 Organizational Culture
I am going to mention organizational culture here due to many reasons. The most signif-
icant reason is the fact that both companies are project-oriented and should have defined
a similar organizational culture. Organizational culture consists of people with various
competences and it is convenient to put the right people to the right positions. However
people are influenced by many factors and that fact can reflect to software process. These
factors are written below.
Hofstede regarded organizational culture as the collection of values, beliefs and norms
shared by its members and reflected in its practices and goals. Results of several studies,
e.g. [11, 12, 13], have also suggested that organizational culture has a significant effect on
both - the successful implementation and the use of IT.

3.4 Employees Behaviour
I think there is the crux of the matter. If I want to find interesting aspects in software
processes in different countries, I have to focus on different location. Different location
creates different culture and culture influence human behaviour as I proved in the Re-
lated Work section. Organizational culture is made from people and people do activities
in software process that is why culture is interconnected to everything. I am going to
focus on employee's behaviour in which I am going to determine culture differences.
The culture is typically represented as iceberg [4] which contains visible and hidden
parts. The visible part consists of manifestations of culture that can be identified through
human senses. However, it only makes up a small portion as the largest portion of cul-
ture is invisible. This part illustrates beliefs and values that form and shape culture over
time. The iceberg model is shown in figure 3.

In this paper I focus mainly on patterns of hidden parts listed below:

- Communication among employees in a company. Organizational culture creates
  variant roles for employees along with responsibility and defining relationships
  in hierarchy. For instance the style of communication between colleagues and be-
tween subordinate and his supervisor is different.

- Environment which represents an area where employees work in or surroundings
  that somehow influence the men's working process.
• *Time* represents one's speed of living or establishing priorities to activities and other aspects.

• *Space* is a synonym to human values with relationship to culture. For example national sympathy with religion or nature, etc.

• *Power* relates to one's skills.

• *Thinking* of employees covers train of thoughts of people.

• *Individualism* of employees characterizes employees' esteem of individual activities and success versus the importance of their belonging to a social group.

• *Competitiveness* of employees represents a human characteristic and means a feeling to be the best one in a group of people.

The influence on these patterns is characterized in the second related work. Taiwanese are pointed out as reactive culture and Czech people as linear-active culture. Properties of the characterization are described there in details. I have taken it into account and compared it with my own insights from my visitations of the prospective companies.
4 Example

In this section I am going to provide particular examples of software process, organizational culture and employees behaviour. These examples relate to Czech and Taiwanese companies which I visited.

4.1 Lager – Taiwanese company

During my exchange program between universities, me and three Taiwanese students; we visited 4 times the Taiwanese – Lager company.

4.1.1 Company Introduction

Lager is one of the few companies that provide both core game technology as well as modular upgrade technology. The company offers easier software maintenance but also allow a more rapid upgrade frequency. Such technology makes Lager extremely unique and stays on the leading position of the online game arena in Taiwan. A distributed computing architecture is used to deal with users’ data. The users’ data is distributed to multiple servers, where the different data is computed in parallel and sent simultaneously to the terminal to complete data processing and internet transfer. Distributed system, Lager’s own innovation, allows thousands of users to enjoy online game at the same time.

The Lager company was established in 1999 and nowadays it has reached the CMMI level 3. Below there are written basic data about the Lager company.

<table>
<thead>
<tr>
<th>Year 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employees:</strong></td>
</tr>
<tr>
<td><strong>Capital:</strong></td>
</tr>
<tr>
<td><strong>Products:</strong></td>
</tr>
<tr>
<td><strong>Interests:</strong></td>
</tr>
</tbody>
</table>

Table 2: Lager Company Data

I made four visitations in the Lager company together with three Taiwanese students. During these visitations we talked with CEO assistant, project manager and senior programmer. The Lager Company consists of more than 250 employees divided to 4 departments which are located in different countries. Every department has couple of teams and every team includes various of roles of employees.
4.1.2 Software Process

Lager company has been producing online games for 12 years so they have sophisticated software process highly optimized for game industry. Usually a prime claim comes from game players. They are not satisfied with current offer of online games; they want to create similar game which will suit better for them; or they have a new idea for a new game. Creating a new game is not easy procedure. From the prime claim to distributive package it takes two to three years.

The figure 4 below shows software process model of online game used by Lager company. I have made comments to each step in the process.

Description of the Lager software process

The Lager software process model contains these steps:

Claim – The claim is the first signal to create a new game. This signal might come from investor, players' needs, etc...

Requirements – In this step, there is a demand to focus on main specifications of a new game given by a customer. Specifications may be: action game, fighting among spaceships in the universe, target to specific players, and unlimited number of players and so on.

Concept (Idea) – There raised a new idea from customer so he communicates with the Lager company about it. If both sides are satisfied a new accepted ideas are stored.

Concept Document – A concept document is made out. All stored ideas are written down. This step takes 2-4 weeks and 6-12 PW (people per week) work on it. The final version has got between 20 and 30 pages.

Concept Document Review – The created concept document is controlled by a customer and if there are mistakes or improvement suggestions then the concept document is returned to the Concept step. The Concept Document Review takes one week.

Formal Proposal – The concept document is enlarged by more detailed information. There are also mentioned business specifications as costs, target market, etc. The Formal Proposal Review phase takes 2 months and 10 PM (people per month) work on it.

Formal Proposal Review – After Formal Proposal step there is a Formal Proposal Review. It takes one week. There are three main aspects which may prolong this step: termination, improvement and time extension.

Developing Prototype – Prototype means a version of future product which consists of main functionality and presents a few examples of sceneries. In the game industry, for instance: model of hero of the game, a few monsters, movement of characters, punches and maps where the game takes place. Developing Prototype Phase takes 5 months and 50 PM.

Prototype Review – It is a conclusion of previous step within the scope of the company. It takes 2 weeks.
**Formal Prototype Review** – Takes 1 month and 10 PM. This step provides formal way of the previous step. That means, public is informed from this review about the progress.

**Developing** – In the last quarter, there is produced Close-Close beta version which is an offer to professional players for 2-4 weeks. They analyze the functionality, playability and other factors of almost final product. All user data from the testing will be deleted. There are also other important steps which have to be done in the last quarter.

Represents the main phase of building the functionality of the game. It is divided to 5 quarters and 4 of them have the same approach - 10 weeks of developing in 2-4 teams and 2 weeks writing documents what have been done and planning what has to be done in the next quarter. These 5 quarters take 15 months and 540 PM.

