Standardization in Agile Projects

Research Study Conducted Within the Taiwanese Software Industry

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AKNOWLEDGEMENT & DEDICATION

Before heading further in this thesis there are many people that has been a part of this thesis work in helping me to be able to finish my report. First of all, my Supervisor Anna Hornström who gave me the right knowledge, directives and support, but also the possibility to experience something that can be classified as invaluable through giving me the possibility to go to China and Taiwan.

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Moreover, I have to give great thanks for the company representatives that took their time for interviews and hence also gave valuable knowledge for this research area. Lastly, I will give great thanks for all other people that I have either met or have helped me in some other way to be able to reach the final result of this thesis work. In this way, nobody has been forgotten.
ABSTRACT

Due to the increased globalization today organizations needs to be more changeable to the constant changes that appears on the global market today where both opportunities as well challenges have to be carefully considered. The new economy emphasizes a new way of producing customer value where the work nowadays has transited over to more information and knowledge oriented market offerings in which the work becomes more complex to carry out in higher extent uncertain environments ever experienced. The product characteristics has radically changed from the traditional standardized product into products inferring a higher extent customization where tailor made products governs the thinking to precisely and specifically satisfy the disperse customer demands on the market. Especially the Software Development industry can be considered as a vital area that has been given attention align with the current development trend and hence been prominent and crucial within many different business areas world widely today.

To overcome such appearing challenges companies strives for continuously improving their current way of approaching their deliverables where this thesis work has been promoting standardization in the process methodology as major concern. In the theory, standardization has been described as something that should be embedded in the process methodology and daily processes to be able to gain the wished consistency. Whilst other theories promotes standardization as something that can slow down the processes, require more resources and lastly pull away the focus from innovation and quality. In this way, a sustainable extent of standardization in the process methodology should be sustained where such optimum can enable small Software Developing companies to become more competitive in a more competitive marketplace today. The project performance have hence a huge impact on the competitiveness of the companies whereby this study provides understanding and recommendations for how small Software Developing companies in Taiwan should act based on the current prevailing situation in terms of standardization.
TABLE OF CONTENT

Contents
1 INTRODUCTION ..................................................................................................................6
  1.1 Contribution and Significance of the Study .................................................................7
  1.2 Purpose ........................................................................................................................8
  1.3 Research Questions ...................................................................................................8
  1.4 Scope and Limitations ...............................................................................................8
  1.5 Structure of the Thesis ..............................................................................................9
2 METHODOLOGY ................................................................................................................10
  2.1 The Research Model & Research Strategy ..............................................................10
  2.2 Problem Formulation ...............................................................................................11
  2.3 Data Collection .........................................................................................................12
    2.3.1 Literature Review ..............................................................................................12
    2.3.2 Interviews ..........................................................................................................13
  2.4 Analysis .....................................................................................................................16
  2.5 Result Evaluation - Validity .....................................................................................16
3 THEORY ...............................................................................................................................18
  3.1.1 Traditional Project Management .......................................................................19
  3.1.2 Agile Project Management .................................................................................20
  3.2 The Balancing Dilemma ..........................................................................................21
  3.3 Project Performance .................................................................................................23
  3.4 Software Development .............................................................................................24
    3.4.1 Strategic Implications ......................................................................................25
    3.4.2 Software Flexibility ..........................................................................................25
    3.4.3 The Software Development Process ..................................................................26
  3.5 Standardization .........................................................................................................28
    3.5.1 Definition ...........................................................................................................28
    3.5.2 Standardization and Performance ..................................................................30
4 EMPIRICAL FINDINGS .......................................................................................................32
  4.1 Company 1 ................................................................................................................32
    4.1.1 Overall Process Methodology with Steps .........................................................33
    4.1.2 Elements, Tools and Templates .......................................................................33
    4.1.3 Earlier Process Methodology ...........................................................................35
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.4 Project Performance and Standardization</td>
<td>35</td>
</tr>
<tr>
<td>4.2 Company 2</td>
<td>36</td>
</tr>
<tr>
<td>4.2.1 Overall Process Methodology with Steps</td>
<td>37</td>
</tr>
<tr>
<td>4.2.2 Elements, Tools and Templates</td>
<td>38</td>
</tr>
<tr>
<td>4.2.2 Earlier Process Methodology</td>
<td>39</td>
</tr>
<tr>
<td>4.2.3 Project Performance and Standardization</td>
<td>40</td>
</tr>
<tr>
<td>5 RESULT</td>
<td>42</td>
</tr>
<tr>
<td>6 ANALYSIS</td>
<td>43</td>
</tr>
<tr>
<td>6.1 Strategic Implications</td>
<td>43</td>
</tr>
<tr>
<td>6.2 Process Methodology and Flexibility</td>
<td>43</td>
</tr>
<tr>
<td>6.3 Project Performance and Standardization</td>
<td>45</td>
</tr>
<tr>
<td>6.4 Balancing Dilemma</td>
<td>47</td>
</tr>
<tr>
<td>7 DISCUSSION</td>
<td>49</td>
</tr>
<tr>
<td>8 CONCLUSION</td>
<td>51</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>53</td>
</tr>
<tr>
<td>APPENDIX A</td>
<td>56</td>
</tr>
<tr>
<td>APPENDIX B</td>
<td>57</td>
</tr>
<tr>
<td>APPENDIX C</td>
<td>64</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

Due to the increased globalization today organizations needs to be more changeable to the constant changes that appears on the global market today where both opportunities as well challenges have to be carefully considered (Fernandez & Fernandez, 2009). The new economy emphasizes a new way of producing customer value where the work nowadays has transited over to more information and knowledge oriented market offerings in which the work becomes more complex to carry out in higher extent uncertain environments ever experienced (Fernandez & Fernandez, 2009). The product characteristics has radically changed from the traditional standardized product into products inferring a higher extent customization where tailor made products governs the thinking to precisely and specifically satisfy the disperse customer demands on the market (Rokkunuzzaman & Choudhury, 2011). Especially the Software Development industry can be considered as a vital area that has been given attention align with the current development trend and hence been prominent and crucial within many different business areas world widely today (Chow & Cao, 2007).

However, from that standpoint this thesis work will demonstrate an investigation in the field of Agile Project Management respectively Standardized Project Management with major concentration in process methodology standardization. The outranged dilemma has an origin within the theory that proposes an ideal hybrid constellation among agile respectively standardized approaches whereby such theories promotes evidence concerning limitations the extent standardization that can be adapted in the process methodology (Boehm & Turner, 2003). Align with this discussion agile projects among small Software Development enterprises has been reported as suffering from low performance in terms of budget respectively time overdue together with scarce customer satisfaction concerning scope and quality.

According to several studies conducted within the Software Industry 50-80 percent of all the projects experience some kind of failure in terms of time, budget and quality (Rajkumar & Alagarsamy, 2013). Whilst Davenport (2005) presents “precise” statistics showing that barely one third of all Software Development projects succeeds. Furthermore, an industry report conducted by The Standish Group (2013) reports a success rate of 39 % in terms of scope, time and cost where The Standish Group further expresses that the success rate has been increasing over the years. This reason spells that the increased success rate relies upon the fact that many companies adapts newly developed approaches and methodologies, tools, reviewing the whole project process, optimizing, better decision making etc. In this way the focus in this study will be in the area of process methodology which has an effect on the final performance in terms of software development project success (The Standish Group, 2013). However, according to Jiang et al (2004) incorporated methodologies supporting the Software Development process which in this case can be referred to standardization has not been perceived as successful accordingly to the authors. Whereby, there still prevail doubts whether standardization can enable greater project performance, this in comparison to what has been claimed by the Standish Group (2013) respectively Rajkumar & Alagarsamy (2013).

Through studying whether an increased amount of standardization can enhance the success rate of the project without considerable performance losses one can gain an understanding for
how Software Development companies in an earlier state can act initially to attain enhanced performance. The theory in general emphasizes two competing scenarios where one side uses to promote Agile Project Management as the most prominent way of working whilst the competing side promotes standardization as more preferable in projects (Fernandez & Fernandez, 2009).

According to several studies an increased extent of process standardization can derive into performance losses in which companies in general avoid standardization in the highest extent to gain more flexible structures that does not stagnate the development process (Choi et al, 2014; Mishra & Mishra, 2011). This since higher extent standardization implies more documentation in which employees within the concerning organizations experience as bureaucratic and inflexible in the sense that the focus from the core business activities becomes less favored for documentation and non-core business activities (Conboy & Morgan, 2010). Thereby, agile structures have been adapted by many organizations but in turn derive in bad performance since a non-balancing structure with important routines in which the demand for standardization has to be considered to support the development processes (Attarzadeh & Ow, 2008). Hence, an increased amount of standardization can both enhance respectively undermine the project performance in which this study will investigate the relative connection as major concern within small Taiwanese Software Development companies.

1.1 Contribution and Significance of the Study

The contribution areas of this study will foremost concern the research world respectively small and young Software Development companies where these two stakeholder areas can benefit tremendously from this research. As Liu et al (2008) expresses there are few studies that actually promote standardization of Software Development processes in relation to performance and flexibility where this study will concern small enterprises within the Taiwanese Software Industry. Regarding to the literature research non-purely defined study in accordance this study has been found in the literature whereby the characteristics of this study will contribute to the prevailing gap that exists today. Through this study small Software Development companies especially those with few years of operating can benefit from this study through an enhanced understanding whether standardization can affect their project performance. Articles from a more general point of view touches the performance respectively standardization criteria many times but has different views regarding the performance outcome where Software Development companies in general are discussed and not specifically small enterprises with few years in the neck.

As aforementioned many of the of the small Software Development enterprises suffer from very low success rates (Rajkumar & Alagarsamy, 2013) whereby an increased success rate would enable the small Software Development companies within the Taiwanese Software industry to become more competitive. This especially considered to the competition caused by the established enterprises on the market whereby the small Software Development enterprises relies upon innovation and customer specific solutions (Knight & Cavusgil, 2004).
Chu (2008) expresses that the Taiwanese Software Industry currently position within the infant state in the Software industry development whereby this study supports small companies within the Taiwanese Software Industry to develop their current capabilities. In this way, this study will show whether small Software Development companies should standardize their process methodology or not to advance towards the right direction.

1.2 Purpose
Thereby this study aims to investigate whether an increased extent of standardization in the process methodology among small Software Development companies in the Taiwanese Software Industry can enhance the performance in terms of cost, time and scope. Secondly, this thesis work will as well evaluate the current extent of standardization among the studied companies to see how they work today in order to be able to compare it to an earlier state.

1.3 Research Questions
The following two research questions have been proposed for the study:

RQ1: To what extent are the involved companies in the study today using standardized Project Management practices to develop software for their customers?

- The first research aims to answer how the concerning organizations within the Taiwanese software industry today works with project in order to be able to evaluate and appreciate the extent of standardization that has been incorporated in the process methodology today.

RQ2: Can an increased amount of standardization in the process methodology reduce the number of reported project failures?

- The second research question will be able to answer whether small software enterprises within the Taiwanese Software industry should increase the extent of standardization in their process methodology to overcome the high number of project failures.

1.4 Scope and Limitations
The scope and limitations of this study concerns only two companies that will be included in this study to make the study itself fitting into an appropriate amount of work, but as well can provide necessary evidence to the findings. Furthermore, only small Software Developing companies in an initial stage with few years of experience will be considered within this study to clearly profile the typical characteristics of the organizations within this study. Moreover, the definition of standardization has been appropriately defined within the theoretical foundation in chapter 3.5.1 which refers to standardization in terms of process methodology, process elements and lastly tools and templates where this definition are the major concern in this thesis.
1.5 Structure of the Thesis

However, concerning the structure of this thesis paper the following structure has been proposed for this thesis work:

- **Chapter 2 – Methodology**: this chapter will describe the methodological approach that have been used to be able to reach to the final result of thesis work.
- **Chapter 3 – Theoretical Foundation**: This chapter describes all the theoretical findings that have been found in order to be able to analyze the theory together with empirical findings and thereafter be able to answer the research questions.
- **Chapter 4 – Empirical Study**: This chapter will describe all the found information that have been found relatively to the concerning research area.
- **Chapter 5 – Result**: This chapter presents the findings that derive from the Empirical Study in chapter 4.
- **Chapter 6 – Analysis**: This chapter analyzes the theoretical findings in alignment to the empirical finding in order to find common interfaces from both respectively areas.
- **Chapter 7 – Discussion**: This chapter provides a discussion regarding the finding from the Empirical Study in alignment to the theory.
- **Chapter 8 – Conclusion**: This chapter describes the final points that can be concluded from this conducted study.
2 METHODOLOGY
This section will present an overview of how this master thesis project have been approached form the first beginning until the end where a specific methodological approach have been followed during the whole entire thesis period to attain the intended result. However, the chapter initially provides information regarding the research strategy that have been utilized whereas forthcoming sections gives clear information regarding the structured approach that have been followed throughout the thesis work. The approach has hence been described based on the elements within the research model whereby those elements has been elaborated and described in an extensive manner to provide a descriptive description concerning the actual proceeding.

2.1 The Research Model & Research Strategy
Before heading into the actual stepwise proceeding that has been utilized within this thesis work the research strategy will be concisely be elaborated. In terms of research strategy one can distinguish among three such strategies; quantitative research, qualitative research and a mixed strategy where the quantitative research infers a study consisting of pure mathematical or statistical study where one collect information that has mathematical character. Whilst the qualitative study only concerns information that has been gathered from different qualitative sources such as other papers or interviews that do not collect information with mathematical or statistical character. The third strategy the mixed method can be related to a mix of the both the qualitative respectively the quantitative approach (Cresswell, 2009; Cohen et al, 2007) where this thesis work only follow a pure qualitative approach to be able to find the final result.

The research model that has been used within this thesis work consists of four major phases that have been followed in a structured way to being able to reach the final result of this these, see Figure 1. In this way, the problem formulation, data collection, analysis and lastly result evaluation forms the structured way that has been undertaken during the proceeding of this thesis work.
Thereby, the problem formulation can be referred to formulating and elaborating concerning the actual problem that have to be solved through mainly defining the purpose respectively the intended research questions of this study. The data collection has been undertaken to bring in all the necessary information needed to be able to answer the research questions whereas the analysis aimed to bridge the findings derived from the interviews together with the provided theory in this thesis work. In this way, the analysis has in the end derived into the final result which also undergoes an evaluation regarding the consistency in terms of validity.

