Agile Methods (Scrum, XP) Applying into Small (Micro) Enterprise Business Website Development

A case study of Dalsland Travel AB website development project

by

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Abstract

Title: Agile Methods (Scrum, XP) Applying into Small (Micro) Enterprise Business Website Development: A case study of Dalsland Travel AB website development project

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Abstract: Agile Development Methods (AM), Scrum and extreme program (XP) are wildly used all around the world in information system development domain, which is from a few to hundred developers, several weeks to dozens of months. This thesis focuses on Agile methods, Scrum and XP applied into a local Small (Micro) Enterprise (SME), which is composed of only 2 employees, a business website development project. Author composed it base on qualitative research methodology, used literature review for theoretical study, participant observation case study for collected data. Data analysis is composed by data reduction (literature review and previous observation part), data display (problems and solutions part) and drawing conclusions (analysis of solutions part). Three research questions are listed for the core of this thesis and are answered during the thesis. Several problems and solutions which occurred during the development procedure are described. Certain suggestions are also listed for people who are interested in this field or who want to apply Agile Methods into SME website development domain.

Key words: Information System Development, Agile Methods, Scrum, Extreme Programming, Small and Micro Enterprise (SME)
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Finally, I present all my regards and blessings to the people who helped me to finished my study and research work.
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<td>AM</td>
<td>Agile Methods</td>
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<tr>
<td>IEH</td>
<td>Ideal Engineering Hours</td>
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<tr>
<td>IID</td>
<td>Iterative and Incremental Development</td>
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<tr>
<td>ISD</td>
<td>Information Systems Development</td>
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<td>SME</td>
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1. Introduction

This thesis shows the results of the research carried out during Agile Development Method and its noteworthy methods applied into local Small (Micro) Enterprise website development processes.

It is a collaboration based at a master student and his supervisor of Informatics and Media Department of Uppsala University and a local Small (Micro) company, Dalsland Travel Sweden AB which is only composed of 1~2 employees. And this thesis was carried out in the cooperation between the local Small (Micro) business and Uppsala University from Oct. 2011 to Aug. 2012.

The core questions of this thesis concerns the practical viability of Scrum, one method of Agile Development Methods, in a practical environment, a Small (Micro) business website development processes. More specifically, a Small (Micro) business worries about its economic survival in the rapidly open world, it needs a website to expand business. However, due to the limitation of human resource and lack of technical supply, its attentions turn to university, sources of valuable assets in professional field: high-educated, skilled people, and a novel method to develop website (Information System Development). An MIT colleague summarized that knowledge is global, but learning is local (Williams, 2002). The contributions and lectures resources of Uppsala University to Agile Development Method application into software development had increasingly attracted the attentions of local business man. How should apply Agile Development Method into Small (Micro) business website development? What can university lectures resources guide the processes of Small (Micro) business development? What were the differences between Agile Development Method theoretical principles and practical applications? What problems or troubles were occurred during the development procedure? What were the solutions to cope with development problems? And what suggestions were summed up for Agile Development Method applies into website development for Small (Micro) business? These questions have been the focus of this thesis and will revealed in the following chapters.

This thesis elaborates on description of Scrum, one of Agile Development Methods, applies into actual case study, a Small (Micro) business website development context. Trying to verify feasibility and reliability when Scrum principles applied into real world case. Trying to find out some knowledge gaps or inconsistencies occurred for Scrum theories application. And also try to sum some possible suggestions or notions up through experimental developmental processes.

For this point of view, readers who are interested in Agile Development Method
application, Agile Methods applied into SME website development, students of Scrum Method, or other potential people who are in this field are welcome. Based on the goals of this thesis, practical case experiment, thus, some theories of organization behavior, business management and website programming are not in the core scale of this thesis.

In this part, a brief structure of this thesis is emerged. The main structure of this thesis is combined by seven chapters, Introduction, Research Method, Literature Review & Observation, Results Analysis, Suggestions, Conclusion, and Reference.

Introduction chapter is talks about the goals of this thesis, possible appropriate reader, research goals, research problems and research questions and motivation of this thesis.