1. **Marketing** – The Company is trying to arrange all procedures to assure prosperity of the new game – decisions about the market place, about advertisements to game portals, billboards, leaflets and news, etc.

2. **Quality Assurance** – Checking the new created game and customer’s (investor’s) requirements.

3. **Operation Team** – Represents a team collected from selected players. Their opinions, feelings and suggestions are important for the game and may change appearance and properties of the game.

4. **Level disk** – This part is extending of the final game, for instance: a new map, new monsters and localization. The Lager Company translates their products to 10 languages. This procedure takes 3 to 4 months.

5. **Tuning** – If during the previous phases a new idea how to improve the game has arisen then in this phase it may be done.

**Product** – After last quarter the Close Beta version grows up. This version is provided to public and it is tested for stability by players. After 4 months of testing there is a stable version which is prepared for distribution and sale.

**Completion** – The stable version is distributed in CD, DVD or on-line. To this point, the whole process has taken 2.5 years.

**Clone** – A clone of the game could be created. The functionality or the main characters of the game are the same, but there might be added new monsters, maps, etc. The procedure of creating of the clone consists of Prototyping, Developing and Proposal phases.

**Documentation**

- **Review idea document** – consists of basic ideas of the new project. The scope is between 20 to 30 pages.

- **Review proposal document** – contains a design concept and major specifications like business specification. The scope is around 60 pages.

- **Documentation for next quarter** – this document is written by developers. It takes around 2 weeks and it consists of sequence diagrams and written text.
Figure 4: Lager Software Process
4.1.3 Organizational Culture

The organizational culture in Lager company is a hierarchic structure which specifies roles, their competences and reflects needs of the right placement of human resources in online game industry. In this paper I mainly focus on development software process so the figure 5 below shows just a characterization of development department. There are four development departments in Lager company. The main development department is located in Taiwan, another one is in Japan and one in Hong Kong and the last one is in Mainland China. Lager has many reasons to have a branch office in different countries, for instance financial reason or need to be closer to a potential customer.

Each development department has at least two teams. One team has forty people as maximum. One team approximately consists of ten programmers, ten designers and twenty artists and one project leader. There is no rule that one team has one project. Project leader leads many projects / tasks in one team and one project leader leads only one team. From the figure 5 is also visible that in each team, there are experienced employees who share important experiences and knowledge with junior employees. In addition there are other employees which do not belong to any team. They control all departments / teams whether they hold the original concept. For example design manager controls if everybody holds the original concept of the design requirements / models.

![Organizational culture in Lager](image)

**Figure 5: Organizational culture in Lager**
4.1.4 Employees Behaviour

I observed employees in Lager company as well as students in university to determine Taiwanese characteristics and behaviour. I was studying in Taiwan for 5 months and during this period I attended classes with Taiwanese students and also I communicated with other Taiwanese friends in non-university activities. At that time I noticed a lot of differences in comparison to Czech culture. When I focused on two groups (1. Lager employees, 2. last year university students) and compared their behaviour, in many cases it was the same. This indicated I separated the right culture characteristics. For instance, the surveyed people had a great authority to leaders and professors. Another example could be hiding mistakes to protect themselves, assiduity, and authority to foreigners and also that Taiwanese are not self-confident.

<table>
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<tbody>
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<td></td>
<td>24</td>
<td>0</td>
<td>70</td>
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<td>Core Technical Programmer (4)</td>
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<td>5.75%</td>
<td>1.50%</td>
<td>10.25%</td>
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</tr>
</tbody>
</table>

Table 3: Summarized Programmers Activities - Lager

I was observing colleagues from university during my lectures and collaboration on projects. During visitation of Lager company three of my colleagues from university helped me to observe and communicate with employees from Lager. As a team of four people we were observing different kinds of programmers in Lager Company. Every one of us had 2 subjects – 2 programmers for observing. The observation period took 100 minutes. We were focused on activities of these programmers and the duration of doing these activities according to their specifications. Summarized data was collected in the table 3.
Hence we visited Lager company during Close-beta version testing; the main activity of client and server programmer was testing a new game. Testing contained of playing the game (observing the functionality, looking for bugs, etc.) and chatting with other employees using MSN or built-in chat in the game. This is also a type of communication which is not visible from the figures 6 (represent data from table 3) at the first moment. Therefore the period of communication phase was longer than it is visible from graphs!

![Lager Chart]

Figure 6: Summarized Employees Activities in Graph - Lager

The observed subject – Server programmer administrator was monitoring activities (playing) of other server programmers (load, stability tests, etc.). Sometimes he left his place and in this time his activity was not clear because he went to other place with other employees and I had no possibility to continue my research for couple of minutes.

The core-technical programmers are responsible for developing, maintaining and testing a low level or core parts of the game. In the Lager company, every core-technical programmer has to have at least ten years practical experiences in programming and his work is not so connected to phases of software process. Even though we visited Lager company during Close-beta version testing and other types of programmers were mainly testing the game. For example, one of the core technical programmers was trying to use new technology and other was writing a programmer’s manual.

From observed data, the average communication period of an employee in Lager approximates to $\frac{3}{4}$ of time from his working period.

2 core-technical programmers were writing a programmer’s manual during observation. Almost $\frac{1}{2}$ of their working period they spent on writing documents. The other 2 observed core-technical programmers did not write any document. From these facts I as-
sumed that \( \frac{1}{4} \) of time, average core-technical programmer spent on writing documents. Other kind of programmers did not write any documents during the observation. The manager of Lager Company described in which period of developing a game different documents were produced (detailed description is in Software Process section).

During my visitation of Lager company, we were walking across the working area; we communicate with manager and meeting employees. Everybody was nice as all Taiwanese people are and they always tried to meet our wishes as they were able. Sometimes people were laughing and I have not heard an argue during my visitation. I felt good mood in the working area. The reason would may be that Lager employees likes on-line games and even during developing games they live for the game and enjoy the time of creating the game.

I did not see any competitiveness neither individualism in Lager. The reason may be that all employees are developing the same game and cooperate together for the same purpose.