2.2 Problem Formulation
In order to be able to find the right research area that will be studied a research problem has to be found in which the problem formulation can be considered as the first step in the methodological approach that has been utilized. In order to be able to define a research problem a pre-study was conducted in order to gain a grasp of the current research area in a much better way through reading articles about the concerning research area. However, the research subject has during the proceeding iteratively been carried out in order to refine the research problem into a more specific contextual setting. Thereby, a planning report has been created in which this planning report has been changed several time to find out the right touch that the research will reach whereby the purpose could be formulated and developed into clear research object. Based on the problem formulation research question for the intended purpose of this study could be created and hence stands as foundation when conducting further research in order to be able to concentrate on the right problem area.
2.3 Data Collection
This section will describe the data collection procedure that has been dedicated as the second step where data collection can be referred to the information retrieved from different sources. In this way, in terms of information retrieved the information can be classified in either primary respectively secondary data where primary data can be referred to information retrieved from mediums that never has been published before and hence appears at the first time (Dahmström, 2000). Whilst secondary data can be referred to information interpreted from already published material and further articulated into secondary information (Patel & Davidson, 2003). This thesis work has been utilizing both of the aforementioned information types where the interviews can be classified as the primary information retrieved whilst the secondary information derives from the articles and the other published mediums utilized within this thesis work. Hence, through the stated information there will be two sections that promotes the two respectively data collection methodologies utilized within this thesis work: interviews respectively literature review.

2.3.1 Literature Review
The literature study has been approached through an extensive investigation concerning all the necessary research areas that needs to be researched in order to be able to carry out this study. The purpose of the literature study has been to dig deeper into the currently stated problem situation in order to being able to grasp the current problem dilemma in much proper way. A literature review can be seen as the way to review current articles within the concerning areas and then comprehend the information retrieved from the articles to further create a complete literature review that correspond to the intended research problem (Cresswell, 2009).

In this way, 33 articles, books or investigations has been utilized within this study to gain the essential grasp of the research area where foremost articles derives from the field of Software Development, Agile methodologies, Project Management, Standardization and theory proposing the dilemma between Discipline and Agile. From that standpoint all the articles has been retrieved from different databases such as Google Scholar, KTH Library and free search on Google. Most of the articles derive from different Journals that publish the different kind of material such as IEEE Computer Society, The Journal of Computer Information Systems, Science Direct etc.

However, some article has been considered as extensively valuable for this research where the following articles can be considered as key articles in terms of their huge impact that they had on this study: Fernandez & Fernandez (2009), Liu et al (2008), Boehm & Turner (2003) etc. However, despite from the most prominent articles many other articles has provided essential “glue” in order to being able to connect the different theories into one common theoretical framework in which these article provides necessary evidence.
2.3.2 Interviews

In terms of interviews there are three major interviewing strategies can be presented in which structured respectively unstructured makes up the major two characteristics whilst the third strategy semi-structural can be referred to the third one (Cohen et al, 2007). However, structured interviews can be referred to interviews that already have prepared questions and hence mainly rely upon these questions during the interviewing session. Whilst unstructured interviews can be seen as interviews that does not utilize any kind of prepared interview questions in which the interviewing party instead ask questions that pops up from the own mind deliberately in accordance to the proceeding of the interview (Cohen et al, 2007). Whereby, the semi-structured way of interviewing can be described as the mixed way of utilizing both prepared interview question in combination with questions that one has not prepared in advance (Fontana & Prokos, 2007).

However, this thesis work has utilized the latter announcement as interviewing strategy since two “valid” companies has been interviewed within this study in which the difference among the contextual settings varies. The semi-structured interview has hence been great complement to the various types of companies interviewed whereby the prepared questions (See Appendix A) has been seen as overall questions to be answered whilst unstructured questions has been asked to clarify the specific information of interest to retrieve.

Furthermore, each interview took from about 70 minutes to 130 minutes to conduct where the variance in time mainly relies upon how sophisticated process methodologies that the concerning companies possesses over. But also that all the interviewed parties was not native English speakers in which it could take longer time to get the questions fully answered. Furthermore, all the interviews was conducted through face to face where all of the interviews was recorded with a voice record medium to be able to listen to the interviews all over again. Moreover, notes was taken during the interviewing session to be able to read those again afterwards where the interviewed companies mostly had two people representing the company during the interviews. Both the note taking and the recording provide possibilities to decrease probable bias, this according to Driscoll (2011). The following representatives regarding their profession have been interviewed in this thesis, which can be illustrated in Table 1.

To be able to evaluate the extent of standardization in the processes the respondents was discussing together with the interviewing parts to be able to together appreciate the extent of standardization in the process. Based on the information derived from the participating respondents one had the possibility to evaluate the current process methodologies, the answers from the interview and foremost own perceived picture of the context. Thereby, one could clearly in relation to the “standardization” in the Project Management book from the Project Management Institute (2013) appreciate the current situation relatively to the defined agile state in this thesis work and hence give suitable ranking in the “Pure Agile-Standardization” scale.
Table 1 illustrates the people from the two valid interviews that took part in the both respectively interviewing sessions.

<table>
<thead>
<tr>
<th>Company</th>
<th>Person</th>
<th>Profession</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company 1</td>
<td>Person 1</td>
<td>CTO</td>
</tr>
<tr>
<td>Company 1</td>
<td>Person 2</td>
<td>Software Engineer</td>
</tr>
<tr>
<td>Company 2</td>
<td>Person 1</td>
<td>Software Engineer</td>
</tr>
<tr>
<td>Company 2</td>
<td>Person 2</td>
<td>Sales Manager</td>
</tr>
</tbody>
</table>

Ethical Considerations

The ethical consideration has been carefully considered during the whole entire thesis work to ensure that all the information has been appropriately collected in the most ethical way as possible. To protect the information in the most proper way for external exposure an initial agreement was sent out to the interviewed parties in order to ensure that the respondents fully agree upon the ethical issues before conducting the interview. The purpose was clearly described before the interviewing session was started which also was included as a criteria in the ethical form that the respondent should sign before the interviewing session started. In this way, in accordance to Kvale (1996) the purpose was clearly promoted which can be seen as ethical from that standpoint.

Furthermore, the initial agreement that should be signed by the respondent before the interview starts ensures that the respondent accepts all the criteria set and hence accept these criteria’s before the interviewing session starts. Regarding to the commitment the interviewed respondent has the full possibility to stay anonymous during the interviewing session concerning making information public (Driscoll, 2011). The respondents were always asked for allowance to give out with specific information to ensure that ethical aspects have been fulfilled from the most carefully and respectfully way (Mack et al, 2005).

Sampling Strategy

The sampling strategy for this thesis work has been mainly been conducted through utilization of industry networks, sending interview proposals for companies operating within the Taiwanese Software industry and lastly attending one Agile Workshop Seminar. The selection criteria for the companies that in the end could be considered as valid possess the following characteristics:

- Small companies approaching Software Development
- Low extent of standardization – Agile process characteristics
- Demonstrated performance changes
- Demonstrated standardization changes in their processes

From these three major strategies that has been approached five interviews has been conducted whereby two of these interviews can be considered as valid in terms of the stated
selection criteria above. The result from the sampling strategy can be seen illustrated in the Table 2 below:

Table 2 below illustrates the sampling statistics concerning the total number of interviews sent, Approved interviews and lastly interviews valid based on the selection criteria.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Invitations Sent</th>
<th>Approved</th>
<th>Valid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposals</td>
<td>58</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Networking</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Seminar</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

As can be seen from the table 2 above the network was the most prominent way to reach the type of companies in terms of the number of interviews that could be approved and also valid for this study. In total from the group “Proposal” no interviews could be reached even thought 58 proposals in total was sent out to companies based in Hsinchu respectively Taipei in Taiwan. The Seminar derived into one possible interview which thereafter could be considered as invalid in accordance to the set selection criteria. Thereby, all the valid interviews derive from the invitations sent through the industry network.

However, in terms of the selection criteria related to the sampling group “proposal” companies was selected from the provided database at the webpage of “CISA Information Service Industry Association of R.O.C”. In this way, Software companies with only the criteria of developing Software was selected among the companies in the database where companies located in Hsinchu and Taipei was included in the sample group “Proposal”. Successful contact would further led to preliminary questions regarding the four major selection criteria in order to determine the suitability of the company in this study before interviewing the potential company.

To describe the process in more detail Software Development companies was foremost the selection criteria in which the three remaining selection criteria could be evaluated afterwards the interviews was conducted regarding to the companies appropriateness to this study. Furthermore, the first interview that was conducted was considered as a pilot in terms to evaluate prepared interviewing questions and hence being able to improve these for further interviews. The pilot interview has been counted into the statistical table above whereby the pilot interview are included in the group category of Network and hence also considered as invalid. The reason why only two companies could be considered as valid relies upon the fact that the three other companies stated as invalid could not meet the criteria set in the beginning of this section and hence only two of the interviewed companies could be considered as valid. Two of the companies could not demonstrate standardization changes whilst the last company could not be fulfilling the criteria as small company.
2.4 Analysis
The analysis part aims to bring out the answers to the current findings through combing the finding from the literature review together with findings from the interview study. In this way, one can analyze the current findings to be able to draw final conclusions from the result that has been deriving from the interview study. The approach to interview the finding has been mainly concentrated on analyzing the:

- Strategic Implications briefly
- Process Methodology
- Standardization and Flexibility
- Balancing Dilemma

In this way, four major areas have been analyzed to be able to draw a conclusion about the findings in this thesis project.

2.5 Result Evaluation - Validity
This section will elaborate concerning the validity of this research that has been conducted in Taiwan within the Software Development industry where the reliability will not be assessed since no quantitative study has been conducted (Cohen et al, 2007). The validity can be referred to the idea to conduct the study several times and hence being able to gain the same result all over again according to Krishnaswami & Satyaprasad (2010).

In this way, to clarify the validity of the findings in this thesis project one can clearly see that the prepared questions has been directing the interviews into the right research area whereby the validity for the interviewing should had been strong. But also that two people from the two respectively companies attended the interviews to answer questions should be an indication of that they can correct each other during the proceeding interview. It should furthermore also be stated that the interviews was recorded where notes was simultaneously taken during the interviewing session to be able to go back again and confirm what the respondents answered. Moreover, clarifications regarding their expressed statements was mostly conducted each answer by the interviewing person in which this gives a confirmation from the respondent side that the information has been understood in a right way. Furthermore, an information sheet about the study and interview questions was sent out some days before the actual interviewing session took place whereby this enabled the respondent to prepare for the answers and think about these in beforehand.

From that standpoint the information to be able to answer the first research question was based on the information that was retrieved from the interview where the evaluation of the extent of standardization in the processes was extensively discussed between the respondent and the interviewing part. Furthermore, concerning the numbers gained from the interview parties in terms of the project performance an email was sent before the interview was starting in which the respondent could prepare for the answers concerning project performance. In this way, the assessment concerns both performance and the extent standardization within the processes measure the actual situation concerning the two aforementioned assessment
criteria’s can be seen as valid. Thereby, the study should be valid from all the criteria’s in order to be able to answer the research questions in the most appropriate way.
3 THEORY

This chapter will cover the theoretical foundation for this master thesis project in order to support the further analysis to be able to reach the final result of this master thesis paper, see figure 2. Concerning the structure respectively the theoretical content within this section the initial two sections describes the conventional respectively the agile principles in order to clarify the concepts before digging into the actual problem area. However, to be able to answer the first research question which was: “To what extent are the involved companies in the study today using standardized Project Management practices to develop software for their customers?”. In this way, the chapters about Software Flexibility, Software Development and Standardization provides the essential theoretical knowledge needed to understand the current state of small sized Software Development companies in terms of the extent standardization incorporated within the processes. This implies that the current state can be evaluated upon the theory that has been provided within this chapter.

Furthermore, the second research question which was: “Can an increased amount of standardization in the process methodology reduce the number of reported project failures?”. To support the second research question and understand the pattern correctly and the relative answer for “why” the performance appears in the following way found within the study the section about Performance and Standardization respectively Project Performance provides the essential knowledge to understand the phenomenon and definition. From that standpoint the Balancing Dilemma section provides the essential knowledge deriving from the optimization theory where standardization respectively pure agile settings somehow reach an optimum. This dilemma gives an important hint regarding that standardization can enable both bad respectively enhanced performance in which this part provides essential theory for the further analysis part of this thesis. Thereby, this theory enables the essential theory to analyze on which side of the breakeven point the concerning companies currently are positioned at whereby the study can find probable reasons for the appearances of the performance in this study.

![Diagram](image)

Figure 2 illustrates the connection among the different sections to the defined research questions.
3.1 Agile and Traditional Project Management
This section will describe the ground concepts of traditional Project Management respectively Agile Project Management in order to gain a grasp of how these two management disciplines are related to each other. The reason why this interrelation will be described relies upon the fact that this study will revolve around how traditional practices or standardized ways in terms of the extent standardization will affect the more agile project methodologies.

3.1.1 Traditional Project Management
The traditional Project Management can be considered as the “ordinary” way of running projects through utilizing traditional approaches emphasized in the traditional way of running projects. The literature within the field of Project Management can be considered as very extensive in terms of published material where the concept of modern Project Management derives from the 1950s in which an era of utilizing project methods and techniques started among many organizations (Seymour & Hussein, 2014). According to the Project Management Institute (2013) Project Management can be defined as:

“Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (Project Management Institute, 2013, pp.5).

In this way, through the statement above Project Management can be seen as a multifaceted practice that comprises of many interrelating elements that have to be coordinated into one common activity carried out in a specific time interval (Project Management Institute, 2013). Whereby, this master thesis report will have an emphasis on analyzing the application of standardized practices in agile project settings in order to see whether the concerning organization can adapt more traditional principles to decrease the reported failure rates.

The reason why a methodology or structured approach should be utilized relies upon the fact that a tremendous amount of complexity has to be handled in an appropriate way whereby traditional approaches can be used to handle this dilemma (Seymour & Hussein, 2014). In this way, the structural approach facilitates the project stabilization which in turn enables one to handle problems in a much better way during the project proceeding. Since the project can be embodied around a more structural approach to handle the complexity methodologies can help the project to stay inside the budget, time deadline and provide the customer with demanded quality (Attarzadeh & Ow, 2008). This makes the project less risky according to Attarzadeh and Ow (2008) where a well structured methodology promotes well documented processes (Boehm & Turner, 2003), requirements and functions throughout the whole entire project lifecycle (Fernandez & Fernandez, 2009). Among many reason for why one should utilize standardized process models relies upon the fact that the consistency plays a crucial role in running project in order to attain better managing function within the project frame in terms of communize the practices into one shared approach view. But also that a pre-prepared approach enables practices that will be used within any project where novice people in the organization can get support from these facilitating structures (Attarzadeh & Ow, 2008).