Research Method chapter introduces all research methods which were applied in this thesis. Which research approaches were used and why used them. And how to collect data, i.e. collection approaches.

Literature Review & Observation chapter is the core of this thesis. This chapter demonstrates the literature reviewing all the theoretical knowledge of Agile Methods, Scrum, XP, and explains why they worked. Survey resource lists all survey results for Agile Methods application feasibility. Another crucial part of this chapter is observation elaborated -- case study.

Results Analysis chapter focuses on the analysis of empirical project procedure, sum the problems and solutions up, and the analysis of the solutions.

Suggestions chapter supplies certain practical suggestions for Agile Methods application and future work.

Conclusion chapter concludes all the work of this thesis and answers all the research questions.

1.1 Background Information

This thesis focuses on a specifically business and technical facts, Small (Micro) enterprise business website development project. Thus, several key words have to be explained such as, Small and Micro Enterprise, Information Systems Development, Agile Method, Scrum, Extreme Programming and so on.

For business domain, diverse governments and organizations have different business
definition of Small or Micro Enterprise (SME) according on various dimensions. For example, in Australia, a small business technically employs five (5) to nineteen (19) employees and a micro business is the enterprise with less than five (5) employees (NSW, 2012). In Europe, the definition of SME is detail, small enterprise is the enterprise with less than 50 employees, an annual turnover below €10million and a balance sheet total below €10million; for micro business, is the enterprise with less 10 employees, an annual turnover below €2million and a balance sheet total below €2million (ESBA, 2011). In this case study, the local business company, Dalsland Travel Sweden AB which is only composed of 1~2 employees and one of them is developer. Thus, the local business company is a Small and Micro Enterprise (SME) according to ESBA's definition.

Generally speaking, a website establishing is a quite professionally skilled task. It consisted by software and hardware technologies, such as code programming, database generation, homepages design, service, computer workstation, networking, telecommunication and so forth. All the features for website building belong to information systems (IS) domain, and a website development also be regarded as information systems development i.e. ISD.

Information Systems Development (ISD), which is a process of applying information technology into a specific purpose in a particular context (Ågerfalk, 2010). As very closer present, a number of information systems development methods emerged, some of the most popular include Scrum, eXtreme Programming, Crystal and so forth (Kieran, 2009). Craig Larman cited a survey result said Scrum and XP are the two most common widely applied agile methods (Larman, 2003). Although it is impossible to accurately defined agile methods according to concrete practices vary, but iterative development is deemed as the heart of agile methods (Larman, 2003).

The case of this thesis is talking about the local SME applied Agile Methods into its website development procedure. It could belong to Information Systems Development (Agile Methods) application domain. Thus, the scale of this thesis should be Agile Methods application into Small (Micro) Enterprise's Website Development context.

1.2 Research Problem and Research Questions

1.2.1 Goals of research

The goals of research should be clarified by each researcher. And the research goals could be regarded as guide of each research work. Scholars stated several vital research goals. For this thesis, the main goals of research were the core to directed all research works. They insure that the research tasks were implemented successfully. The goals of research in this thesis are listed in below.
On this Scrum website development project, the core goals included bring all theoretical knowledge, principles, practice tips into real development context in order to verify and test theory's principle and authenticity, discover new problem solutions, clarify development steps and so on.

1.2.2 Research Problem and Research Questions

Internet, website, could be very important to Small and Micro Enterprise (SME), and there is already evidence that some SMEs have benefited by them (Mehrtens, Cragg, Mills, 2001). Developing a website for SME could be regarded as Information Systems Development (ISD) fields. Agile development Methods (AM), a quite new development methods which are the vital part of ISD, is based on Iterative and Incremental Development (IID) software development and only appeared in very close present. Agile methods (AM), especially Scrum and XP, are widely applied into thousands software development projects all around the worlds (Larman, 2003).