It is rather difficult to analyse the thinking of the people in such a short time. But in general the Taiwanese people are positioned between the Linear Active and Reactive people groups (The meaning is described in Related Work section). All employees worked in open-space areas, there had some boardrooms which were used for group meetings. Every employee had a small cell – 1,5m2 which were surrounded by many small game creatures. There was a silence in an open-space, only sometimes two or three employees created a small group and discused to each other but regardful of others.
4.2 Tieto Czech s.r.o – Finnish Offshore Company

When I came back from Taiwan I have continued my studies in the Czech Republic, and continuously started to work at Tieto Czech s.r.o as a software developer. And, because I need to do a comparison - Taiwanese vs. Czech company - I asked in Tieto Czech company and made a presentation for my project leader and colleagues about my master’s thesis. They were interested in it and provided me answers on my questions.

4.2.1 Company Introduction

Tieto was established in Finland in 1968, at that time called Tietotehdas Oy. In the year 2004, Tieto started with offshore production in the Czech Republic. Nowadays, Tieto Czech s.r.o employs around 2000 employees in the Czech Republic. The main purpose that Tieto came to the Czech Republic is to be closer to a potential customer and also there are lower salary demands here. If I focus on cultural differences between the Czech Republic and Finland I come out from my five months of an exchange study in Finland and related work at the beginning of this paper. There is a little diversity, for example Finnish people are more polite, less communicative and more introvert. Despite of this diversity Czech and Finnish people are comprehension is very similar.

Tieto provides mainly IT services and product engineering. Tieto is one of leading companies in IT services in the North Europe but selected service provides in the whole world. Tieto uses ITIL which is the most widely accepted approach to IT service management in the world.

<table>
<thead>
<tr>
<th>Year 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employees:</strong></td>
</tr>
<tr>
<td><strong>Total assets (EUR million):</strong></td>
</tr>
<tr>
<td><strong>Main industries:</strong></td>
</tr>
<tr>
<td><strong>CMMI:</strong></td>
</tr>
</tbody>
</table>

Table 4: Tieto Company Data

Due to the fact that Tieto company has a wide portfolio of products and services I am going to just refer to a Network Inventory service. I have been hired as a software developer in Enterprise Solution unit which covers Network Inventory service. This service is provided for 9 big companies in Finland, Norway, Sweden and the Czech Republic. That
means there is needed around 150 people to develop, maintain, support, prepare offering and test for support the Network Inventory service.

The Network Inventory service focus on geographical information system, how to take an advantage from it which means:

- Data capture
- Store, manipulate, manage, and present all types of geographically referenced data
- Store, manipulate, manage, and present all types of non spatial data
- Data analyze
- Data interoperability
- Plant Maintenance integration (SAP PM)
- Asset management integration (SAP AM)
- Another customers' IT systems integration

4.2.2 Software Process

Tieto has CMMI level 3 that means Tieto has well defined processes, for this purpose Tieto uses web based application W2E (Way To Excellence). It follows base Tieto values:

1. Work together – by sharing the same ways of working, cooperation and collaboration is simplified.

2. Learn and grow – helps to achieve a lot of daily tasks more efficiently. Defined roles and responsibilities helps identify where employees need to improve, to play role, to develop them – used to improve how employees will work tomorrow.

3. Committed to quality - W2E is a collection of best practices helping to more efficiently work towards common goals and increase performance.

4. Care for their people and customers. W2E clarifies cooperation and defines responsibilities. This leads to less misunderstandings and helps to trust and respect colleagues. Using W2E employees work together, company become stronger and can deliver what is needed for customers to be more successful.

The structure of W2E is defined to four levels. It covers all kinds of work in Tieto - both internal as well as with their customers. The top level consists of 11 process-groups. Within each process group there are processes, sub-processes, activities and tasks, and some of the activities and tasks are explained in more detail by the help of methods, guide and handbooks. The figure 7 shows process-groups. These process-groups represent a life cycle of new business which means in simple form:
Figure 7: Process-groups of W2E

1. Business man does an offer to a customer.
2. Delivery manager approve a proposal and control started project.
3. Line managers and project managers organize a team of qualified employees and control sub-projects.
4. When the product is developed a completion certificate is written down and product is delivered to the customer.

Each of process-group contains list of processes. There are plenty of them however for my purpose the process of software development I am going to show on the figure 8 below. Each step in the software development model is described by a few sentences.

Description of the Tieto software process

Offering management - Offering management is in Tieto well-described and sophisticated process. There can be written a lot of information about theory and application of but I would like to mention it just as a brief introduction.

The purpose of the offering development and management process is to develop world class standardized products, bundle pre-defined solutions and describe working models which enhances the customers’ perceived values of our offerings as well as
enabling the corresponding product delivery capabilities with defined quality and efficiency.

A product in this context is used as a common word to reflect competences, software and hardware goods that fulfil a customer need. Product includes one-time deliveries as well as continuous deliveries. A product shall be seen as the smallest building block, which together with other products forms a holistic solution.

The delivery format might be in the form of individual consultancy hours, as a project, as a managed service, delivery of software and hardware goods etc.

The output from the process is primarily used in the sales and marketing processes but corresponding preparations and ramp-up of delivery and support capabilities are included as well.

Offering development and management within Tieto have an industrialized approach.

- Enables the company’s strategy and vision, by executing the processes in which the product, solutions and models are identified, planned, developed, supported and managed.

- Handle both sustainable continuous incremental improvements as well as breakthrough innovations.

- Balance the outside-in and inside-out perspectives, to secure that the expected customer value benefits, as well as the defined internal efficiency and quality targets are achieved.

- Is based on a lifecycle perspective, where the balancing of short and long term requirements of the return on investments is highlighted.

**Domain definition** - The purpose of the Domain definition process is to produce enough business and domain information (requirements, architecture, and plans) for the software development work to be run successfully.

**Define software requirements** - Collect and document the software requirements of the project based on system requirements, customer input and internal input. The requirements must be fully elaborated in fixed-price projects.

**Analyze software requirements** - Review the requirements to understand the stakeholders’ needs, expectations and constraints. In many cases the requirements are already defined by the customer. The requirements review is then extremely important task.

**Decision: Approve software requirements** - Approve the software requirements for this project. Establish Requirement baseline.

**Plan re-use**

- Components to be re-used in this project.

- Components from this project to be re-used elsewhere.

**Specify architecture / Verify architecture** - Specify the architecture of the product by utilizing guidelines and reference solutions including:
- Architecturally significant requirements.
- System decomposition.
- Element relationships and their characteristics.
- Non-functional characteristics.
- Design instructions.

The architecture documentation must be elaborated on a detailed level for fixed-price projects.