In some literature the traditional standardized Project Management structures have been
described as heavy weight methodologies that emphasizes structured manner of managing projects. However, these structures are favorable in circumstances when undertaking larger projects in order to coordinate the disperse constituents in a proper manner into one common project. The heavy methodologies or namely Project Management gives a better control for the project manager in terms of all the reporting and documentation but counterproductively slows down the development process in terms of stagnating requirements. However, it should be denoted that such strict methodology can give many benefits but in other hand developing into project failures when such methodologies does not support the project process due to appearing changes. The documentation has to hence be modified which causes tremendous additional work where the bureaucracy rather stagnate a development process that could be proceeding further without disturbing preventions. A wrong methodology can in many cases cause tremendous failures for the project which have to be considered carefully before undertaking a project. Mostly the standardized heavy methodologies can be own tailored approaches or commercial approaches or standards developed by some other party (Attarzadeh & Ow, 2008). Lastly, there are many benefits to rely upon structured process models but there are as well factors that have negative effects on the process and its outcomes upon a long time period which should be carefully considered.

3.1.2 Agile Project Management

In terms of Agile Project Management which can be seen as the today’s project methodology (Spundak, 2014) the traditional approach have been described a too bureaucratic in terms documentation. Thereby, the development against more agile and foremost more freely adaptable approaches has been utilized to overcome the rapidly changing circumstances that prevail within the global marketplace today. In this way, a company that adopts agile practices mostly relies on very light weight methodologies that emphasizes as less structured approach to follow when developing software (Conboy & Morgan, 2010).

Thereby, the emphasis on light weight methodologies implies that the project itself can be more flexible in terms of actions that can be conducted among the people that perform the project work. This further infers that the agile thinking permeates more customer interaction rather than putting focus on irrelevant documentation and processes that stagnates the development process as whole. In this way, the customer have been placed as the central element in favor for discipline, documentation, planning etc. (Chow & Cao, 2007) through advocating flexibility, collaboration and communication among the team members in the project (Conboy & Morgan, 2010)

Due to the more people oriented approach emphasized through the agile project methodology the customer preferences can be more encapsulated within the final project outcome whereby delivering value propositions are favored for disciplined actions (Conboy & Morgan, 2010). Hence, people in terms of interactions together with iteratively workable software development with close collaboration with the customer and responding to change through the flexible adoptable approach (Chow & Cao, 2007) gives arise for a more non-rule environment endeavoring for value creation. Since the customer value can be seen as central in the agile
thinking the customer can be an active member in the team giving necessary inputs regarding preferences whereby the customer can be seen as less disconnected to the final outcome in comparison to the strictly traditional approaches (Conboy & Morgan, 2010). The team members can thereby be able to use their creativity and communication to create innovation where a shared vision among the team members enables each individual to utilize its own capabilities of tacit knowledge in the most proper way, and hence not be disturbed by restrictions within the development process (Boehm & Turner, 2003).

According to Fernandez and Fernandez (2009) agile practices is mostly applied in the software industry but have given an echo in the construction industry through a more open friendly approach enabling more creativity. In this way some phases within the project process relies upon more freely approached structures whilst other phases have been more strictly managed to not lose the consistency. Thereby, for instance the pre-design phase or the design phase has adapted agile practices to stimulate the creativity for new innovative ideas. Hence, agile practices have been approached alongside traditional disciplines to embed for a more flexible approach in some stances whilst providing structures in other settings for the sake of consistency.

However, Fernandez and Fernandez (2009) furthermore claims that agile practices possesses over more risky proceeding due to the non-consistent structure which is more preferable in the uncertain and complex environments that requires the spaces for flexibility and changes (Fernandez & Fernandez, 2009). The agile methodology hence embraces around guiding principles (Elliot, 2008) which can be complemented with further practices to tailor an appropriate methodology for the intended use. This can for instance be market developed process models such as XP (Extreme programming), Scrum, FDD (Feature-Driven Development), DSDM (Dynamic System Development Method), ASD (Adaptive Software Development) etc. (Chow & Cao, 2007) where many of the methodologies embeds lightly weighted disciplined structures with emphasis on flexibility. Thereby, those methodologies do not rely upon pure agile principles and hence have somehow involved practices enabling the demanded flexibility.

### 3.2 The Balancing Dilemma

As mentioned within the previous section many of the process models within the agile world do not rely upon purely agile thinking whereby some inclusion of standardized elements implies more stabilized project process settings. This implication can be seen as key aspect that will be investigated within this thesis work since the amount of standardization within the current setting should be analyzed together with possibilities to increase the extent of standardization within the agile processes of the concerning organizations in this study. However, from that standpoint, it has been clearly exposed in the theory that many of the agile project practices utilize standardized elements which have been clearly promoted by Conboy and Morgan (2010), but also Chow and Cao (2007) expresses the same view.

Moreover, Boehm and Turner (2003) validate this through describing a weighing dilemma between agile Project Management respectively traditional Project Management which in turn
implies utilization of core strengths from both approaches in one common approach. But also that the same authors claims that the need for both agile respectively discipline can be seen as essential due to the essence of having some kind of balancing structure enabling conformance in the process as whole.

From a strategic point of view concerning the balancing dilemma many of the agile methodologies adapt standardized elements as aforementioned whereby Fernandez and Fernandez (2009) uses to elaborate concerning the different process constellations for Project Management. This can be closely related to the commercial process methodologies on the market today as earlier promoted which embeds some extent standardized process methodology. Align with this an illustration of an example process model where the traditional Project Management approach can be interconnected with an iterative agile process methodology, see Figure 2 below.

![Diagram](image)

\textit{Figure 3 illustrates an example connection between agile iterative Software Development respectively traditional Project Management process steps, inspired by Fernandez and Fernandez (2009).}

As clearly stated and illustrated in the article written by Fernandez and Fernandez (2009) standardized practices have described as something that can happen alongside the agile project process in terms of the mutual compatibility which also have been stated as the most valid approach. However, those interdependencies have to be balanced in the most appropriate manner in order to sustain integrative coincidence and synergy in alignment to the projects to bring out all strengths and advantages from both methodologies (Boehm & Turner, 2003).

However, the standardization does not always provide the wished constellation in terms of flexibility which do not always sustain favorable situation in the organization and especially not among people such as managers that utilizes these process models. In this way, those methodologies can derive in unwillingness among applying managers to utilize these approaches and hence they stick to their own way of running projects due to the higher extent
bureaucracy and less practical structure. Thereby, these methodologies can be hard to apply in real case situation due to the complexity of the process approach whereby projects managers tries to find their own ways through shortcuts to run projects (Attarzadeh & Ow, 2008).

However, several other stakeholders have also an interest in the extent documentation provided since for instance external actors relatively to the project may require substantial amount of documentation for their own use. These models may not always be favorable in different contexts but provides necessary value for other parties involved in the project process where a project mostly have a limited amount of time to be carried out. The documentation may require additional resources and probably time to cope with the requirements which do not provide favorable conditions in terms of resource and time utilization. To be able to reactively respond to the changing environment less documentation is preferable and hence the process methodology should be limited to a certain extent to simultaneously relying upon experienced people. This can be required in many cases to be able to adapt to the required changes appearing in the dynamically changing environment whereby this can be seen as the major reason for the increasing use of agile practices (Fernandez & Fernandez, 2009). The increase of more agile practices in the development processes enables the project work to incorporate focus into innovation and enhanced creativity in the final outcome which can be seen as value creating in that sense (Conboy & Morgan, 2010). Thereby, the limiting features in the process standardization methodology incorporated in the project practices should be considered carefully to not stagnate the creativity and innovation abilities in the project group.

Thereby, the balance dilemma can be vital to consider in terms of the benefits and disadvantages one can gain through both those methodologies whereby as aforementioned a constellation bringing out the best from both respectively methodologies can be seen as the most optimal.

3.3 Project Performance
According to the Project Management Institute (2013) the success for a project can be measured in quality, time and cost where all these three parameters can be incorporated into a triangle as illustrated below in Figure 4. The triangle itself can be referred to the “iron triangle” which illustrates prioritization among the cost, time and lastly the quality factor which in turn infers that changes in one of those aspects implies automatic changes in the other aspects (Atkinson, 1999). The dependency among the factors will not be elaborated in this paper where the three bare concepts only will be described regarding to the common concept project performance (Liu et al, 2008).
Figure 4 illustrates the “iron-triangle” consisting of the three performance parameters cost, time and quality, inspired by Atkinson (1999).

In some Software Development theory the triangle can be seen as blown away in terms of that scope have to incorporated into the success criteria definition whereby time, cost, quality and lastly scope represents the criteria that Software Development project can be assessed upon (Chow & Cao, 2007). However, referring to the regular theory regarding to the definition of scope quality can be seen as clearly incorporated into the definition of scope whereby the same definition will be utilized in this thesis project (Ebbesen & Hope, 2013). Thereby, this thesis will distinguish among three success criteria rather than the four success criteria proposed in some papers to define the three success criteria parameters. The defined criteria will then further be utilized to distinguish among succeeded respectively failures projects in order to determine the failure rate in the concerning organizations. In this way, the definitions for the three criteria will defined as following in accordance to Liu et al (2008) which have been claimed as generally accepted in the software industry:

- **Scope**: can be referred as the effectiveness in terms of the extent that the customer preferences have been fulfilled.
- **Cost**: can be defined as the efficiency in terms of the output produced work in relation the input of resources.
- **Timeliness**: can be defined as the ability to meet the set time deadline.

### 3.4 Software Development

This chapter will introduce the reader to gain an understanding of the strategic implications, the flexibility dilemma and lastly the Software Development process in which essential understanding and knowledge for further analysis will be gained within this chapter.
3.4.1 Strategic Implications
From a perspective of an organizational view the customer should always be revolved around the project to be able to fulfill the requirements where cost and time aspect have to be considered due to the interdependency to the requirements. The competitive advantage within the software industry witnesses about the required space for innovation and creativity where the development process embraces around flexibility to sustain creativity which in turn paves the way for innovation (Liu et al, 2008). The software industry can be seen as dependent upon the “newness” creation which infers that innovative solution has to be created upon a constant basis to offer superior customer value (Choi et al, 2014).

At the same time the strategic implications implies vital consideration of strategic issues which can be seen from a two-sided view where tailored respectively standardized product assortment dominates the agenda for many companies (Buxmann et al, 2013). This further implies that the competitiveness among companies from especially the small and medium sized category competes through flexible and innovative approaches emphasizing customization (Knight & Cavusgil, 2004). Whereby, larger global enterprises rely upon standardized software through standardized product constellations to become competitive on the market today (Jaakola, 2009).

The difference among the two strategic approaches gives an indication that enterprises relying upon standardized settings concentrates on economies of scale through adopting cost efficiency and huge volumes. Whereby, these enterprises focusing on customer tailored approaches concentrate their process development on creativity and innovation. In this way, the standardized approach creates similar or identical products through copying previous work into several similar or identical products which further implies that the fixed cost may be high but the variable cost seen as negligible. In terms of the tailoring strategy the variable cost increases depending upon the project proceeding whereby the uncertainty in this case can be seen as high from a cost perspective (Buxmann et al, 2013). Thereby, these projects emphasizes agile approaches to create space for innovation and creativity as earlier mentioned whereby the cost control may be impeded through the extensive uncertainty within these agile projects.

3.4.2 Software Flexibility
Since this thesis project will concern about agile projects where customization in a higher extent permeates the software development process flexibility in the project process as whole can be seen as crucially vital. The flexibility concept itself can be referred to the required space that software development projects mostly require to be able to obtain space for creativity and innovation (Choi et al, 2014; Mishra & Mishra, 2011). This can be connected to the earlier mentioned “newness” that Choi et al (2014) promotes as important to sustain competitive edge on the market today where the flexibility in turns have been closely related to software quality (Choi et al, 2014). Thereby, innovation can be created upon a constant basis through the space dedicated for newness during the software development process whereby flexibility enhances the customer value creation (Liu et al, 2008).
On the contrary, the space for flexibility provides the software development abilities to change for instance requirements in terms of incorporation of new features needed to sustain better customer satisfaction. However, the flexibility does not always provide spotless results since no specific framework or structure guides the project into the final “correct” result that the project aims to attain. On the other side the flexibility should not be prevented due to the importance of iteratively working out the final solution through finding the right “touch points” that embraces the customer preferences. Through the standardization the organization can obtain a structured and balanced way of conducting rework and changes in a more timeless manner where the error correction process can be enhanced (Choi et al, 2014).

Furthermore, the ability for changes can be seen as crucially vital to sustain customer value since an inflexible approach may hamper the possibilities to create the final necessary touch that the customer demands which can be referred to software quality. The quality aspect in turns influences how well the company approaches their competiveness since the quality aspect itself affects the profitability, expenses, liabilities etc. whereby the rework possibilities provides the necessary value which makes the space for flexibility crucial from that standpoint (Liu et al, 2008).

3.4.3 The Software Development Process
This chapter will elaborate concerning the software development process in general through describing the procedures usually conducted among software developing companies today where the reader will gain an essential grasp of the holistic software development process. The discussion about the most ideal software development process has been discussed during many decades where such discussions mostly revolves around how a process should be approached with consideration of time, cost and quality dominates the agenda today (Dibå & Dingsoyr, 2008).

The Software Development process in general relies upon a freely approached way of developing software where the process itself can be reminded of a process starting from scratch without necessarily prepared elements (Davenport, 2005). Al-Rababah and Al-Rababah (2007) refers these prepared elements as prepared modules with the intention to be used in several other projects in the future where the intentional focus within this paper concentrates on software project without considerable modularization processes.