Published books, articles, journals and other materials talk about the applications of Agile Methods, Scrum and XP. For example, writing in 2003, Craig Larman said, 'Agile Methods, Scrum and XP could be applied in software development projects which is from a few of developer to hundreds even thousands of developers, one iteration to dozens of iterations, one team to a number of teams and from local project to globally project (Larman, 2003).' And he gives a number of application practical tips of them. However, he said nothing about application into Small Micro Enterprise (SME) software project.

Other scholars explored, applied and investigated practical implementation of Agile Methods, Scrum and XP into Small Micro Enterprise (SME) context and summed up certain application experiences. Some of them related to challenges and weakness of Agile Methods, Scrum and XP in enterprise, especially Small Micro Enterprise (SME). Such as, 'Agile Methods (AM) emphasizes the use of small, empowered, motivated and multi-skilled teams of well trained professionals (Ribeiro, Fernandes, 2009)', 'need to
new strategies that be decision by expert manager (Amiri, 2012), 'hired an experienced outside consultant as coach (Drobka, Noftz & Raghu, 2004). And Larman cited 'Responding to change over following a plan' from The Agile Manifesto, and 'welcome changing requirements' from The Agile Principles and so forth.

On the other hand, some scholar doubt what were not clarified existed in all the application experiences. For example, Riberio and Femandes did not say how to train professional team, Amiri did not claim what new strategies could be decided by expert manager, and Drobka and his colleagues did not clear coach's duties and tasks. Meanwhile, for The Agile Manifesto, Responding to change over following a plan, does not mention where the changes come from. The Agile Principles, welcome changing requirements, also does not say whether the requirements exist outside of Agile Methods. All the doubts have to be verified and examined in a practical context in order to gain certain knowledge, find out and capture some problems and solutions.

All of these doubts could be summed up several research questions for this real SME website Agile Methods development project:

- **Research Question 1:** how to apply Agile Development Methods into SME website development project context?
- **Research Question 2:** what are the main differences between Agile Methods' theoretical principles and practical applications in SME website development project?
- **Research Question 2:** What problems or troubles occurred during the development procedure, what are the solutions to cope with, and what are the strengths and weaknesses of them?

### 1.3. Motivation

#### 1.3.1 Theoretical foundation

Nowadays, computers and Internet are playing a crucial role for people daily life, study, businesses and so forth. More and more studies, surveys, people or specialists promulgated a number of features of Internet application. Some of them are advantages and some are not. For Small or Micro Enterprise, the potential benefits of Internet is enormous. The advantages of Internet are extreme evident, such as, a) enhance SME ongoing business survival, b) improve SME ability to compete with larger competitors, c) enable SME to operate on an international market share, d) supply a cost-effective way to launch new products, services, collect customer information, improve communication, discover potential customer and so on.
(Akkeren & Cavaye, 1999).

Others, a study concluded that small business Internet adoption outcomes will become more and more effective and incremental (Mark, 2011). For small businesses, Internet technologies and website interactivity is viewed as particularly important to develop stronger and more effective links with customers. Website interactivity provides a cost-effective way for businesses to understand customers and is a crucial competitive advantage for small businesses to compares to larger firms (Mark, 2011).

Dalsland Travel Sweden AB, a local Small (Micro) Enterprise, worries about its economic and business survival in the rapidly open and vehement competition business environment. Meanwhile, it is encouraged by all benefits of Internet to business abilities, it eagerly needs an effective, low cost and feasible way or method to strengthen its economic survival----website. The main goals and purposes the website for local SME are extend its business area, enhance competitiveness, improve business innovation, elude market risk, reduce operation costs, decrease labor costs, link customers tightly and so forth.

Presently, how to development a proper business website for a SME become a pivotal problem. However, SMEs have a number of weaknesses, like, costs limitation, shortage of time and resources, professional staffs lack and equipments restrict etc. All these weaknesses press SMEs to look for a low cost and effective method for website development.

However, different ISD methods have different properties for different software development (Marks, 2002). Some of ISD methods cause the development processes high risk, low efficiency and high costs. Agile method (AM), which was appeared at 1960s, is more and more broadly applying into any scale of software development due to its unique features, widely application area, high development efficiency, lower development risk, low development cost and so on.