**Tailor process** - Familiarize with the requirements in order to understand the scope of the project and to be able to tailor the process to meet the needs of the project.

**Agile software development** - When there is an impact on the organization, the software development process starts with definition of the requirement scope for the domain and the architecture of the domain. This work (Domain definition process) is typically done before the actual software development project starts.

During the Software definition process, the requirements on the software system are defined. The technical solution is defined and verified. A software definition life-cycle is selected and software development process is tailored to fit the pre-requisites and needs of the project. All this is done as part of the preparatory phase of a delivery, e.g. in a project it is integrated with the Project management Initiation sub-process.

During the Software construction process, the requirements are designed, then constructed and tested to produce an output as per plan.

During the Software acceptance and hand-over sub-process the customer accepts the software system, the development team hands over the responsibility, and archives the results.

**Life-cycle specific** - The Agile software development life-cycle starts with the initiation of the scope of a delivery from software development perspective and tailoring of the software development processes to fit in the delivery’s use based on the organization’s standard life cycle models. All this is done as part of an initiation phase of a delivery, e.g. in a project it is integrated with the internal initiation sub-process.

The Agile requirements engineering covers the gathering, analysis, documentation, verification and validation of both the implicit and explicit software requirements from the Orderer (i.e. customer or internal orderer) and possible other stakeholders (e.g. developers, testers). The sub-process ensures that all orderer needs are covered as part of deliverables. The needs could be related to satisfying user functionality, interfacing with already existing software(s), taking care of the standards, conventions, security and reliability. It also covers performance, maintenance and portability related issues.

During the Agile architecture & design sub-process the solutions to satisfy given requirements are selected and designed. Also the necessary information for further design, integration and verification are prepared.
In the Agile detailed design & implementation sub-process a standardized approach is established and maintained to detailed design, software coding and design implementation.

After the implementation the code is integrated and the testing performed on the product/system in order to validate the build. The goal is to identify integration issues as soon as possible so they can be corrected easily.

When the solution is ready for delivery, the acceptance testing is performed. After successful passing of the tests the solution is delivered and deployed to the Orderer.

**Define technical standards** - Define user interface concept for the product, including:

- User interface style.
- Main views.
- Interaction style.
- User interface design instructions.

User interface design needs to be reviewed by users. Define coding standard and what user documentation and training that are needed.

**Set-up tools & systems** - Plan tools to be used in the project based on the customer and internal requirements. Request access rights for tools and systems.

**Demonstrate system** - Demonstrate the working system to the customer. If there are any problems encountered while installing and/or specified by the customer, document them. Run acceptance tests to the project’s deliverable as planned.

**Manage and fix defects** - Analyze the reported defects and fix defect according to the acceptance criteria of the project.

**Provide support & training** - Provide support and training to the customer as planned in the project so that the customer can assume responsibility of the deliverable.

**User Docs and Localization** - Handle localization tasks as planned in the project. Write help files and other user documentation as planned. Finalize all technical documentation (architecture, design, test specs, maintenance instructions etc.). Deliver finalized agreed documents to customer.

**Hand-over release** - Hand-over the release responsibility to operations and maintenance organisation. Hand-over responsibility of the release to customer.

**Decision: Install and archive?** - Decision to install the customer approved release candidate as the official release in production and archive it.

**Install release and archive deliverable** - Distribute and install the release in production. Update configuration management database with release details. Archive the deliverable; freeze baseline in version control system, clean up and archive project documentation and e-mails. Archive re-useable components in dedicated repository.
Network Inventory Service
As I mentioned previously, I work in Tieto as software developer in Network Inventory unit which supports Network Inventory service. Tieto is customer oriented company and tries to satisfy every customer requirement. In this case software processes has to be tailored to particular customer.
Tieto Company
Software Process Model

Figure 8: Tieto Software Process
4.2.3 Organizational Culture

In Tieto, there are two organizational cultures. The purpose is to divide to financial and production responsibility. I am focused to the production responsibility, it is a matrix structure organization. This type of structure brings advantages as follows:

1. **Transparent roles of employees** – transparent hierarchy structure of employees which is supported by lucid programs that enable each employee to see the whole structure of employees in units.

2. **Well-arranged dispatching of employees to a project** – Line manager has a view of his subordinates and is able to help to a project manager with looking up the right person for his needs.

3. **Higher protection of employee’s rights** – Normally every project manager has a team of people and each of them is liable for his work to the project manager. If project manager and a member of the team have a problem there is nobody who can solve it. In the matrix structure, there is a line manager who can do it.

Network Inventory Service / Enterprise Solution Unit

As I mentioned in the previous section, I was hired as software developer in the Enterprise Solution unit to support Network Inventory service. Generally the organizational culture in Tieto is connected with projects. There are many of departments as it is shown on figure 7 (W2E process-groups) and these departments represent services, for instance Marketing and Sales, Offering and Competence Development, etc... The whole organizational culture is too huge to cover up it all. In figure 9 I made an example of Enterprise Solution unit however other development unit would have similar organizational culture. There is a short description of roles in developing team and its specification which refers to the figure 9:

1. **Software developers**

   The Software developer verifies the specified architecture, and assists the Project manager to: analyze the software requirements, tailor the standard SWD process, and create technical standards.

   The Software developer demonstrates the working system to the customer, manages and fixes bugs, and assists the Project manager to create the release candidate and produce the software.

   The Software developer is a typical part of a Development team, and is therefore sharing the responsibilities with the other participants in the team.

2. **Project managers**

   The responsibility of the project manager is to coach the development team and remove impediments, so they can complete their tasks and achieve the sprint goal.
The project manager also makes sure that the team adheres to the agreed practices (including the project defined process). Impediments and non-conformities are escalated if needed. The project manager also facilitates meetings; send invitations, book premises, and run the actual meetings.

3. Developer Team

The Development team is responsible for implementing and verifying the changes to the software and other affected artefacts (such as technical documentation, user documentation, test cases, plans and reports) as defined by the items in the product backlog.

The Development team modifies configuration items and participates in baseline audits.

The Development team monitors its progress compared with the plan (sprint backlog). They are also responsible for carrying out the sprint planning meetings, daily stand-up meetings, sprint review meetings, and sprint retrospective meetings.

The Development team consist of the people needed to develop software and related deliverable. Several of the following roles are typical part of a Development team: Analyst, Software architect, Test manager, Software developer, Test engineer, Technical documentation specialist, Tool specialist, User experience designer and Technical documentation specialist.