![Software Development Process](image)

*Figure 5 illustrates a general Software Development process consisting of decision gates before and after each project phase, inspired by Sangwan et al (2007).*
However, from a general point of view Sangwan et al (2007) promotes one unified and generalized software development process consisting of four iterative phases: inception phase, elaboration phase, construction phase and lastly the transition phase (see Figure 5 above). In this way, the “inception phase” aims to incorporate an initial feasibility study with intention to see how the problem can be solved with potential solutions through investigating the projects worthiness of being approached for future actions. Concerning the “elaboration phase” which can be seen as the planning phase emphasizes the planning of the specified core requirements and elements that are deemed as vital from an architectural point of view are given highest priority. Whilst these functions and features that possesses over less importance are planned in the end of this phase where the elaboration phase can be seen as the phase revolves around activities such as prioritization and planning. However, the third phase which has been expressed as the “construction phase” implies that the software development starts where everything should be developed into a finished software product. The last and the fourth step which has been expressed as the “transition phase” infers that the product have been finished and prepared for the end user and the market in general (Sangwan et al, 2007).

Moreover, Sangwan et al (2007) claims that his process can be seen as a general process which can be more extended to suit into the specific context where more details implies more standardization within the process methodology as aforementioned in this thesis work. Furthermore, the approach have been described as something that applies iteration in each of the phases before proceeding further in the vaguely lightly defined process consisting of few standardized features enabling flexibility. However, most of the process methodologies enabling agile processes to work out smoothly such as XP (Extreme programming), Scrum, FDD (Feature-Driven Development), DSDM (Dynamic System Development Method), ASD (Adaptive Software Development) etc. (Chow & Cao, 2007) as earlier mentioned consists of overall process steps with intention to not hamper the flexibility within the processes.

However, the abovementioned Software Development process does not need to follow the strict way concerning the four process steps presented which also can be conducted without any supportive standardized steps which in this case can be referred to pure agility. This further implies that Software Development can be conducted in either pure iterative way or conducted through as aforementioned through predetermined phases where these predetermined phases can possess over elements of iterative proceeding (Sangwan et al, 2007).
Figure 6 illustrates an example process model consisting of three iterative phases.

It should further be denoted that commercial agile methodologies as aforementioned have some certain phases where mostly of the phases have iterative elements to carry out the phases, see Figure 6. For instance the Scrum methodology uses several phases where each phase has several iterative sprints meetings before heading to the next step (Beedle et al, 1999). Another agile methodology among the handful available models DSDM or namely Dynamic System Development Model uses phases with elements that can be utilized where each phase has an iterative feedback loop back to the previous phase to rework something in earlier phases (Firdaus et al, 2013).

This can be seen as very obvious that the agile process methodologies emphasizes flexibility whereby the agile methodologies mostly relies upon basic principles where additional elements adds up to a more sophisticated and standardized process model. Hence, mostly from what have been described light-weight structures provides a less standardized approach where agile thinking governs the major process step methodology through guiding principles (Firdaus et al, 2013).

3.5 Standardization
This chapter will cover the essential description concerning the meaning behind standardization in order to give the reader a clear nuanced view of how this thesis work defines standardization within the scope of this work.

3.5.1 Definition
The meaning of standardization can be seen as broadly defined where the definition of standardization in this thesis project will be concentrated in the area of project management. According to the Project Management Institute (2013) a standard can be seen as a formal document consisting of practices, norms, processes but as well methodologies that are established and followed within the organization (Liu et al, 2008). All the information in those documents derives from earlier detected best practices documented into developed standards that the concerning organization can utilize for new purposes (Project Management Institute, 2013). Whilst Liu et al (2008) defines the standardization as utilization of methodologies,
techniques, procedures and tools upon a constant basis which have an overall influence on the project. On the contrary, Dybå & Dingsøy (2008) uses to promote standards in the area of Project Management as practices, tools and techniques that have to be followed.

Other authors that have been defining or describing standardization as surrounding disciplines that have to be followed when running the projects (Boehm & Port, 2001) whilst other authors promotes standards as an approach to follow when running the project (Kamal, 2002). Batra et al (2010) refers standards as stepwise procedures that have to be followed where there is controls for appearing changes whereby Choi et al (2014) promotes standardization as the documentation that have to be created when running a project. In this way, through all the different ways of describing standardization the authors describes the meaning of standardization from a different levels and different perspectives where this thesis project will perceive standardization from the point of view of its comprising elements. Hereafter, the standardization will be defined as a common documented approach or process methodology from the highest point of view where standardization will be seen as the process methodology itself with its process steps and elements, tools and templates. Thereby, one can clearly see that this thesis has the intention to divide the process methodology into 3 major categories to facilitate further evaluations of the process approach within the concerning organizations in this study:

- Process Methodology
- Process Steps and Elements
- Tools & Templates

The reason why these steps have been selected within this master thesis project relies upon the fact that these categories have an influence of the extent standardization that have been adopted by the concerning organizations within this study. But also that, these categories can be seen from different levels where the Process Methodology represents the highest levels whilst the Tools & Templates that have been assigned to the lowest level, see Figure 7.

Figure 7 illustrates the structure that standardization has been assigned to facilitate further elaborations in the next coming chapters.
In terms of the extent standardization which has been equalized as the amount of documentation infers that the more steps and elements followed in a Project Management process the more documentation will appear. The same can be said about tools and templates which infer more documentation due to a greater utilization of those categories. Tools and Templates have been relocated into the same category since these two are documentation created simultaneously during the project proceeding whereby Tools & Templates have been assigned to the same category (Schwalbe, 2012). Principles or Norms have been considered as non-standardized elements in this study and have hence not been included in the definition of standardization.

3.5.2 Standardization and Performance
Despite from what have been mentioned concerning standardization in agile project so far this section will extent the current knowledge through interconnecting performance with standardization. Thereby, through investigating what the literature promotes concerning performance and standardization one can gain the vital understanding of the way standardization affects agile projects. As aforementioned in previous chapter standardization in agile settings has not been an easy issue to solve where some extent of standardization can be of essence to sustain a balanced approach supporting the project as whole. To connect standardization in agile project in the spectra of performance in terms of cost, quality and time this section will give the reader a holistic view concerning the paradox of standardization and the correlation to performance. The literature has been critically reviewed concerning different statements that have to be figured out before heading further in this thesis project.

At a first glance, from the highest overview as also aforementioned within previous section in this thesis the standardization itself provides the necessary balance to be able to manage the project in a great way to attain the demanded performance. The standardization itself can enhance the process procedure itself through stabilizing the processes and hence provide risk reducing functions that improves the project performance (Choi et al, 2014). Standardization have helped many organizations to enhance the project performance in terms of budget, quality and on-time deliveries (Liu et al, 2008) where Choi et al (2014) promotes an enhanced financial performance through standardization.

This can be explained through then increased controls that has been applied through the standardization that decreases the prevailing risks by enabling an enhanced predictability over the project. The consistency itself through well defined process standardization can also provide the required flexibility at the same time even thought standardization has been incorporated. Since the space for flexibility can be sustained one can provide enhanced possibilities for improved quality where the gap itself can be defined as the total available time and budget that can be utilized for changes and rework (Liu et al, 2008). In this way, one can clearly see that an increased extent of standardization can be beneficial in some contextual settings in terms of project performance.

However, standardization can also imply decreased project performance in terms of the bureaucracy caused through all the standardized elements necessary to be utilized where
standardization itself slows down the project process. In this way, the time aspect can be seen as important since agile projects promote rapidly performed deliveries where standardized methodologies can be seen as inadequate to utilize. But also that increased standardization would infer a higher extent of resources needed which in turn increases the project cost due to unnecessary documentation which rather could be conducted without the required documentation. However, as also known an increased amount of standardization in the processes may hamper the required flexibility to sustain great quality which in turn gives arise for less quality in the customer configuration. Thereby, the intended scope cannot be met due to the restricted space for making changes or rework to comply with the set features that the customer demand (Attarzadeh & Ow, 2008).

Thereby, as has been promoted within this paper the balance of agile respectively standardization has to be configured in the most proper manner to be able to sustain an appropriate process approach aiming to create superior value for the customer with great process performance. In this way, increased or decreased amount of standardization in accordance with the theory shows that the performance either can be enhanced or decreased which in turn means that some optimum has to be found. However, this will show whether an increased amount of standardization will enhance the project performance in general in which an understanding of whether an optimum already has been reached among the concerning companies has been attained.
4 EMPIRICAL FINDINGS

This section will cover the conducted interviews that are valid for this study in relation to the set criteria in the beginning where two companies have been standing as foundation for this empirical research. Both of the two respectively companies will be abbreviated as company 1 respectively company 2 in this study. However, all the information in this section comes straightly from the conducted interview whereby the section about company 1 derives straightly from what has been said during that interview (Chapter 4.1). Whilst the information that derives from the respondents within company 2 will be elaborated in the section about company 2 and their current state and performance (Chapter 4.2). This initial statement infers that all the referencing in these sections straightly derives from the interviews. In this way, all the information will be referred to the transcripts provided in Appendix B for Company 1 respectively Appendix C for Company 2.

4.1 Company 1

The first company that was visited in order to gain information regarding their process methodology development over the years was Company 1 a Software Development company focusing on Cloud and iOS/Android mobile app services for their customers. The company was founded during the year of 2009 where the current organization has been running in approximate during six years in which Software development always has been the major concentration for the organization. Today the company possesses over 20 employees where 14 of those employees focuses on mere Software Development in the organization.

However, the organization treats every Software product as one unique creation for their customers whereby every Software Product created has its own touch of features tailored for the specific requirements from the diverse customer group. In this way, few features in the end product hold the similar product constellation in which the Software Development within the organization constantly are approaching differently from project to project. As one of the interviewed persons within the organization clearly denoted some customers may have the same or similar demanding features which can require totally different approaches even thought the features or the product holds the similar characteristics. Thereby, the coding may differ radically in some cases even thought the product may pose over similar characteristics where the organization currently tries to reuse prepared coding that are stored in a central repository. However, the customer always asks about new features that they want to incorporate into the customer specific solution whereby a lot of new things has to be considered in the development process.

To describe the typical characteristics of the projects within the concerning organization the representatives from Company 1 described their projects as complex in the sense of the customer specific solutions and features within the end product. Each project takes between three to twelve months in general to finish where the time often equivalently correspond to the size of the project that the organization undertake. The larger projects can sometimes involve up to 10 people where the smallest one can be managed by one Software Engineer whilst the average project are managed in average by 3 Software Engineers (Appendix B).
4.1.1 Overall Process Methodology with Steps

The overall process methodology that Company 1 utilizes consists of four major phases: Specification, Development, Testing and lastly Acceptance, as can be illustrated in Figure 8.

Figure 8 illustrates the overall Project approach in which Company 1 applies in their Software Development Approach

The framework that Company 1 utilizes for their Software Development in general holds up the overall approach that should be conducted where each of the steps has iterative loops referring back to preceding process steps. In this way, the process itself can be described as a spiral that iteratively builds the end product whereas the illustration above has been plotted horizontally to illustrate the iterative approach. However, the framework utilized by the concerning organization has been developed by themselves with inspiration taken from other methodologies and commercial approaches in which the methodology has reminding elements from other process methodologies.

The process methodology of Company 1 can be seen as a methodology that does not comprise of many phases and hence possesses over a light weight constellation with overall steps that clearly draw boundaries among the different phases. The purpose of the first step Specification and Prototype aims to create an initial product specification together with the customer with including prototype creation before going into the next step. The second step Development implies both planning and development in the broad sense where the third step infers testing of the product in order to find issues and bugs in the Software. The last and the fourth step can be referred to Acceptance which can be referred to the final transition of the product to the customer where the final handover can be concluded. According to the company representatives that were interviewed all the steps has to be conducted even though the customer creates the specification and the prototype whereby the step itself has to be conducted regardless of whom that conducted that part. No specific documentation has to be filled in to update the customer since communication and weekly meetings instead replace documentation (Appendix B).

4.1.2 Elements, Tools and Templates

This section will briefly elaborate concerning the elements, tools and templates Company 1 utilize to develop their software products where all the phases in general have a low degree of standardization, see Appendix B as reference for whole this section. The four phases will regarding to the perceived situation concerning Elements, Tools and Templates be described separately as follow:
1. **Specification and Prototype:** In the Specification and Prototype as aforementioned the prototyping respectively the project specification can be bypassed if the customer already have specified and created those two major elements that this phase mainly consists. Before heading to the next phase of the process one have to fulfill the two mandatory requirements which basically infer that one prototype and one requirement specification should have been created. The decision whether the prototype can be delivered to the next are taken by the software engineer ensure the readiness of the prototype for the next phase. This phase does not consist of any necessary documentation where the briefly written specification mostly will be defined together with the customer through communication in which the prototype can be created by either the customer or the company.

2. **Development:** The development process in turn has 5 major elements that should be conducted which also can be seen as mandatory where the following four elements are conducted: Building System Architecture, Assigning People, Time Planning, Break Down work and lastly Development. All of these steps has been considered as mandatory to perform during the project proceeding before the test phase can be entered. In this way, every project follow these basic steps where the System Architecture firstly are built in which thereafter the work has to be delegated to the people involved in the project. The third step infers creating the time schedule with important milestones that should be achieved where flowcharts, relationship graphs and other graphs are created in the way that the Software Engineer self prefers. From that standpoint the Software engineers has the freedom to create their own schedule in terms of their own preference as long as a schedule with important milestones has been created. This schedule will then be checked upon a weekly basis to be able to conduct probable schedule changes needed which in turn creates documentation in relation to rescheduling. After the time planning the work will be scaled down in small pieces or features as the interviewees described where these features will be considered as issues that should be solved upon the assigned deadlines. The issues are created in the GIT system where then the employees in the company can follow the current project proceeding. However, after that the work has been broken down in smaller features the development can be conducted where the development according to the interviewed people runs without structures in which each engineer works in their own way. The iteratively conducted development process will be evaluated upon weekly basis through meetings regarding to the current status concerning the time schedule in focus and thereafter be communicated with the customer. Thereby, depending on how the project has been running new issues may appear and hence be feed into the GIT system together with earlier issues that needs to be solved. Based on the performance that has been committed schedule changes can be conducted to update the current status of the project where all the projects follow the overall mandatory structure.