And more, a number of agile methods (AM) strengths exist in many aspect. They aspire early development iterations which forces tackling the hardest, riskiest tasks first and discovers the true nature of the development team and developer skills. They accommodate and provoke early requirement change, thus, effectively avoid "software pollution rate" (un-useful requirements and over-engineering of waterfall model) and prove productivity. They advocate early partial product, a visible integrated and tested partial product, hence, client's confidence increased and new business opportunities provided also, and the product can launches sooner (Larman, 2003). All these strengths lead to several violent characters, lower development cost, lower development risk, higher productivity, higher client satisfaction, higher developer's working confident, more business opportunities and so forth. And these characters sorely attract the local SME to applies it into its website development project.
Agile methods (AM) include several development methods, Scrum and XP are the most known two. And they made up more than 66% of AM methodologies application (VERSIONONE, 2011). These novel development frameworks with unique characteristics intensively attracted me to apply them into actually practical manner. To verify and relive theoretical knowledge, practical tips of Scrum and XP, to appreciate their advantages, understand their performances and features, all of these are the core factors to stimulate me to work with them.

On the other hand, however, all the material, articles I read were based on the experiences of medium or large software projects and only seldom surveys come from really small scale projects development. Whether Scrum and XP are suitable for the local SME website development, whether certain manners inconsistent with the theories will be occurred, whether something new or theoretical gaps existed, these issues inspired my passion to perform Scrum and XP in veritable development process.

Meanwhile, Scrum and XP development methods are pretty new knowledge for me. I've never learned, realized and engaged them in a really working context. Thus, applying them into an actual development project is a rigorous challenge and learning opportunity for me. Applying all the development skills into an actually work context, carry out valuable experiences, improving my working abilities, summarizing and collecting useful skills, archive the goal that in depth impress the theoretic knowledge I learned are the main motivations for me.

Moreover, other motivations are, conclude some issues even problems which did not mention or appear in Scrum and XP principles, recording and collection the solutions for these issues or problems, summarizing all solutions as the directions or orientations for future study or research.
2. Methodology

The contents of this chapter starts from research methods which would be used in this thesis, explain the reasons for the methods selecting and data collection. And theories study aspect, briefly refers the theory supports for actually practice and analyses the practical processes base on particular description of the case study. After these, an elaborated analysis of practical processes will be showed.

2.1 Research Methodology

Research work is a core aspect of this thesis. It elaborates related information which begins from research definition, resource materials conduct for suitable research work. And the next part is data collection and data analysis.

2.1.1 Definition of research work

Definitions of research are similar claimed by different scholar or organizations, e.g. 'refer to systematic activity to increase the level of knowledge and the use of the knowledge to find new applications. The essential criterion is whether the activity generates fundamental new knowledge (Raybov, 2008)', and 'a detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding (Cambridge, 2003)'. Keep these definition in mind, we could summed up that research is the procedure to generate new knowledge, information or understanding.

Research is classified as basic research and applied research (Neuman, 2009). Applied research related to scientific study and research that generating empirical observations to solve critical problems in real society context (Salkind, 2010). In this empirical project context, all principles, practical tips and theoretical knowledge of Agile Methods, Scrum and XP were applied into SME website development processes in order to verify authenticity, reliability and feasibility of them, try to find out certain solutions for practical problems and sums up new knowledge or experiences for potential readers.

Sum up that this thesis is an applied research.
2.1.2 Research methods

Mentioned in above aspect, the purpose of each research is to capture new knowledge or understandings based on systematic activity. Researchers have to define research problems, fix research scale, realize the theoretical background knowledge in order to achieve the research purposes. And then go to data collection aspect which used special methods for data gathering. Thereafter, an in-depth data analysis should be demonstrated in order to enhance the credibility of the research result for this thesis. Following is the detail of research methods used in this thesis.

2.1.2.1 Deductive and Inductive Approaches

One of the most crucial core principle for a researcher to do good research work is appropriate research approach specifying in order to achieve the research goals. This principle supplies a way for each research work. Generally speaking, there are two common reasoning research approaches: Deductive and Inductive Approaches (Wilson, 2010; Blaikie, 2010; Bryman, Bell, 2007).