Documenta**

Developers who support the Network Inventory Service mainly write down user manual and developer manual. They of course maintain readable code with comments. If a customer requires another type of documentation (diagrams, models, specs, etc.) they are able to provide it, if not these documents represents the minimum.
Figure 9: Organizational Culture in Tieto Czech s.r.o
4.2.4 Employees Behaviour

Tieto Czech s.r.o. employs around 2000 employees. I work in Enterprise Solution unit which consists of 150 people. Daily I meet around 15 people and in some occasion at most 50 people. Other people are in a different building, town or country. In the building where I work, there is no open-space area but there are small offices for 3 to 5 people. I occupy our office with 2 senior developers, one senior consultant and one lead developer. I was hired to Tieto Czech s.r.o. six months ago so I was able to observe behaviour of employees who I was meeting most often. I also discussed the software process, organizational culture and employee's behaviour with my project manager who made interesting comments and gave me comprehensive answers to my questions and remarks. One of his interesting comment leads to Czech behaviour – trying to move someone's responsibility to someone else. May be it can be defined as foxiness or laziness.

In Tieto Czech s.r.o., I did a similar observation as in Lager company. I was observing working processes and people behaviour every day so I drew up a table from it as well. My day shift takes 8 hours and I still attend Tieto Czech s.r.o three days in week hence I am still a student on full-time study program. From those 8 hours I spend 5 to 6 hours solving issues, developing programs, read docs or write docs. The rest of time I discuss with colleagues, attend meetings, fill internal supporting programs and take a rest. From my observation, me and colleagues communicate at least one hour per day verbally or by chatting. Normally me and my project leader have one to two meetings every week. In these meetings, we discuss finished tasks from last week and project leader gives me new tasks for the next week or updates the old ones. I have another meeting with my line manager. This kind of meeting is approximately one per month.

All of these meetings and supporting programs help Tieto to lead employees (projects) and keep employees' data, attendance, needs to be updated and fresh. It is crucial for that huge company as Tieto is but also brings wasting time of employees with the administration.

In general Czech people character is defined: sense of humour, good improvisation skills, foxiness, hard-working, envy and not so much toleration [6]. Most of them are consequence from the Czech history. In spite of it Tieto tends to find a specific type of people when they hire new employee. This is the task for Human Resources department. The new employee has to be a team player, positive, and he or she has to meet other characteristics which are known only for Human Resources department. Tieto also provides many benefits and education programs to motivate employees.

I made a similar observation in Tieto Czech. I observed Czech employees for 100 minutes during their working period. I was observing six different professions: Senior Consultant, Senior Developer, Junior Developer, Leader Developer, Server Administrator and Database Specialist. I am going to describe working process of each profession in few sentences with respect to Business Intelligence unit of Tieto Czech company.

Senior Consultants mainly communicate with managers and software developers. They prepare offering for new project, discuss current solution with managers and project leader. They are also a representatives of Business Intelligence unit in discussions among
other units where they provide information about all solutions that Business Intelligence unit offers.

Senior Developers code and test new functions of software. They discuss with junior programmers and teach them. They know particular products in details and drive the design decisions. Senior developers are responsible for writing documentation.

Leader Developers lead other type of developers. They also code and test new developed functionalities and fix bugs. Leader developers are also responsible for writing documentation such as programmer’s manual.

Junior Developers mainly code and test new software functionalities. They are leaded by Leader Developer however they can discuss difficulties with both Leader Developer as well as Senior Developer.

Database Specialists care about databases. They use database management software and set up databases to meet needs. Database Specialists assist with transfer of data, test the effectiveness of databases, modify and adjust database performance and resolve database problems.

Server Administrators take care of the overall control of servers. Their role is to design, install, administer and optimize company servers. They also monitor activities of servers and software that is running on servers.

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<td>0</td>
<td>14</td>
<td>8</td>
<td>7</td>
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<td>7.83%</td>
<td>7.00%</td>
<td>9.33%</td>
<td>11.33%</td>
<td>3.83%</td>
</tr>
</tbody>
</table>
Table 5: Summarized Programmers Activities - Tieto

I found mutual characteristics of Czech employees behaviour in my observation in Tieto Czech company. Czech employees are very ambitious but on the other hand they are rather lazy and look for a way how to make they work as much easy as it is possible. They do not have problem to share information and have a sense of humour. Motivation is the engine which persuades them to work on tasks. Authority is not so strong for them. Their working area or work-table is adapted to their feelings.

Communication of Czech employees is 15.75% as you can see in table 5. However I have to recall that in Lager company I only observed different kinds of developers. If I focus only on communication period of developers in Business Intelligence unit of Tieto Czech I will get only 10.67%.

There is another interesting fact. As everybody knows internet is great a tool for searching information and can be really useful search for right answer of some question. On the other hand some information on web pages like advertisements and news could be noisy for the searcher and they can easily interrupt him from his working process. After that the surfing activity changes to resting activity. In this case the period of resting activity is higher than 11.33%. The graph 10 represents summarized employees activities in Business Intelligence unit of Tieto Czech.

Tieto has many standards and studies because it tries to improve processes and knowledge in company. One of these study is about successful communication and in simply form is described below.

Successful Communication

Communication needs (list borrowed from MaPIT project)

- **Informing** - corridor information missing – give reasons, background, context
- **Monitoring progress and providing transparency** - regular meetings, progress reports, frequent deliveries
- **Problem solving** - clearly defined contacts for problem solving, discussion forums (barrier to ask, delay in answer)
- **Giving feedback** - PROVIDE - not only negative as input for improvement - positive crucial as motivating factor , PAY ATTENTION to
- **Relationship building** - personal relationship to support understanding and trust
Figure 10: Summarized Employees Activities in Graph - Tieto

Figure 11: Communication in Tieto- W2E
5 Conclusion

As I mentioned in the introduction, I am trying to find out which aspects of the cultural influence are positive or negative and it may be a key to improve maturity of software process. The Model section described how I want to determine these aspects – by investigation of organizational cultures, software processes and employees' behaviour. I did two investigations, one in Taiwanese company and one in Czech company. I described these investigations in Example section. Now I am going to make a conclusion from investigations and summary of both cultures.