3. **Testing:** When the Software product has been developed the product will be tested upon its features that has been created where the testing phase consists of three major elements: Define Test Scenario, Testing and lastly Checking. These three steps are not all mandatory where only the Testing respectively the Checking can be seen as
mandatory in which the Test Scenario can be seen as obviously something that do not necessarily need to be defined in beforehand. In the testing phase the produced Software will be tested upon bugs and mismatches before the customer get hands on the final product where a test plan will be created initially to see what should be tested on the software which can be seen as the only document created. The first if needed different test scenarios will be created but mostly this step will not be incorporated into the testing procedure. Thereafter as aforementioned Step 2 – Testing will be conducted which infers that all the things defined on the test plan will be tested whether they follow the requirements and that everything has been fulfilled and finished. The third step Checking infers that the test will be checked upon whether bugs or mismatches have been found in the developed software. In this way, whether the company found any mismatches or bugs those deviations can be solved through after work conducted on the developed software product to ensure the quality to the customer. However, sometimes the customer do not require any testing in which the company then freely upon their own way conduct testing where the testing does not have and mandatory requirements just that the test has been conducted and checked.

4. Acceptance: The acceptance phase can be considered as the last final phase which in turn infers that the project will be ended and hence be closed as passed through. In this phase no necessary documentation has to be provided but the customer can sometimes require additional documentation whereby the customer demand decides the amount of documentation needed to provide.

4.1.3 Earlier Process Methodology
According to the both representatives there did not existed any process methodology for about 3 years ago where everything was conducted upon a freely approached way of developing software. Thereby, no further elaboration concerning this aspect will be conducted in which the next section describes the project performance and the extent standardization (Appendix B).

4.1.4 Project Performance and Standardization
This section will describe the project performance from the earlier state respectively the current state, but as well providing an evaluative appreciation of the extent standardization in the current processes of Company 1. The success rates derives from the years of 2015 respectively 2012 where the interviewed persons announced the numbers that can be illustrated in the table 3.
Table 3 below illustrates the success rates of the software projects for the years of 2012 respectively 2015 in terms of budget, time and scope.

<table>
<thead>
<tr>
<th>Success Rates (%)</th>
<th>Budget</th>
<th>Time</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>80-90</td>
<td>80-90</td>
<td>100</td>
</tr>
<tr>
<td>2012</td>
<td>60</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

According to the interviewed persons within the concerning organization the success rates has been increasing due to the higher extent standardization according to the people that was interviewed. As one can see from the Table 3 above the rate of success has been increasing when comparing the situation that prevailed during the year of 2012 with the year of 2015. According to the company representatives the rise in the success rate depends mainly because of the increased stabilization that has been incorporated in the current Software Development process. From the first beginning no standardization was incorporated within the process methodology which has been declared as the lowest possible ranking in the Agile-Standardization rating as can be illustrated below In Figure 9 (Appendix B). On the contrary, concerning the amount of standardization today in the appointed Agile-Standardization scale which can be illustrated in the same aforementioned schedule can be seen to be around 2 in a rough appreciation.

Figure 9 illustrates the current respectively the previous state printed in a scale of from 0 to 10 concerning the extent standardization in the current process methodology.

4.2 Company 2
The second company that was visited in order to gain information regarding their process methodology development over the years was Company 2 a Software and Hardware producing company focusing on Fiber Optic Test and Measurement Solutions for their customers. In this way, the company has the product as major deliverable with an additional and supporting software product that controls the major main product that the company promotes in which Software Development will be researched in this thesis project. The company was founded during the year of 1990 where the current organization has been running in approximate during 25 years. The company can be said to be composed by two major functions: the product function respectively the Software function where the Software
function today consists of 4 active Software Developers.

However, concerning the Software types that are created by the organization every project can be considered as unique where the company mostly combines several modules that have been created before. Only when the customer require features that never has been created by the organization before the complexity of the project increases, this according to the interviewed personnel within the company.

Furthermore, the combination of the different modules does not get integrated without any effort where each of the modules has to be integrated through integrative coding in which the modules are connected to the main product features demanded by the customer. Thereby, each project has to be considered upon two demands where the customer respectively the main product requirements determines the software constellation that has to be embedded to work with the main product. In terms of the project sizes every project mostly takes about 1 to 2 months to conduct where some projects may take up to 3 months to conduct in which mostly 2-3 people works with each project (Appendix C).

4.2.1 Overall Process Methodology with Steps
The overall Project Methodology that Company 2 today utilizes consist of mainly five major steps which are the following: (1) Collecting Software Requirements, (2) Feasibility Evaluation, (3) Software Architecture Design, (4) Software Component Analysis and lastly (5) Developing Product, see Figure 10. The five steps represents the overall Project frame utilized by the concerning organization in which (1) Collecting Software Requirements, (2) Feasibility Evaluation, (4) Software Component Analysis and lastly (5) Developing Product are considered as the mandatory steps that has to be followed in every project. The third step Software Architecture Design has been mentioned as the not mandatory step that has to be included in each project due to that some projects already utilizes standardized Software Architecture Designs where mostly specifically tailored Software projects includes the third step.

![Figure 10](image-url)

*Figure 10 illustrates the overall Project approach that Company 2 applies in their Software Development Approach.*

The first step in the process Collection Software Requirements infers that the software requirement has to be specified in accordance to customer respectively hardware requirements. Thereafter in the second step a Feasibility Evaluation will be conducted to see whether the project can be carried out by the organization where the third step can be referred to create an initial architecture design. The fourth step in turn can be referred to conducting an initial analysis of the components/modules needed to be integrated among each other together
with the additional coding activities. Lastly, the development step aims to conduct all the development actions to develop the Software in accordance to customer respectively Hardware requirements. This process methodology has been own developed within the company and hence not taken from other organizations (Appendix C).

4.2.2 Elements, Tools and Templates

In this section all the phases will together with the elements, tools and templates be elaborated in order to be able to conduct an appreciation of the current amount of standardization embedded within the process methodology today, see Appendix C for transcript covering this section.

1. **Collecting Software Requirements:** This step implies that the Software Requirements are collected based on the requirements of the customer respectively the Hardware requirements. In this way, Collecting Software Requirements has two major criteria that has to be fulfilled before the next step Feasibility Evaluation can be conducted: customer requirements respectively Hardware requirements. In this there is no huge amount of documentation or steps that need to be followed where only requirements are collected through meetings with mainly the customer and the Software Engineer group. In this way, the requirements are documented in some specific documents before they are sent further for Feasibility Evaluation.

2. **Feasibility Evaluation:** In the Feasibility Evaluation stage an evaluation of the projects ability to be undertaken will be assessed, but also that a cost plan will be presented in this stage. Through the Feasibility Evaluation the company can determine whether the project should be undertaken or not through in which the Software Engineer evaluate the feasibility of both customer requirements respectively Hardware requirements. This step does not imply any documentation except from the cost plan where the Software Engineer solely evaluates both requirement criteria’s whereby the hardware compatibility will be checked in relation to the Software Requirements. If the Software requirements cannot be managed by the current Hardware capabilities further Hardware changes has to be conducted to sustain the enquired Software requirements. Simultaneously align with the assessment evaluated by the Software Engineer the Project Manager creates a cost plan as aforementioned that aims to promote the cost objectives of the intended Software Development project. Thereby, documentation will be created through the proposed cost plan conducted by the Project Manager.

3. **Software Architecture Design:** The third step within the process methodology of the concerning organization can be referred to the creation of new Software Architecture Design align with newly incorporated product features that has to be integrated in the Software. However, this phase can be consider as not mandatory and hence mostly bypassed since most of the Software products utilizes already prepared standardized Architecture Designs. This phase will only be conducted when new features has to be incorporated into the Software Design whereby the project complexity increases due to the new product created as aforementioned.
4. **Software Component Analysis:** This step infers that an initial analysis respectively component composition in relation to the customer respectively Hardware requirements will be conducted and defined. Thereby, this step implies to define the intended components that should be formed and integrated into the final software whereby this step only consists of defining the components respectively creating necessary documentation for the development phase. In this way, this step can be seen as a pure documentation step establishing control to be able to develop the Software in the right way. Based on the definition of components that has to be developed into a Software product the time schedule can be defined and created by the Project Manager and hence the Software Component Analysis phase can be considered as the last step where documentation appears in the whole entire project process.

5. **Developing Product:** The phase Developing Product comprises of mainly four major elements that has to be conducted but also considered as mandatory in which the following steps are included: (1) Develop Components, (2) Sample Program, (3) Software Testing and lastly (4) Software Integration & Test. The first element Develop Components all the components are developed individually by the Software Engineers in order to further be integrated with the other developed components in the fourth element. The second element implies that sample program has been created whereby one can verify whether the right sample program can be considered as correct before heading further for testing. However, the third element can be referred to Software testing which further implies that the components are tested upon whether the components consists of failures and bugs that has to be corrected before integrating the components together. After the third step through component testing the fourth step will be conducted which implies that the software components will integrated together and undergo testing together with Hardware as last element in the Software Development process. As aforementioned within the previous phase no documentation are conducted within the fifth phase “Developing Product” in which every process basically focuses on the Software rather than documentation. In this way, a coding platform as tool (SPN Server) are utilized in order to be able to develop the intended Software products whereby this platform enable the Software Engineers to comment the coding upon a constant basis. Other Software Engineers have opportunity to fix those issues indicated by another Software Engineer in which this supports the bug fixing and failure identification process for better quality. The whole entire Product Development phase with the four elements itself runs iteratively at maximum twice in which then finished compatible Software can be provided for the existing Hardware. Every week one meeting will be held to do through the issues in each project together with the schedule to ensure that the project runs in the most proper way as possible to solve appearing dilemmas.

4.2.2 Earlier Process Methodology
According to the company representatives who was taking part during the interview the process model has been developed since 2012 where the fourth phase Software Component Analysis has been added to stabilize the project process. This step was not incorporated before
which further implies that the project process in general had less incorporated requirements of documentation which in turn infers that the process was less standardized. But also that the development phase earlier at 2012 did not incorporated any control system that are used today to support the development process today foremost for coding and bug fixing. This implies that the process before was more freely approached where tools and documentation was not used as extensively as today (Appendix C).

4.2.3 Project Performance and Standardization
This section will describe the project performance from the earlier state respectively the current state, but as well providing an evaluative appreciation of the extent standardization in the current processes of Company 2. The success rates derives from the years of 2015 respectively 2012 where the interviewed persons announced the numbers that can be illustrated in Table 4.

Table 4 below illustrates the success rates of the software projects for the years of 2012 respectively 2015 in terms of budget, time and scope.

<table>
<thead>
<tr>
<th>Succes Rates (%)</th>
<th>Budget</th>
<th>Time</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>100</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>2012</td>
<td>100</td>
<td>70</td>
<td>80</td>
</tr>
</tbody>
</table>

As can be read from the Table 4 the performance has been increased in terms of quality from 80 percent year 2012 until 100 percent year 2015 whereas budget respectively the time performance still prevail the same as before. According to the interviewed people in the concerning organization the enhanced customer fulfillment relies upon the fact that the processes has been more standardized in comparison to the earlier state where Quality Assurance has been described as one of the reasons. The enhanced performance in terms of quality relies upon the fact that the bug control has been improved through the platform introduction basically due to the enhanced control. But also that the additional fourth step which has given more control into the process before the development phase starts in order to ensure that the right component configuration are considered before the actual Software Development starts. In this way, the fourth phase provides necessary documentation that provides a specification function enabling a clear description of the needed components for the intended Software. Through this initiative in accordance to the interviewees’ probable time respectively cost gains will be achieved in the coming future even though nothing has been achieved currently in terms of cost and time. However, since the development goes away from the standardized Software configurations with more emphasis on additional tailored features the development time has been increasing since components has to be developed from scratch through newly created Software Architecture Designs (Appendix C).

In terms of an appreciation concerning the amount of standardization embedded in the current processes within the concerning organization the current state can be appreciated to 4 in a
scale out of 10, as can be seen in Figure 11. Whilst the previous state clearly can be appreciated as 2 out of 10 due to the less standardized approach that the company previously applied year 2012 during their Software Development process as aforementioned.

Figure 11 illustrates the current respectively the previous state printed in a scale of from 0 to 10 concerning the extent standardization in the current process methodology.
5 RESULT

The result from this study will be elaborated in this section with emphasis on the stated research questions in the beginning of this thesis work where this section aims to see whether the interviews has been answering the intended research questions.

Research Question 1: “To what extent are the involved companies in the study today using standardized Project Management practices to develop software for their customers?”

According to the two companies that have been studied within this thesis both of those companies has a low degree of standardization in their processes in which the process steps consists of few mandatory elements that has to be conducted. Both of concerning organizations within this study emphasizes more to develop the product rather than focusing on the documentation where the overall process phases do not need to be followed strictly. Especially, the first organization that utilized only brief steps to keep track on the project whilst the second company had some few additional sophisticated process elements. However, both of the companies prefer light weight structures in which the project process can be considered as relatively agile in both of the cases.

Research Question 2: “Can an increased amount of standardization in the process methodology reduce the number of reported project failures?”

The result from this shows that an increased amount of standardization can enhance the project performance in accordance to the studied companies within this thesis work where all the performance parameters (Cost, Time, scope) could be enhanced. The first company was showing enhanced performance in terms of time respectively cost whilst the second company was showing performance improvement in terms of the quality aspect. The reason for the enhanced performance relies upon the enhanced control that the concerning organization gain through more standardized practices in the project process. In this way, according to the result provided in the previous chapter standardization can help to improve cost, quality and time where the result does not show performance improvements in all of the three parameters simultaneously. Thereby, the final answer to the second research question can be stated as validated concerning that an increased extent of standardization among companies utilizing light weight structures can enhance the project performance.
6 ANALYSIS
The analysis section will analyze the result gained from the two studied companies in terms of their process methodology and the extent of standardization incorporated in their process methodologies. Thereby, the analysis chapter will constitute of four major areas that will be analyzed together with theoretical foundation provided in a previous chapter: Strategic Implications, Process Methodology, Project Performance & Standardization and lastly the Balancing Dilemma.

6.1 Strategic Implications
Concerning the strategic implications both of the companies develop Software products where they use to produce these products for different purposes but as well having different development strategies to create value for their customers. The differences among their development strategies can be seen from the perspective of standardization and tailoring where company 1 mostly relies upon freely approached programming without larger amount of standardized modules or settings in which the freely way dominates the development process. On the contrary, company 2 mostly relies upon standardized modules where newness will be created more rarely in comparison to company 1 in which standardization infiltrates the development process in a higher extent.

One can clearly see that both of the companies utilize tailoring strategy for the sake of value creation specifically regarding to customer requirements, according from the theory stated by Buxmann et al (2013). However, Buxmann et al (2013) also promotes that standardized production implies prepared elements or modules reused several times where company 2 can be considered to utilize a hybrid strategy through utilization of prepared modules in a higher extent. However, since the Software mostly are applied within different user contexts and at the same time tailored to the customer based upon the customer preferences one can see the strategy as hybrid from that standpoint. Thereby, align with the theory regarding small and medium sized enterprises proposed by Knight & Cavusgil (2004) can be confirmed where customization and flexibility mostly characterizes small and medium sized enterprises to be able to gain competitiveness on the market.