Deductive Approach, some scholars called "top-down" approach, was happened when a researcher works from the general information to a specific topic or domain. It starts at the top of a very broad theoretical knowledge which is about the research's topic of interest. Then, the researcher narrow them into hypotheses which could be tested by observation lead to certain confirmations of the original theory and arriving at a conclusion (Wilson, 2010; Blaikie, 2010; Bryman, Bell, 2007). On the other hand, Inductive Approach, "bottom up" approach, begins with specific observations and measures which were related to the researcher's topic of interest, then detected patterns and regularities, formulated certain experimental hypotheses, and finally summed up some general conclusions or theories (Crossman, 2013; Wilson, 2010; Blaikie, 2010; Bryman, Bell, 2007).

In this thesis, the Deductive Approach should be engaged to conducting the research work and capturing the answers for the research questions. The steps, which deductive approach was engaged, were, firstly, started from reading related literatures which focus on Agile Methods, Scrum, XP, ISD, in order to have a deeply comprehensive understanding for the domain of Agile Methods application. Secondly, sought and studied certain knowledge by literatures which focus on SME, website development and acceptation of SME. Thirdly, determined and clarified the applications of Agile Methods, Scrum and XP into SME website development context by literatures studied. Following, connected with local SME which expected to applied Agile Methods into its website development working project. And my research then focused on Agile Methods, Scrum and XP applied into SME website development project. Fourthly, I jointed into the project as Agile Methods application coach to observed the whole
processes of SME website development with Agile Methods application and recorded down notes for new problems occurred and all solutions during the development period. Fifthly, analysis all the observation steps, problems and solutions in order to captured certain confirmation of the original theories of Agile Methods principles, gained new conclusions and solutions for problems during the application processes.

Sum up that, the suitable research approach for this thesis should be Deductive Approach. This thesis starts from general Agile Methods, Scrum and XP theories, and then goes through data collection from empirical application in specific context----SME website development by Observation, thereafter, analyzed the problems and solutions during empirical application context in order to elaborated the conclusions for readers.

2.1.2.2 Qualitative and Quantitative Methodologies

Generally, there are two popular common research methodologies for research work: Quantitative and Qualitative Approaches (Wilson, 2010; Blaikie, 2010; Bryman, Bell, 2007). There are the cores which can help researchers to get new information and knowledge, understand and express new phenomena and explain the causes of them. Scholars explained that quantitative research approach was used for the goals for specify variables which can be measured or tested or indicated as numbers, and they concerned the question of 'how much' and 'how often' (Raybov, 2008). In contrary to quantitative research methods, qualitative research approach build a new construct, which should be clearer the previous one or could be understood better, from observed points or from existing issues (Ryabov, 2008). It is about finding out not only "what" questions but also 'why' questions (Willis, 2012). Most of qualitative research were small scale and focused on a single or small number of cases, and it included several methods like, interviews, direct observation, analysis of texts (documents) or audio (video) recorded tapes or behavior (York.ac, 2012).

Sum up that qualitative research was most optimal research approach for this thesis. Depend on qualitative research approach principles, I chose an empirical case, the local SME website Agile Methods Development application project. Then I jointed into the local SEM as Agile Methods application consultant, guided, coached and participated the whole development application processes by direct observation in order to captured all data for research work. Recorded all problems and solutions which were occurred during the development periods for data collection. Thereafter, analyzed all the recorded data to got the answers for research questions.

2.1.2.3 Data collection

Required, necessary and validity data collection is a vital way to achieve the goals of
research, capture the answers for research questions and so forth. Usually, the researchers were able to verified research hypotheses, captured answers for research questions depend on analysis of collection data (Ryabov, 2008).