Czech Culture Summary

The Czech Republic is located in the middle of Europe. The history of Czech nation is stigmatized by German intrusion and Russian occupation which took many years and it meant decay for the Czech Republic. Nearly 50 years of being directed by the Soviets had left a legacy of lassitude and avoidance of responsibility. From that time, Czechs are still searching their identity. The history changed thinking of Czech people and many of their characteristics react to it. For instance: lack of self-confident, low authority to leaders, foxiness and black and dry kind of humour. The Czechs are also very hard-working. Using data from EU Labour Force Survey (EU LFS) 2007, the Czech Republic and Iceland have high scores on working overtime and working long hours. If I focus on Czech employees. Here is a list of their key values:

- a little bit less communication (more factual),
- if they do a mistake, they are not happy even though it is not a big deal,
- supervisor's order is not everything, they need be motivated (there are always questions: why I should do it, what is the purpose, will I have a benefit from it?),
- low authority to leaders, masters, seniors, etc.,
- lack of self-confidence,
- flexibility,
- passive resistance,
- discipline, steadiness but also foxiness,
- rationality and morality,
- individualism and creativity.

Czech employees do not like working in a stress area, they prefer small offices for a few employees than huge open plan office for plenty of them. Czech people are not so much tolerant to each other and demand suitable conditions for their work. Generally working hours are between 7:00 A.M to 3:00 PM.
On Geert Hofstede it states that the masculinity in the Czech Republic is a little bit over 50 percent. Low salaries according to high cost of living force women to earn money as well. Men are opening up to the conventional division of sex roles. The Czechs are soft speakers who communicate in a thoughtful manner and they do not make a rapid conclusion. They are also dutiful and polite listeners. They rarely interrupt and give a little feedback. They often use sarcasm. If a discussion tends to be too large or roundabout they usually lose attention. Czech negotiation is contemplative, practical and rational. They take time to find the right solution but not so long. The solution has to suit all concerned.

Taiwanese Culture Summary
Taiwan is a mountainous island lying only a few hundreds kilometres from mainland China. Taiwan was colonized by the Dutch and later became a part of China. After China’s defeat Taiwan was possessed by Japan. However Taiwan reverted back to China’s jurisdiction in 1945. Nowadays Taiwan is one of the largest IT hardware producers. Taiwan is ahead of China in various measures but Taiwan’s software industry cannot be considered as a success on the other hand Taiwan’s IT hardware industry is on the highest level.

The mentality of modern Taiwanese is still shaped by teachings of Confucius. The main Confucian thought is obedience and respect for supervisors and parents, duty to family and employer, loyalty to friends, humility, sincerity and courtesy [3].

Taiwanese belong to reactive culture whose people prefer first to listen to the other’s position and then react to it and make their own point of view. They are one of the most courteous people in the word, especially toward foreigners. These two facts sometimes cause problems for foreigners because Taiwanese might say what they think a person wants to hear, whether it is true or not. Taiwanese are not known for their creativity, but among their characteristics belong humaneness, geniality and sense of honour. If I focus on Taiwanese employees, here is a list of their key values.

- very communicative,
- hide their mistakes or disability, are afraid of losing their face,
- approvingly waggle with their heads on everything,
- great authority to leaders, masters, seniors, etc.,
- are not self-confident,
- not individualistic and creative,
- modest.

Taiwanese discussion is patient and courteous and everyone protects everyone’s face. This leads to slow decision making. Taiwanese listen carefully and they do not interrupt anybody. The manner of the speaker is more important than the content. That is why speaker has to create a feeling of trust with the audience to carry his point. Taiwanese
belong to a collectivistic society, in which people are integrated into strong groups. Taiwanese team members can work together in harmony and do the job in great care. The problem arises when someone wants to give a negative feedback to a Taiwanese in a way of preventing from loosing his face.

**Total Summary**

In the Czech and Taiwanese culture summaries above, I mentioned history and location of each nation because it plays important role of people behaviour. After that I added a list of cultural characteristics and I also pointed out some hidden characteristics of each culture as it is shown in iceberg model. I will further use these summaries in the Discussion section and on observations which are described in the Example section of this document. The first one was made in Lager – Taiwanese company and the second one was made in Tieto Czech company. Now I am going to compare observed data and do an insight.

Taiwanese developers’ communication period as a contrast to Czech developers’ communication period is two times longer. This might be caused by the general fact that Taiwanese are very communicative nation.

Another point which can be visible from table 3 and table 5 is that if we compare total percentage of surfing on internet and resting activities then the Czechs take a rest longer then Taiwanese. (I suggest that some part of surfing on web pages do not belong to given task.) Czech resting activity period approximates to be two times longer than Taiwanese one. I think it is compensation of communication deficit (searching information on the web) and also longer resting gives them a chance to relax more and then start working roundly.

Various cultures have different way of understanding and recording of information. Documentation helps to write down useful information during all phases of new product, for instance: requirement specification, design analysis, different types of reviews, user manual, etc.

The period of writing documentation of Czech employees takes only 8% of total time of observation. If we compare it with Taiwanese one (= 14%) we will get big difference. This might be caused due to fact that I observed Larger employees during close-beta testing phase. During this phase is insisted to write vary kinds of documentation.

Coding and testing activities are the main activities of developers. (Usually there are Software Testers who test software according to user requirements, however in Lager and in Business Intelligence unit of Tieto Czech; there are no testers so developers have to manage it.). Figure 6 and figure 10 show these two activities represent the largest parts of graphs which correspond to the assumption.

There is not so big diversity among reading and monitoring activities periods. Czech and Taiwanese developers spend similar time on these activities.

The organizational culture in both companies is project oriented where project leader leads subordinates in one or more teams. In Tieto Czech, the organizational culture is extended to a matrix representation which means that there is one more person – line manager who cares about all employees in a particular unit and borrows these employees to project leaders for projects. The matrix representation much more fits to Czech
culture because in a case when subordite disagrees with his project leader there is still
line manager who can solve their conflict. This case cannot happen in Taiwanese culture
because Taiwanese respect leaders and disagreement is unlikely. Czech IT companies
provide flexible working hours for their employees and they also expect creativity and
cooperation as well as discussion in teams. The making decision process is an activity
divided to all participants and the best solution is chosen. Greater authority of some par-
ticipants is not taken into account. This is a difference according to Taiwanese decision
making process. Taiwanese respects opinions of older people and supervisors. Subordi-
nates also prefer to execute supervisors command against providing their own creativity.
From the Hal Hosftede work, Czech and Taiwanese people belong into results oriented
cultures, which means they are comfortable with unfamiliar situations; they put a lot of
effort to overcome challenges.