6.2 Process Methodology and Flexibility
This sub section will analyze the process methodologies and the flexibility in the current processes in relation to the answers derived from the conducted interviews within the two concerning organizations. As one can clearly conclude form the interviews both of the organizations demonstrate utilization of relatively flexible process approaches where company 1 can be seen as the most prevalent example embedding flexibility in their development processes. The relative difference among the two investigated organizations in terms of their process methodology both companies utilizes light weight structures where the amount of standardization in their processes distinguishes their extent of flexibility (Firdaus et al, 2013).

This can be clearly seen from the perspective of iteration where company 1 foremost
emphasizes an approach that can be defined from the first beginning several times in which the flexibility for changes can be seen as extensively considered. Flexibility has been denoted by Choi et al (2014) respectively Mishra & Mishra (2011) as the available space for changes where company 1 can be doubtlessly considered as the more flexible in terms of process methodology. While the second company foremost emphasizes phase-wise advancement without considerable back-loop iterations whereby the flexibility may be less emphasized for company 2.

This phenomenon can be interrelated to the DSDM methodology that Firdaus et al (2013) uses to promote where one can ascend back to previous steps for changes or rework. Based on this reasoning the flexibility seems to be higher for company 1 whilst the second company emphasizes fewer abilities to ascend back within the process whereby the flexibility on phase-level can be seen stricter for company 2. One can clearly see that both of the companies relies upon more traditional Software project methodology structures in alignment to the general Software Development process model that Sangwan et al (2007) proposes. Through the great flexibility company 1 can enhance their customer satisfaction through the embedded flexibility within their processes where changes can be conducted without constraining structures (Choi et al, 2014). Thereby, company 1 can create more sophisticated and unique features where this provides greater innovation for the customer with new ideas and new solutions, this in alignment to the theory proposed by Liu et al (2008).

However, the difference among the two companies can be described as fundamental in terms the efforts that are put into the definition of the project where company 1 clearly has a vague definition of the value that should be created whilst company 2 chooses to be more structured and disciplined to define the requirements. As one can clearly see the customer are instead closely involved in the projects run by company 1 whereas company 2 uses to clearly define the features of the Software product from the beginning through an additional analysis step as earlier mentioned. Thereby, company 2 follows more of an inception phase and an elaboration phase (Sangwan et al, 2007) to solve out the initial issues and based on these requirements conduct a component analysis with the aim to find out an appropriate Software constellation with interrelated components. Whereby, company 1 mostly relies upon a freely conducted initial approach aiming to crafting an initial overall Software product closely together with the customer where no specific definition process aiming to define the final product from a detailed point of view are in place.

Concerning the process methodology and the flexibility in general from the point of view of consisting elements within each of the phases the degree of flexibility can be considered as various in both of the concerning situations.

In terms of a comparison of both the process methodologies company 1 possesses over less mandatory elements that has to be conducted in relation to the process methodology of company 2. This implies that the process methodology applied at the company 1 possesses over less standardized way of approaching certain steps whereby the flexibility seems to be essentially larger in that sense. This can be closely connected to the theory that Fernandez & Fernandez (2009) promotes where some steps in the methodology may possess over stricter
elements whilst some phases can be carried without considerable guiding throughout the phases. This especially applies to the methodology that company 1 utilizes where the development phase has several criteria that has to be fulfilled but at the same time some phases has to only fulfill the major objective which infers greater flexibility. However, company 2 has been more concerned about to keep the similar pathway for all their projects which in turn derives into greater consistency, according to Fernandez & Fernandez (2009).

Especially the development phase uses to emphasize different elements among the two process methodologies but considerably apply the different elements in other phases. For instance that the time planning and work planning are conducted within the development phase in company 1 whilst company 2 uses to conduct these elements earlier during the preceding phases instead. Thereby, one can clearly see that company 2 uses to emphasize clear planning initially to be able to create the needed Software product whereas company 1 works together with the customer as Chow & Cao (2007) emphasizes as more agile concentration. Both of the companies utilizes weekly meeting among the employees in which according to Conboy & Morgan (2010) enhances the collaboration, flexibility and communication among the team members.

The documentation and templates in both of the cases can be considered as low where company 2 mostly uses to document thing from the first beginning from phase 1 until phase 4. Company 1 approaches documentation upon very rarely basis since these are not needed to fulfill the customer requirements in which only documentation are adapted when the customer really needs that for further purposes. In this way, external actors instead influences the need for creating documentation due to the demand from the customer for instance which further derives in value creation for other parties when creating that documentation, as stated by Fernandez & Fernandez (2009). Obviously, both of the companies rely upon standardization in a certain extent to gain the necessary benefits from the standardization in the greatest extent (Boehm & Turner, 2003).

6.3 Project Performance and Standardization
This section will be devoted to one of the major research areas that have been investigated where the standardization dilemma has been researched in relation to the performance spectra. As could be seen both of respectively companies the performance was increased in terms of either quality, time or cost where standardization has been given arise for more consistency in the both respectively Software development processes through enhanced control. This phenomenon can be closely connected to the theory proposed by Fernandez & Fernandez (2009) which clearly claims that standardization provides the objected consistency. The deriving result from this study can be closely connected to the performance increases that can be attained through embedding more standardization within the processes, according to Attarzadeh & Ow (2008). In this way, according to the same author the standardized approach handles the experienced complexity in a better way which further supports the project to stay inside the required commitments regarding to budget, time and scope/quality.

As can be seen from the company 2 one can clearly state that the company relies upon
consistent way of developing Software through following a predetermined approach or pathway in all projects. Furthermore, company 1 can be described as similarly minded where the structure keeps up consistency in terms of facilitating structure for enhanced control but more relatively released from structures in comparison to company 2. In this way, according to Seymour & Hussein (2014) respectively Choi et al (2014) standardization provides the necessary stabilization where both companies have been experiencing that during their development which will be carefully elaborated further on within this section.

However, the performance appreciation has been conducted together with the respondent in order to be able to see how the performance has been changing through the standardization changes in the concerning companies. From that standpoint company 1 was undergoing radical changes in their way of working with Software Development projects where basically no methodology was used during the year of 2012 in which today has been supported with a light weight methodology. As one could clearly see was that company 1 reached higher number in the aspect of budget and time whereby the success rates can be seen as originated from the incorporated standardization as clearly stated during the interview. This mainly relies upon the enhanced control that the company has gained through incorporating time, cost and activity planning together with weekly evaluation to be able to track and control the proceeding more easily. Especially the issue tracking system that has accordingly to the information retrieved form the interviewees been standardized and hence less time consuming and costly. The quality aspect has always been considered as 100 percent but the time and cost aspects have been low from an initial point view during the year of 2012. Obviously, the standardization enabled company 1 to more effectively and efficiently handle their processes which enable enhanced financial (Choi et al, 2014) respectively timely performance (Liu et al, 2008).

Regarding the situation for company 2 the performance has been enhanced in terms of the quality aspect due to the implemented quality control system as aforementioned that supports the development process concerning coding and bug fixing. This performance improvement goes hand in hand with the theory promoted by Choi et al (2014) where the company conducts essential analysis activities before the actual development process starts in which this activity provides quality assurance. This relies upon the fact that the analysis activity conducted as the fourth phase essentially brings out an analysis regarding to the set requirements to ensure that right components are incorporated into the Software product.

As was clearly stated during the interview as earlier elaborated this process steps has additively contributed to the reported quality improvements. This further implies that the risk can be considered as low to conduct failures in further steps in accordance to the theory proposed by Choi et al (2014) whereas the predictability has been enhanced concerning the expected outcome (Liu et al, 2008) due to the additional fourth phase. Thereby, one can clearly see that standardization of process steps and elements provides the necessary control and risk reducing factors with valuable additive functions to be able to carry out Software development projects with enhanced quality. However, still there prevail doubts concerning time respectively cost parameters regarding performance changes where no changes has been experienced in terms of these aspects. However, as Attarzadeh & Ow (2008) promotes in their
theory accordance to the statements that has been promoted in this thesis work standardization requires additional resources in which time respectively cost can be affected. On the other hand standardization can as well decrease the lead time respectively the cost through less needed rework through standardized and directed approaches enabling consistency as aforementioned (Choi et al, 2014).

However, it should be promoted that the extent of standardization varies along both of the mentioned processes that the two respectively companies approaches to develop Software. In this way, company 2 has in accordance to the elaborated process structure tinted the process methodology can be seen as varying in terms of process standardization in each of the phases. Thereby, the theory proposed by Fernandez & Fernandez (2009) indicates that company 2 has designed their process methodology accordingly to the needed demand of standardization in each of the phases. On the contrary, as clearly expressed by Liu et al (2008) well defined standardization can provide both the needed demand of standardization in alignment to a favorable performance, as aforementioned within the theoretical foundation (Liu et al, 2008). Whereby, depending upon the allocated extent of standardization incorporated among the different phases there should be a concentrated standardization on different phases to gain the most beneficial and balanced approach as possible.

The similar characteristics concerning the standardization allocation among the phases in company 1 can be experienced as similar in the sense that the development element focuses foremost on development whilst the surrounding elements and phases possesses over standardization. The company has the same similar constellation where the development phase does not include standardization in the highest extent in comparison to the other phases in their process methodology. In this way, to gain the most appropriate setting standardization can be reinforced in selected parts to gain the most beneficial performance where this statement can be seen as an interesting finding for further research concerning performance optimization.

6.4 Balancing Dilemma
The reason that the Balancing Dilemma has been incorporated within this thesis relies upon the fact that standardization to some certain extent may hamper the project performance when the extent of standardization exceeds the breakeven point as aforementioned in the theory chapter. Regardless of the result presented within this thesis the outcome has to be motivated against the theory to be able to confirm the possible performance outcomes reported in the interview studies conducted within this study. From that standpoint the breakeven point can be considered as the point that in some way infiltrate whether the current extent of standardization within the processes can be considered as below the maximum. Since there are two constraining options related to settings where pure agile respectively fully standardization of process methodologies a breakeven has been mentioned as existing, according to Boehm & Turner (2003).

In close relation to result gained through the interviewing studies one can clearly see that the performance has been increasing in terms of the increasing standardization whereby both of
the cases may have been placed either on the right hand side or the left hand side. This depends whether some of the two companies has been passing the breakeven point or that they still have to come closer to the breakeven point coming from the left hand side of the line, as can illustrated in Figure 12.

Figure 12 illustrates the existing breakeven point and hence gives hint regarding the current localization of the companies in the study.

Since one cannot know whether the included companies within this study has been passing the breakeven point an additional test would had been appropriate to conduct to see the relative changes over the years to determine the current status. However, the study has through the two companies showed that the performance can be increased in terms of the extent of standardization in the processes but not the relative performance gains due to the not fully applied balancing dilemma in this thesis work.
7 DISCUSSION
This study shows that an increased extent of standardization can increase the project performance in terms of time, cost and scope where two companies has been included in this study. From that standpoint all the performance parameters in terms of time, cost and scope can be raised when implementing more standardization in the process methodology to carry out Software Development project among small companies having Software Development as core or beside activities. In this way, the contribution of this research will be both to the world of enterprises but as well the current research area that has been reported as vaguely subscribed within the concerning research area. Many small Software Development companies can hence take advantage of this study through gaining a grasp of the current dilemma in much better way through this research. But also that the research world will be contributed with an additive research area that can be researched even more in the future to gain much better understanding concerning standardization and performance.

However, the result from this study only shows that performance can be increased through higher extent standardization but cannot give the ranges of possible performance improvements due to the indulging prevailing balancing dilemma that has to be considered. The balancing dilemma itself can be considered for additional research in conjunction to the performance and standardization dilemma which has not been extensively included as research object but important to include and analyze briefly with the current concerning research.

Furthermore, the reason for why the result look in the following way relies upon the fact that both companies formerly possessed over low standardized settings where they probably does not had hit the breakeven point. This further implies that there was space for more standardization without dipping performance which in turn infers that this study can be confirmed as long as the companies possesses over low-weight process methodologies that have space for more standardization. Hence, this implies that the balancing theory in alignment to the performance spectra can be seen as confirmed and truly overlapping with other theoretical contributions. From that standpoint standardization can help companies to enhance their current performance regardless of cost, time or scope for which the flexibility can be steered into the most proper configuration relatively for optimization.

Moreover, one can clearly see that the result mirrors the theoretical view provided from the balancing theory and would probably had decreased whether the companies would had been positioned on the other side of the breakeven point. In this way, the initial situation among small Software Developing companies should start from relatively agile profiles as clearly stated within the selection criteria for the companies qualified within this research area.
Furthermore, something that also worth promoting in this discussion section local optimizations within the whole entire process methodology can provide more customization concerning the focus areas that should be more standardized or less standardized. Thereby, some phases may possess over more standardization than other phases to sustain more favorable optimization where both of the companies utilizes such process activities.

However, the study should be criticized in terms of the number of companies included within
the study where at least one more company probably would had been giving this study greater variation and hence also more possibilities to analyze and generalize the outcome much better. However, the low variation should not be the largest problem but rather situational in terms of the variation and multifaceted dimension it would have been giving this study. Furthermore, the methodological approach has been carried out without larger problems as was planned from the first beginning except from the number of companies included in this study. Maybe that the sampling would had been better whether the companies would had been deriving from the sampling group of sending out proposals to optional companies rather than relying purely on the network. In this way, there still prevail doubts whether the sampling can be seen as fully representative since only two companies was included in the study and hence also derived from the network.

Finally to propose issues for further research there can be retrieved a plethora of research areas deriving from this study where one of the most prominent further research areas may be the following:

- The balancing dilemma with further concentration in the breakeven point together with standardization and performance where the major research issue would have been to investigate the possible performance gains that one can get through standardization. In this way, an investigation regarding the extent standardization relatively to the project performance would had been interest to study to really see how much performance one can gain through standardizing the process methodology with a certain extent standardization.