Several important issues should be considered for researchers in order to ensured the data collection reliably, for example, which kind of data can be collected for goals of analysis, testing hypotheses and answering the research questions (Sekaran, Bougie, 2010). The most commonly known data collection techniques which were used by researchers were: Documents (Literature review), Observations (Case study), Survey (Questionnaire, Interview) (NAU, 2001) and others like: Interview, Questionnaires and Surveys, Observations, Focus Groups, Ethnographies, Case Studies, Oral History, Documents and Records (UOA, 2012). All data collection techniques were engaged for seeking the required, important information in order to help researchers to achieved research purposes, answered research questions (Ryabov, 2008).

In this thesis, data collection part depends on two main techniques, Literatures review and Direct observation. Documentations of literatures review are all published texts, archive data, stories, book, articles, biographies videos, and others (Ryabov, 2008, 1). Literatures review approach is used to my thesis in order to build a basement for comprehend, analysis and realize what other peers have done in the field of Agile Methods applied into SME website development context. After that, another data collect approach, Direct observation, should be used for empirical data gathering since all valid quality literature information product.

2.1.2.4 Data analysis

After all data collection, data analysis should be highlighted. It is the most crucial important part of this thesis. 'Generally, the common approaches for the analysis of qualitative data include data reduction, data display and drawing of conclusions (Sekaran & Bougie, 2010).' 'Data reduction refers to the details for data selecting, coding, and categorizing the data. It focuses on qualitative data reduced, rearranged, and integrated to theory. The examples of data reduced include words, sentences, paragraphs and so forth (Ryadov, 2008; Sekaran & Bougie, 2010).' 'Data display is the activity which displays data in an organized, condensed way. Charts, matrices, graphs are frequently used phrases for it (Sekaran & Bougie, 2010).' 'And drawing conclusions is the last analytical activity of qualitative data analysis. It focuses on the point where is the answers of research questions, what identified themes stand for, the explanations of observation patterns and making comparisons (Sekaran & Bougie, 2010).'

In this thesis, data analysis was elaborated in several chapters. A brief description of data analysis approaches should be claimed.
• Data reduction. Data reduction refers to details for data selecting, coding, and categorizing the data and focuses on qualitative data reduced and rearranged. It includes words, sentences, paragraphs, and so forth. In this thesis, a number of literatures were selected and categorized in order to supply a solid theoretical background information. The development processes were observed and recorded. Some development steps were recorded and some were reduced in order to keep reliable qualitative data. All words, sentences, and paragraphs in chapter 3 and 4 could be regarded as data reduction.

• Data display. It used charts, matrices, and graphs to display data in an organized and condensed way. All data after being reduced have to be organized by display manners in order to discover patterns and relationships between them. Data display eventually facilitated the drawing of conclusions. In this thesis, all development problems and solutions were described, recorded, and displayed in chapter 4 based on data reduction efforts. They could be regarded as data display.

• Drawing conclusions. It is the last analytical activity of qualitative data analysis and focuses on the point where answered the research questions by what identified themes stand for, by thinking about explanations for observed patterns and relationships, or by making contrasts and comparisons (Sekaran & Bougie, 2010). This thesis listed three research questions and elaborately answered in chapter 3 and 4. At the end of this thesis, chapter 6, a brief answers summary was indicated.
3. Literature Review & Observation

This chapter indicated the main research techniques and explained the reasons for selection of them in this thesis. It also listed the data collection processes of literature review and participant observation case study.

3.1 Literature review

All documentation of literature review in this thesis included published books, articles, journals and surveys. At beginning, a number of literatures sought for previous studies. Literature review is necessary procedure due to it supplies a solid background information of the issues related to this thesis topic. The effects of previous literature review studied are:

- Deeply understand theoretical principles and practices of Agile Methods, Scrum and XP
- Deeply understand features, characters and problem of SME software development project
- Deeply understand Information Systems Development application into SME software development project
- Realize what other scholars have done in the specific empirical context
- Determine research questions for this thesis that are not appeared before
- And determine information scale to answer the research questions.