If I focus on software process of both companies there is no need of an improvement
of them because both companies know perfectly their processes to achieve the best quality
for reasonable price. Problems could arise in multicultural cooperation on a project,
especially on particular activities where the communication is a key factor.

Now I am going to mark out activities of software process that are most influenced
by multicultural cooperation:

- communication between project leader and his subordinates,
- internal communication among branch offices in different countries,
- appropriate communication with a customer (for instance requirements specification),
- communication inside the team and
- customer support.

Professor Philippe Kruchten led a project called “Intercultural Factors in Global Soft-
ware Projects” where he examined how the cultural factors influence global software
development. The aim of this project was try to extract incidents in software processes,
in which part of the lifecycle these issues arise and what artefacts are affected. One of
these issues is The-customer-is-king pattern.

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 (represents the Czech Republic) may allow direct and open communications be-
tween the developer and the client, for instance, via customer-on-site practice promoted
by agile methods. On the contrary, in culture, where hierarchy is high (represents Tai-
wan), the developer reports the problems to the management. Then the management
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 com-
munication being ineffective due to the layered communication.
In the previous few paragraphs I summarized information about Czech and Taiwanese cultures. I would add a few remarks which I observed during visitations of Czech and Taiwanese companies.

In general Taiwanese companies should call attention to their employees that the detection of mistakes in the initial phase is much cheaper than in later phases of development product life-cycle. They should explain them that mistakes or disability are not big deal. Mistakes can be immediately solved with no punishment and disability can be delegated to someone else.

Czech companies should motivate their employees by the right way. Openness and friendship may be the way. Tieto has a program called Tieto Values which defines main ideas how to achieve best quality, transparent communication and good relationship. Afterward Tieto employees have clear imaginations of company targets according to this program. Tieto also gives a space for internal communication and development discussion to assure employees’ goals and satisfaction. Tieto also provides basic information about cultures which most employees belong to. This information could be found on Tieto intranet web pages. Tieto has a program for new comers which informs about cultural diversity. Tieto is active in close to 30 countries with approximately 18,000 employees. In the program, there is a discussion about culture in general after that it focuses on the unique characters of some of the countries where Tieto has spread (Sweden, China, India, Germany, and the Czech Republic) and at the end it includes tips for acting correctly in the multi-cultural environment.

In both companies, software processes are tailored to their particular industries, customer requirements are keeping improving for many years. The organizational cultures are created with the best effort.

On the example of two different nations in this paper I wanted to show, how it is important to take into account cultural diversity. Culture influences people thinking, manners, behaviour and communication style. Companies that want to reach out international trade or hire foreign cheap labour force need to focus on cultural diversity because every two cultures are different.

For instance, there is a company which wants to expand abroad or start an international trade. It means a communication with foreign customer or communication between local and foreign developing teams. After that grows a need to focus on a culture difference. Otherwise the company risks financial, communication problems or loosing foreign business from misunderstandings. On the other hand if the company focus on a culture difference than it is prepared and knows what to expect and how to communicate and behave to a customer or between cross-cultural developing teams.

Czech and Taiwanese cooperation
An interesting imagination of cooperation in an intercultural team could be done on Czech and Taiwanese cultures example. I am going to focus on issues that may arise in virtual team which consists of Czech and Taiwanese fellow-workers.

The assumption is that all fellow-workers are selected by Human Resources department in a respect to high level of cultural awareness and sensitivity of all members and
also all members have to be able to communicate in international language. (Meanings of cultural awareness and sensitivity are described in Discussion section.)

Nowadays Agile-based methods become more and more popular. It represents a software process model which is flexible for customer because it provides a possibility of continuously changing of requirements during all development phases. This model brings a frequent communication with customer on meetings with team of developers. The Czechs belongs to less hierarchy dominant culture so they like direct and open communications between the developer and the customer. On the contrary Taiwanese belongs to high hierarchy dominant culture so developer expects orders from supervisors and they do not like to propose their own solution. That may lead to a problem that just a Czech team member will share their remarks and propose a solution to project leader but Taiwanese will expect that only a project leader will estimate a solution and when he do so they will execute it. The Czechs are more individualistic and their productivity is higher if they are motivated (for example by proposing a solution and then trying to solve it).

Another issue could arise in a case of giving a negative feedback. The Czechs do not hesitate to give a negative feedback to other team members and they also expect any feedback from the others. On the contrary Taiwanese abstain of giving a negative feedback. They want to spare somebody from loosing face and as well as they are scared from loosing their faces. Team leader has to have a knowledge base of both cultures and he has to know how to behave and communicate with team members. He also has to know how to motivate team members and count with losing-face factor that may lead to hiding mistakes or hiding disability to solve given task.

![Diagram](image)

- Black color represents a ratio of Taiwanese in the virtual team
- White color represents a ratio of Czechs in the virtual team

Figure 12: Distribution of Czechs and Taiwanese in the virtual team.

If I focus on a ratio of distribution of Czechs and Taiwanese in a virtual team, there can be made 5 base types of distributions which are shown in figure 12.

Now I am going to make an assumption of a cultural distribution influence on the virtual team for each type of distribution:

1. Only a few Taiwanese members in the virtual team – Czechs represent the majority, they are creative and individualistic. They collaborate freely in the team. Taiwanese expect orders from a project leader and work hard on a given task. In a meeting Czechs support decision making process with project leader and Taiwanese regardful wait for the final decision. The cooperation is very good and effective because Taiwanese are very tolerant nation with a respect to foreigners.
2. **Taiwanese minority in the virtual team** – Taiwanese start to make clans in which they communicate with origin language. It creates an isolation between Czechs and Taiwanese. It may bring conflicts as well as bad mood in the team. Czechs might also expect more creativity from Taiwanese members. The cooperation is little bit worse but project leader with high cultural awareness and sensitivity precedes and solves conflicts between cultures in the team.

3. **Half and half** – There is the same amount of members from both cultures. In an unbalanced distribution always happen that minority has to conform to a little to majority on the contrary this kind of distribution brings a need of high cultural awareness and sensitivity of all members of the virtual team to assure good cooperation.