- Another research are of interest would had been to investigate the impact of technology for further standardization dilemmas where technology can help to enable more standardization in the process and hence also provides effective and efficient activities. This especially applies to supporting systems that both respectively companies utilized in order to support the current processes in a much better way. Thereby, more standardization in the processes would probably have been enabled through more frequent use of technology without affecting the performance negatively.
8 CONCLUSION

Based on the result provided in chapter 6 the conclusion part will describe the relative answers to the research questions in alignment to the conducted analysis where one can clearly see that there are reasons for why certain things appears in a certain way. The first research question was: To what extent are the involved companies in the study today using standardized Project Management practices to develop software for their customers?

In this way as one clearly could see was that the extent of standardization in both of the project methodologies that both respectively companies governs over has been reported as relatively low. Both companies emphasized their own methodologies for how to produce their customer specific solutions for their customers whereby company 1 foremost relies upon a more flexible and iterative approach in comparison to company 2. This relies upon the fact that company 1 focuses on creating newness upon a constant basis whilst company 2 utilizes modularization a higher extent to reach customization.

Furthermore, as could also been seen from this study was that company 2 was more concerned about quality assurance and has hence incorporated a standardized quality approach to increase the performance in terms of quality. Thereby, company 2 can be considered as more planning oriented in terms of the added phase enabling the company to address quality issues early during the development process. However, company 1 foremost works closely with the customer and hence emphasizes to develop Software together with the customer in a higher extent than company 2. Moreover, the essence of having the first research question mainly relies upon the fact that the first research question enabled the author and the respondents appreciate the current setting in a much better way through going through the current process methodology to determine the extent of standardization in the processes.

The second research question was: Can an increased amount of standardization in the process methodology reduce the number of reported project failures?

As one can clearly state the performance can be increased when incorporating more standardization in the process methodology whereby time, cost and scope can be increased through different actions. From that standpoint both of the cases could gain better consistency in their result in comparison to earlier states which inferred less standardized approaches. Company 1 could enhance their financial respectively timely performance through the improved control that further implied that they started to conduct weekly evaluation and control upon a weekly basis. Whilst company 2 could enhance their quality performance and consistency through the enhanced control that the standardization enabled through which the predictability has been increasing by lowering the risk. Through this can clearly conclude that well defined incorporations of standardization can enable favorable conditions for many companies that struggle with financial, timely or quality performance gaps.

However, generalization of the result can be hard in this stage to announce but one can through this study conclude that companies has great opportunities to enhance their performance as long as they relocate before the actual optimum. In this way, this implies that
companies that has reached or has passed the optimum should not further standardize their processes. Furthermore, one can clearly through these answers to these research questions state that the purpose has been fully completed where an investigation concerning the current state has been conducted but as well an evaluation of the performance in relation to standardization. Thereby, the conclusion part has been summarizing the key findings from this study but as well answering the research questions in which major concern standardization enable greater performance. In this way, small companies within the Taiwanese Software industry should investigate their current situation from the perspective of performance overlook over their current standardization in their processes to be able to enhance their future performance.
REFERENCES


Fontana, A. and Prokos, A. H., (2007), The interview from formal to postmodern, Walnut Creek: Left Coast Press, inc.


Park: North Carolina.


APPENDIX A
INTERVIEW QUESTIONS

General Questions

- What profession do you hold?
- What type of Software Products do you develop and what are the characteristics of those in terms of size, complexity, Software Type etc.?
- How many people work with software development in the company?

Process Methodology

- What type of process methodology do you use, this in terms of commercial approaches or own developed approaches to develop software?
- Do you always use this methodology and are forced to stick to the approach every time?

Process Steps (Phases) and Elements

- What Process Steps and elements do you follow when you develop software?
- Which of these steps do you have to follow strictly and cannot compromise to leave out?
- What documentation is required before the next step can be approached?

Tools and Templates

- What Tools and Templates do you use in each Process Step (Phase) and Element?
- What documentation do it requires?

Final Questions

- To what extent is the Software Development Process standardized from a scale of 1 to 10? (“Pure Agile=1” and “Purely Standardized=10”) – Make an appreciation regarding to the described information earlier.
- What are the success rate of Software Development projects conducted in the company in terms of budget, time and scope?
What profession do you hold? (“Business Cards”)

What type of Software Products do you develop and what are the characteristics of those in terms of size, complexity, Software Type etc.?

We spend most of our time on software outsourcing for our customer. So we develop mobile apps and cloud services for our customers... In android and iOS for our customer... we have done it in the past four/five years... From three months to maybe one year... Some project we can handle by one engineer... some projects have to be done by a lot of people, 10 people... 1 to 10 people involved in one project... in averagely speaking... how many people will work on each of the projects?... three, for each platform and each project... Each project they varies, they have different requirements and even for the similar product, the customer demand totally different app... Frequently they ask for new functionalities, so that’s the hard part in developing apps... we build some libraries by ourselves and reuse those libraries... sometimes we rely on third party libraries...

How many people work with software development in the company?

So far we have 20 employees... probably about 14 in Software Development...

Process Methodology

What type of process methodology do you use, this in terms of commercial approaches or own developed approaches to develop software?

We build our own, but it is similar to other methodologies... We mostly rely on GIT to manage our soft code... there is GLab where you can do an issue checking... You can have some discussion in that system... For each project there is a GIT repository... There is issue checking and chat room...

We discuss the functionally and the spec for the prototype... after that the prototype will be confirmed... Spec and prototype... Then as a second step you go to... Development... And then maybe test... then... finish the project, how to say that, acceptance... and then we close the project

Do you always use this methodology and are forced to stick to the approach every time?

Most of project we follow these... most of time... if they do not need any prototype and they have spec already, we just develop the software for them... we don’t need to discuss the spec or we don’t need to discuss the prototype... because some customer they don’t know what they want, they just have the paper with requirements, then we have to make a prototype to confirm what they need, then they already have the design, just develop for them... most customers
don’t know what they need, so we have to make prototype... then they confirm for the
development... already in place then you do not need to use the first step?... Yes... but the
second step development is always?!... Yea... but the testing, you test always?... Yes... The
acceptance is the last part... Yes... for the test we create issue in GIT...

Process Steps (Phases) and Elements

- What Process Steps and elements do you follow when you develop software?
- Which of these steps do you have to follow strictly and cannot compromise to
  leave out?
- What documentation is required before the next step can be approached?

We should first create a spec, how we understand from our customer... We also deliver a
prototype... all of these have to be confirmed... then we go to the next step... after this we
should have a spec and a prototype... we have to make sure that everything can be delivered
in the end of this project... so that’s the mandatory things?... Yes...

We have to build the system architecture first... we have to this, and after we can discuss who
is charge of this part and who is charge of this part...and the we define the schedule... we do
not use specific software, but we use those graphs, some flow graph and relationship between
them.. it depends on each engineer on which tools you would like to use to generate that
graph... So it is very free in this way?... Yes... They only have to do it by themselves, it helps
the manager to come out with the schedule... from this the project manager will come out with
a schedule and set big milestones and small milestones...we check the project weekly... then
you create schedule and milestones?... Yes... So this is mandatory?... Yes all the time... then
we break the project into features... and also every week we will come out with a release... So
basically you make it like an iterative process all the time?... Yes, Yes... done on weekly
basis... then you do it, you have a meeting and then you back to the schedule and milestones
and check it?... Yes... This steps is something that you always follow?... every project... in
every project you have to follow these or otherwise you will fail...

The project manager will define the test scenario... Yes, test scenario, then he perform the test
to see if there is bugs or mismatch... Then you test?... hmm... you check the test then?... Yes...
Is also like an iterative process here in testing?... Yes... Is this the steps that you all ways do,
these three steps?... Sometimes the Project Manager will skip the define scenario part...

You just check it clearly what bugs and then there is something then you go and make rework
then?... Yes...We have issue checking... if we find some bug then we create an issue for an
engineer... it’s a tool that we can create issues for engineer... to solve the problem... We have
to test it before we deliver it to the customer... You have to test it?... Yea... But you test it all
the time?... Yea... Even if the time is scarce?... Yea... Most customers ask for a test plan...
Normally we just create a test list... Which functionality we have to test and which items...
This is the only thing that you use as documentation in the test step?... for some small
projects if the customers if they don’t ask for this maybe we will skip the list of this document
and we just test it as fast as we can... They will make their own test... The customer will make their own test?... Yea... We just test for them and they will do it again... So basically the testing can be like that you have just test and?... Yes...

Most of the features have been implemented and all the tests should probably be passed... then we will start acceptance with our customer, we are going to close this project... we will go through all the spec if we already implemented the feature they need and all the function is passed... and we will sign up the acceptance report... most of time we will deliver the test report to them... So there is only one test report?... it depends on the customers... if they ask for some document for the app it is for the end user or it is for the engineer... Do you have your own requirements of what you need to do in this last step?... we should understand for what the customer want and the we prepare for that... So basically, this stage, it all depends on what the customers really need?... Yea...You do not have any like, like thing that is mandatory for you guys to deliver, not really?... Not really... It all depends on the customer’s requirements?... Yea...

Tools and Templates

- What Tools and Templates do you use in each Process Step (Phase) and Element?
- What documentation do it requires?

I think we have our own format of spec... we use axuri... this is the things you fill in?... Yes... Do you need to have a report to the customer, or just conversation?... Conversation... you build the system architecture, is there any, you need to fill templates or? What do you do there? A test plan, we have a template for it... for the system architecture we also have the template of the UML... for the flow chart they have a template there, for the data structure for the project... so basically here during this step the, the system architecture point is more the outcome of the system analysis... so they come up with the system architecture in a kind of diagram, okej and as he mentioned, you know the system architecture can be break down in something related to UI or something related to... more like analysis and result... based on this we can decide you do this part and you do this part and also we decide it, the customer need this earlier and we do this first, do this second, then we can come out with the plan and also the schedule... so basically, we can say this is the planning position for who do what and such things, and you have communication with the customer... Yes... There is no document that you create or anything, just that you create something on the paper?... We create a schedule to the customers... We let they know the big milestones... we finish which part before june, which part will be done before September... and then you break down the work in different parts, right?... Yeea... and then you create the document, but you can do it in your own way as you told?... Yes... and then you develop the software?!... Yes... there is nothing strict that you need to document all the time or anything?... it depends on engineers, some engineer don’t define the the input output for each each... module... module, yes... some engineers likes to make it clear, yes and some prefers to do it in programming... so there is no requirements for how they work, they just work in their own way?... Yes... And you have weekly meeting after this?... Okej so there is no requirements for how you work you just work
on your own way, okej, and you have weekly meetings then after this, but do you need to create some report or something to the customer or is it just the communication? It is the communication we know we just follow of the GIT lab issue tracking, first we review the schedule, what has been done, then what are we going to do, checking up schedule, is there any problem, who got any problem, and should we change the plan or something, after that will check the issue, which feature and which part that should be fixed, what a new bug or that we just found something... So basically the documents that you create is the changes that you do in plans and features that you like in time planning and such things that you and no report that you send to the customer?... But we, but actually deliver the alfa version of the software to the customer, and they can get the software very early, even when not finish yet, so they can see the progress... Okej, so basically there is no documentation only that you create new schedules and such things... mmm... Okej nice okej covered, okej we can go the test scenario, and the test when is that created actually, your test plan, is it created during the development or? What you should test or?... The test plan aaa before you test, can define after your spec is confirmed, Also you can define, only before, you test, so it is okay to define anytime... So what you talked about was to define a test scenario and can also be created in this plan right, what they want to test?... I think, I think what they mention is, aa after that they talk about the spec, they come up with some of the testings, some of the test scenarios, and aa after development, okej before you really go to the testing, before the testing they may come up with more test scenarios or something like that... But, the test plan is something that you, yeaa we talked about it, you don’t need to you can just let the customer test it also... Well so basically, well so their test can be divided in two parts, a part that they will do their own testing, while they are deliver as they mentioned, they deliver the alfa, the own version of the software, where customers themselves can do the testing, probably go for the pilot release, so that they, some of the customers, you know some of the customers can test it, something like that... So we can say in this way because, so you can see that development and test can be interrelated in some way because it comes back to new development in some way, so it should be... Do, do you use any like you talked about spiral, is it more like a concept that you follow, from the first beginning or how, you just go back to the first beginning and checking the specification and go and changing and?... We just control the process by ourselves... Okej okej, but I was more thinking about when coming to the test for instance and you have to go back to the specification and specify something new to develop even more, I don’t know but... Yeeaa sometimes, sometimes even when there is no problems with, the alfa version the customers will want to change the spec with themselves... Soo maybe, this spiral that you talked about?... Yeeaa it’s more like, some kind of iterative way to do it, I think its quite common, when it comes to the apps development, right?... Yes... in the test scenario, there is no documentation specifically... it’s just that you follow the plan and fill in what you need to test, and that’s it?... Yeeaa... In the fourth las step, there was nothing, it was only like you close the contracts or something... Yeeaa... you have a very brief structure and you can do it in your own way... Yeeaa...
Final Questions

- To what extent is the Software Development Process standardized from a scale of 1 to 10? (“Pure Agile=1” and “Purely Standardized=10”) – Make an appreciation regarding to the described information earlier.

When you have a lot of Project Management processes and such things here, then its like ten, then its fully... Totally agile with nothing... then its zero, we can call it... If Im asking you based on, based on what we have going through here, and what you by yourself actually feel that your processes is, how agile are you?... how agile are you processes from one to ten, or are they going more to Project Management?... How would you put yourself in the scale?... Maybe four... I am saying two... from ZZZ you get four... from YYY you also get four... since you are using a very brief structure ten I would say two in my case... okej... How is your feeling about four?... You think you have a lot of structure in your?... mmmmm, I think it is not necessary to have structure in this kind of software Development... for mobile app development maybe its not that much... That’s why I think its four... They mention one thing that is crucial, the characteristics of the company, it may have something to do with the, level of agility...

- What are the success rate of Software Development projects conducted in the company in terms of budget, time and scope?

In terms of time there is always delays in projects, always... just because in app design the spec change all the time... they think of something new... I want this, I want this... I just want this... that one of the reason why it delays all the time... The schedule just delay, delay, delay, yes but I think that now its more controllable for us, just the the schedule and the weekly check have made the the evaluation of the delay more controllable... and I think also the scope of project becomes bigger... for maybe three years ago we just do for each project maybe one or two people... but now maybe we can put ten people in the project... this with the help of the GLab and the GIT server and the weekly checking... would contribute to the project in terms of the tools that you use... the GIT that you mentioned... would it be a key factor to your improvement in terms of the success rate?... tool and also experience... methods of doing it like may more structured way or?... Yes, we also implemented the prototype, this is bad, this is very important to communicate with our customer, yea... This as well in terms of internal communication?... Internal and External... Okej, both external and communication?... Yea... By the prototype as they mentioned... this is some kind of crucial, you know factor... for three years ago you didn’t had this structure with four steps or something? You didn’t have it?... Not that, everything is flexible... It was just like a own manner way, just do it and sent it?... Yes that’s true... At that time we were very small as well and we have maybe 8 people and it was easier to communicate at that time we think... we found some problem and we expand our size also... we have to implement this kind of tools... So basically you had nothing? No structure?... Yes... Maybe you only had one step and it was the development?... Yea... You feel that your budget is better?... In terms of budget control?... Yes... How many of your projects are fulfilling the budget that you plans for?... I think more and more project can be handled in a budget, but the rate is not easy to describe... because every year the
The situation is different, sometimes we have one big project and sometimes have many small projects. It's hard to tell the improvement in budget. How many projects you run annually? In this year we have less projects but bigger ones. 3 or 4 projects in this year, but one two projects very big so we have to invest, we have to use 10 engineers in the budget. Three years ago maybe two, one or two engineers but, so we handled more projects, the project just take three months maybe, and this year projects takes one year or half year, so that's the difference. But at that time I think we had more delay in even small projects, in this moment if we are running three months project I think can be handled well than at that time. Let's say, let's say, say, how would you do in terms of cost if you put success rate today? Compared to 2012, which numbers? Okej, if I assume that still getting for three months that involves two or three people this time then I think we can success maybe 80-90 percent. In budget? Yeaa in budget, just brief, just brief... 60 percent. For three years ago? Yeaa three years ago... In terms of budget? Yeaa... 60 percent three years ago... Yeaa... In terms of time then? I think it is related to budget... that's how we calculate our budget... if we have project delay then we are out of budget... So, so you would, you will give that pretty much, pretty much of the same evaluation when it comes to both cost as well as time? Yes... Same numbers? Yeaa they are talking about the same numbers... But if we talk in terms of the scope? Do you always fulfill the customer's requirements when it becomes to scope? Yeaa... Always? 100 percent? Yeaa... we have to fulfill the scope so then we have to delay or more time to finish all of this... so for scope we finish everything... before we maybe had no documents so we can --- how to argue with our customer the scope change and now we can communicated all the time and know this is other scope or they have to pay more for more feature, it is easier to manage I think... anyway we have to finish all the scope... but you mention that the time aspect is something that you always have problem with...? Well I think here we have to define, we have to clearly define the time constraint here, so basically we will you know as you mentioned probably the customer will come up with the all these new requirements, all these new ideas, right? So here I think our definition will be you know, the time constrain will be, when when customer is, if customer is okay, then its not count to delay, what would you say? Yes, I would say that... here we say that delay is the deviator from the original plan, but if both sides you know, you and customer are have a kind of agreement on that, saying that okay because we are developing this new feature because we are developing this new functionality, so it is okay that we you know, take for one month or two? If that is the case, what do you say you of your success rates in terms of the you know the time constrain? It will be higher... It will be higher? Yeaa I think so... If we talk about the original plan... the success rate would be like you mention around 50-60 percent, but if we are saying that okay the if the time can be renegotiate between you and your customer, okay, their, their success rate can go higher, right so that, because at that time that both you and your customer can be can be agreed on a new schedule?... Yes... in terms of the first time plan, how many of your project are then fulfilling? orginal?... Yeaa original? None... We can say zero percent success then... Again I think this has something to with the characteristics of the Software that they are developing because in terms of apps probably your customers will you have, aa new requirements, new ideas all the time, I think that's the characteristics of the Software side... I think now we can better estimate the time we need more precisely... Okay, why why is that? experience... we check the project weekly... we
know the problems and maybe the potential delays more quickly... so we can handle it...
APPENDIX C
TRANSCRIPT – COMPANY 2

- What profession do you hold? (“Business cards”)
- What type of Software Products do you develop and what are the characteristics of those in terms of size, complexity, Software Type etc.?

Embedded system... our main product is the machine for the testing I think fiber, fiber status... fiber detection... the software is used to control the machine... You develop those software very often, they are very customer specific?... Yes... We focus on the standard product but if the customer needs a special requirement we will do it for them... the product itself is standardized, but the Software around here, it can differ very much?... Yes... So you develop different software to every customer, or do you?... Not every but, if the customer require... We mainly focus on the standard product... It takes at least one or two months... At least... How is the maximum time for a project?... We just give them three months... No more... Is these project very hard to handle?... Mostly he can handle unless the new function don’t have before... Maybe you have a lot of standardized modules?... Yes... You have standardized modules that you put together?... Yes... we have four parts of the software...

- How many people work with software development in the company?

Four... Four?... Yes... How many people work in one project?... Two or three... Two or three in average?... Almost... Almost all the team...

Process Methodology

- What type of process methodology do you use, this in terms of commercial approaches or own developed approaches to develop software?

The basic function is almost the same for every project... For every project always the same steps to follow?... Yes... This is your own steps that you have put into your methodology?... Yes... For the new products this is must steps, if for customer customized products the step three we will maybe we will, the architecture the design we have already so we don’t need to follow this step...

- Do you always use this methodology and are forced to stick to the approach every time?

The must steps is S1, S2 and S4... The fifth step is decided to develop this product, so we have to do this... Testing is for the hardware department... They test it together with the hardware?... Yes... You have always software which is right, so you never test it in the development phase in step five?... For the Software they will have their own testing, in step five... For the software itself they will do it in step five...
Process Steps (Phases) and Elements

- What Process Steps and elements do you follow when you develop software?
- Which of these steps do you have to follow strictly and cannot compromise to leave out?
- What documentation is required before the next step can be approached?

The step one we collect Software requirements from maybe Sales or from PM, then we get the information... then in step two they will evaluate if it is okay, I mean its suitable for if we can do or not... the step two if it is okay then we will go until next steps... In step three, aa for software department they need to confirm that the hardware spec, specification, and then they will based on the spec and then design the architecture... but the architecture is not mandatory to do?... only for new products... and then you make in the step four software component analysis?... Yes... In this step we want to want to, to fix the like for example, maybe the architecture or part of the architecture like IC chips or something, we can fix it, and use to another products... to making it like a standard, we can use it to every product... the software is a huge you know, a huge... they want to divide it in many many parts and then put together into a software... we can pick a small one to use for another products... like modules...

The developing of product, how does this process looks like?... They will be based on the first four steps to to write the soft code... How is this process carried out? What do you do in this process more generally, is it like you develop, and you test, evaluate, develop again?... To write the soft code it takes more time... For software, they will do, I mean develop the component first, and then they have to write their for the testing, they have to write the the sample program by themselves, and then test it... and test it and then if every components are test okay they will do the integration together... then maybe they will have the meeting and then every components, I mean the people responsible for each component, they will have the meeting, and put together, and then test again... we will always go for these for steps... all the time... if you find some faults, failures, bugs, do you back to, do you back then to develop component? Here and then it goes sample program again... Yeaa... test... it’s like a cycle? Is in your project mostly one time, two times, three times, you go this cycle?... If the component has some failed or failure or bugs they will go go from the start and basically they go maybe two cycles, its okay and then if have any others then they will go, maybe its only the... if they still have some some failure it is, I think it belongs in the integration I mean the people that write some program for the integration and the bug belongs here and not go for that person... so in this way you can say this is iterative, you know what the meaning of iterative?... and it’s a loop?... maybe one or two times...

You only check what components that are needed?... Yes... And that’s mandatory?... There is only component design, only design, we can , we try to find we can cut like, fix which components in this design... only design the components we can... Not real development in this steps... we can design which component we can have... Every component we can design first maybe aa what input or and output... in the fourth step we try to design the component in this item... That is only documentation and not real coding... okej documentation?... Yeaa...
we have our own template for each component and it describes that the component function and the input and output... So you always use that template?... Yes... Its no the formal one, formal template, they have their own template for describe, to record this... not the official for this company...

Tools and Templates

- What Tools and Templates do you use in each Process Step (Phase) and Element?
- What documentation do it requires?

If we go back to step number five, do you need documentation when you develop software?... templates or different tools you use?... all documentation almost finished in step four... So for the step five they may, they don’t, they don’t have, they don’t need to have... All documentation is finished in step four... So its totally free from filling in documentation or anything?... They will have a record in the code, in the soft code, they have some remarked maybe failed or something not not smoothly, they will have to not in the code, in the soft code... So its kind of record...

And Feasibility Evaluation, step number two, what documentation you need to there? And what steps?... We have the official format... or all the Software people they will evaluate, evaluate, evaluate the if durable or not, and they will give the information to maybe the R&D, the people in the R&D and they will collect the information and put into the format... a template or something, document yea... What steps do you follow in the Feasibility Evaluation?... The Software will check if the specification of hardware is confirmed and the Software Development department and the people will check the Software... If our Hardware is confirmed, its confirmed I mean the spec the specification the Software Department will see that, will check the Hardware... for example the Hardware maybe they need a huge lot of memory... The Software will evaluate if is okay or not... if if I mean the memories of the Hardware is enough... they will give the information to the PM and say that this hardware is not, is not fit... then PM will choose another model... we have to confirm the hardware specification first... if the requirements from the customers and they want a special function, or like some other functions we need to aa aa send the information to him and they have to check if this function can fit in, if it can fit in our current products... if not they will give the information... basically you check the hardware specification and the feature and customer requirements? ... Yes... Its just checking?... Yea...

The first step, collect software requirements, Is there any steps that you follow there, or is it just that you have a meeting with the customer or?... Sales get the information from the customer... creating documentation... So maybe its only collect information that you have to have in the first step?... Yes... What tools or templates do you use in this step?... For the documentation they already use the word and power point... For the Soft code... will do the version control... SEN Server... This is the tool for...
Was also thinking about cost planning and time planning, do you have this?... The project manager will do this... In the Software Development the last step, do you, do you have some kind of weekly meetings or weekly, weekly evaluations?... Yes, every Friday... every Friday they will check the schedule if you you you reach or not... the cost planning... project manager will do this as step two... and for the time time planning... they will have a short time and to define some to go through I mean go through the step three or four and to find which component we need and then we will give the the the time planning... and every Friday we will check we will check the the time planning I mean the schedule, in the step five...

Final Questions

- To what extent is the Software Development Process standardized from a scale of 1 to 10? (“Pure Agile=1” and “Purely Standardized=10”) – Make an appreciation regarding to the described information earlier.

Seven... Seven?... yeaa... because some projects are very very short and very small and for this case we maybe don’t go to follow the PM book... That’s why?... Yes... If I comparing to projects that are very heavy with documentation, all kind of documentation in every step, they have maybe in every phase, like feasibility study, maybe they have ten different steps, and they have to do it every time, but here we maybe have use some few things that you need to check quickly, but you don’t need to create documentation?... If the customer requirement is not about the creating components... only maybe some we change some code... we just we just do it directly, and without documentation... Then its very low with documentation?... mmm... own evaluation... three and four I mean... This is mine...

In each of those steps here, do you need to write a report to the customer or something or for the company’s use?... So what kind of report?... Aaa it can be the project report!... Project report?... mmm... Yes we we always we we will have the like project proposal... Ok... Yes, yes... But after when you are like developing, you don’t need to write a report and deliver to the customer when you finished with the software?... When you have coming to step five do you need any report delivered to the customer?... maybe we can only have a report for only general things, but not technical or yes... Finished with this question... I think I will start to evaluate and based on mine...

- What are the success rate of Software Development projects conducted in the company in terms of budget, time and scope?

Sometimes the customer is need in hurry... In this case... the success rate is 80 percent, 80... We can do one hundred percent of course... for very short time requirement, it sometimes only 50 percent... So you put an average here 70?... Mmm in average... In time?... Yeaa... But if you taking cost... does those projects go over budget?... Meet always?... Yes... Hundred percent?... Mmm... Is it because of the modules, you know how much it will cost? Because you
have finished standardized modules... Mmm... It helps to know how many hours you have to plan in, you can calculate the cost easier?... Yes...

When you develop software, are they successful always? Sometimes I, they they have some bugs, not everytime successful ... after testing with the hardware we will find some bugs and then we have to fix it... How is the success rates of those software products?... If going through the step five, mostly their successful, besides the besides the bugs... How much can we say they are successful then?... Can we say one hundred percent?... yes, I think the successful rate is one hundred percent because we need to aa aa after shipping we need to aa aa go to the QA department, if its not okay with, we cannot ship out... Of course this include the hardware and the software... Because of quality control?... Yes... Because of our quality control we need to check every requirement, if fits the requirements... We need to check every items ... 3 years ago... for three years we have not lot of documentation and and I mean the document management its not enough... From years to now, aa because we we added step four, so we do more documentation and the management... the performance if think its better... because we have the component analysis and so we can shorter the the development time... this means our software performance is better because we can we can take these components to other products... its more quickly to develop another software... So the step four is helping you with this?... Yes... before we aaa we we only have standard standard products so we need not to need to do the I mean the the architecture design, often... But now you are more also thinking of more customization also maybe now?... More customization? You know creating new products... More focused on that maybe, going over?... Yes... Becoming more and more?... mmm... And before you only had the four steps, except from step number four?... Mmm... mention some changes in step five... we put the version control inside, version control... And then aa we we aaa need every programmer to put the remark in the Software, I just mentioned that... So when we put the remark in the Software maybe aa this programmer quickly quit and another person they can know the the the program very easily from the description... So it helped your performance?... Mmm yea... Since you also did the Software Component analysis it also increased the performance of your projects?... Yes, of course... How was the success rate at that time?... In this year we need to build the component in detail, so it takes a longer time for development... But in the future we believe that it can it can be, shorten the time and the cost... the time is the time is not too much changed... The time is not too much changed because we now still aa I mean I mean the we are building the components... Not a very big change in time... we can shorten the testing the cycle... because it decrease the bugs... In terms of time how many of those projects are successful?... the time, 80, 80 percent... Almost the same... The cost aspect?... The same one hundred percent... What about the scope, the quality of the software you create?... Its better now because we aa we we... Less bugs... And how is the success rate then?... 2012... 80... 80?... Yeaa... 80 percent... it has increased the quality... Because of the standardization?... Mmm... Yes, you are right because of the standardization... Better control probably?... Yes... Clear definition, I mean the document... We follow, then we can have better performance...