4. **Czech minority in the virtual team** – Czechs start to make clans in which they communicate with origin language. It creates an isolation between Czechs and Taiwanese. Czechs are creative and invidualistic so they should do a profession which allows them to collaborate on decision making process. If the project leader is a Taiwanese he should make a free space for Czechs’ comments and remarks after that the cooperation between Czechs and Taiwanese could be good.

5. **Only a few Czech members in the virtual team** – I am not sure that this distribution could be good. It mainly depends on the project leader and his awareness and sensitivity of Czech culture. Czechs are not as tolerant as Taiwanese and this kind of distribution presses Czechs to conform to Taiwanese culture a lot.

In all kinds of distribution, there might happen that members of the same cultures will make clans and it may create an isolation and also conflicts in the team. The solution might be to prevent making of clans, that means create pairs in which each pair consists of one Czech and one Taiwanese. Members of each pair will solve a given task together.

One of the main risks in this new scenario is cross-cultural management. Conflicts and misunderstanding may arise unless people learn how to interact in a harmonic way with persons from different cultures. Mentoring, both formal and informal, is a way to bridge the gap between people. In a scenario where many organizations present multicultural workforce even though they do not embrace (Global Software Development), mentoring may be a way to influence people’s culture. Cristina Casado-Lumbereras, Ricardo Colomo-Palacios, Pedro Soto-Acosta and Sanjay Misra presents an exploratory study of the influence of mentoring on this IT workforce [14].

I made an assumption of a culture distribution influence on the virtual team however it is just an assumption that gives an area for future research. How the culture influences organizational culture and how it influences software process improvement are another areas for future research. These may represent an extension of Chiao-Ching Shih, Sun-Jen Huang work [15].
6 Discussion

Globalization, cheaper labour force, larger market, the vicinity of the customer, and wider IT-experts pools are driving software organizations to offshore software product development [16, 17].

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 are situated at different geographic locations collaborate and cooperate in global software development and development teams. Software development is seen as a global activity and consequences of 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 [7].

Business environment becomes multicultural; it consists of customers and employees of the organizations from various cultural backgrounds. These people, often unaware of each other’s different beliefs, values and manners, are interacting and communicating on a daily basis. The lack of knowledge of cultural differences brings many problems in communication, causing smaller or larger failures, resulting in lack of trust among team members, misunderstandings, misinterpretations and unwillingness to communicate, etc.

Good knowledge management practices are a major success factor for software development, influencing software quality and team performance. Being a challenge even for co-located teams, knowledge management can get much more difficult in global contexts. International teams have to cope with a multiplicity of organizational, temporal, spatial, legal, national and cultural barriers, which can affect the development pace and the quality of the software [19].

The major problems and challenges in global software development are:

- strategic issues,
- cultural issues,
- inadequate communication,
- knowledge management,
- project and process management,
- technical issues,
- lack of trust and willingness to communicate and
- time difference.

Some of them occur because of the physical separation among project members. Another reason could be lack of cultural awareness and sensitivity. That brings a new term - cultural intelligence.
Cultural awareness and sensitivity
Peterson 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 your own behaviour 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 behaviour. Sensitivity to other cultures must be demonstrated through positive behaviour, showing respect and interest in other’s culture.

Cultural Intelligence
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. 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.

Software development models
Traditional software development uses a Waterfall model which is based on determination of customer requirements in the initial phase. In the further phases cannot occur any change of requirements. This model was modified to Incremental and Iterative models. These models are more flexible to customer’s requirements changes during development phases. Nowadays Agile-based methods are the most preferred due to customer’s ability to change requirements constantly. Being cultural sensitive approach causes also challenges to agile development. Agile-based methods brings an advantage of constant changing of customer’s requirements but on the other hand it increases communication; internal (often team meetings) and also external (between customer and developer team). This kind of development may cause issues for software developers from different culture backgrounds:

- The first key issue is exchanging ideas and giving feedback on the daily basis. For instance Taiwanese expect management to run business and developers carry out the instructions. The developers might not be willing to contradict manager or customer ideas. On the contrary Czech people prefer to join the meetings and add comments and remarks; they are much more motivated if they can propose their solution or discuss problems with others.

- The second key issue might be with rapid and small releases. Developers from Japan or Anglo-Saxon cultures might feel frustrated to start development without a detailed, thorough plan.

- The third key issue could happen if client is of Short-Term oriented culture and vendor comes from Long-Term oriented culture. (Long-Term Orientation versus Short-
Term Orientation dimension is about investing long into the future versus goal to get fast results. “Long-Term Orientation” and “Short-Term Orientation” terms are defined by Hofstede). 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.

- The last but not least key issue is the right understanding of customer’s requirements. Supplier has to be ensured that he understands in the way as customer expects. If the supplier and the customer come from very different cultural backgrounds, it is difficult to make sure that customer expectations will be understood very well. This problem in global software development 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 the same) and the coding and testing parts are done in offshore organizations.

**Benefits of culture recognition**
Recognition of cultural issues in software engineering processes can be beneficial for a company at various areas:

- detection and understanding of risks that intercultural cooperation brings,
- fortifying a knowledge base of culture diversity to improve internal and external communication and would serve as a tool for teams and management of the organization in preventing and solving cultural problems,
- providing cultural trainings for employees to improve cultural awareness and sensitivity in intercultural teams.

By continuous 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 a cultural competence through intercultural interactions and develop its cultural intelligence, and thus increase the effectiveness in doing business globally.

**Public Global Cultural Knowledge Center**
Rasa Statkaityte proposes an idea of establishing a Public Global Cultural Knowledge Centre in his master’s thesis. He sees a future in an online tool called Public Global Cultural Knowledge Centre that has a 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 Centre would be a tremendous assisting service for multicultural organizations, providing rangy knowledge on cultural matters and help us in understanding each other better [10].

I really like his idea because there is not such an online tool nowadays. If we need information about different country we can visit Ministry of Foreign Affairs of the Czech Republic. However there is only basic information about the country and how to entry a country. We cannot find information about cultures, how to behave and communicate in
a different country. If a company needs this kind of information then the company has only option to train their employees by training programs in some specialized firm.

It can happen that somebody from the Czech Republic or Taiwan will read this paper and will not agree with mutual culture characteristic I mentioned, that it doesn’t fit to him or her. It can be explained that his or her personality much more influences his or her behaviour and thinking than culture however not in all cases. In addition I focus on people from general view not on few individuals whose personality outweigh culture influences.

Jiří Kavulák
7 Literature