After previous literature review studied, I cleared my research work by specific terms like: Agile Methods, Scrum, XP, SME software development, SME website adoption, Agile Methods in SME website development project. And then I understood the main targets of this thesis, they are following:

- Agile Methods, Scrum and XP application into SME website development project
- Verify theoretical principles and practices tips of Agile Methods, Scrum and XP in specific empirical development context
- Narrowing the literatures seeking down to a few of references that could supply my to answer my research questions
- Chose the suitable materials and sort them for thesis composing

3.1.1 Theories study

One core of this thesis is guided through the combination of Scrum and XP, the two most commonly used project development approaches of agile methods (AM) which
is based on IID software development (Larman, 2003).

Agile methods are a subset of time-boxing iterative and evolutionary methods. All the modern IID methods such as Scrum, XP and others either recommend time-boxing iterative development (Craig, 2003). Although time-boxing is the practice of fixed iteration end date and cannot change, but it not mean developers have to work longer hours or with strong pressure to meet the deadline.

Iterative development is simply name of Iterative and Incremental Development (IID). Iterative development is a building software method which overall life-cycle is combined with several iterations in order (Larman, 2003). And each iteration of iterative development is regarded as a sub-project of certain activities like: requirement analysis, programming, test and so on (Larman, 2003). Each iteration has a crucial goal----iteration release, is a stable, integrated and tested partially working system. And the last iteration release is the completed whole system---the product for customers, market or clients. Iterative development is showed in the following chart, Figure 3.1

![Figure 3.1 Iterative and Evolutionary methods (ZNU, 2012)](image)

3.1.1.1 What is Agile Methods (AM)?

This empirical case, SME website development project, belong to information systems development realm, also could be regarded as a software development task. Software is new product development and is not a predictable or mass manufacturing project (Larman, 2003).

New product development is quite differ from predictable manufacturing. Most evident features of new product development are barely possible to product up-front stable and detailed specs, impossible to estimate effort and product cost, impossible to
identify, define, schedule, and order all the detailed activities, frequently unpredictable change, high change rates and so forth (Larman, 2003).

<table>
<thead>
<tr>
<th>Predictable Manufacturing</th>
<th>New Product Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible to first complete specifications, and then manufacture.</td>
<td>Impossible to product up-front unchanging and detailed specs.</td>
</tr>
<tr>
<td>Near the start, people can reliably estimate effort and cost.</td>
<td>Impossible at beginning. Plan and estimate with empirical data increasingly.</td>
</tr>
<tr>
<td>Possible to identify, define, schedule, and order all the detailed activities.</td>
<td>Impossible at beginning. Build-feedback cycles are required.</td>
</tr>
<tr>
<td>Unpredictable change is not often, and change-rates are low.</td>
<td>Unpredictable change is the norm, change rates are high.</td>
</tr>
</tbody>
</table>

Table 3.1 Comparison of Predictable Manufacturing and New Product Development

Scholars hinted some factors which prevent reliable up-front specifications, lead to high change rate, like:

- The clients or users are not sure what they really want.
- They have difficulty stating all they want and knew.
- Many details of what they want will only be revealed during development.
- The details are overwhelmingly complex for people.
- As they see the product develop, they change their original minds and requirements.
- External forces (e.g. a competitor's product or service) lead to changes or enhancements in requests (Larman, 2003).

Sum up, we can concluded that software production is complex, new product development processes with unpredictable planning, high change rates, imponderable cost, and feedback cycles required. It is at central point of the agile manifesto and the agile principles.

Agile manifesto and principles was stated by Agile Alliance at 2001. Agile manifesto and practice principles commonly deemed to be the orientation for agile project management (Larman, 2003).

- Individuals and interactions
  1. Trust motivated individuals, based on Communication, Transparency, Honesty and regards all Developers, Customers, Managers
  2. Face to face communication, synchronize with Common understanding, Roles, Changes, Problems, Feedback
  3. Team reflection and adjustments, like: Working software delivered in each
iteration, provides direct feedback, Retrospectives to improve team work
4. Self-organizing teams, means: teams decide its own process.

- Working software
  1. Frequent delivery, teams concentrate on results, early calculate remaining tasks and learn to estimate their development speed by 2-week iterations and 3-months release
  2. Valuable software, a feature with business value, concentrated by integration, test and documentation, obtain customer feedback frequently
  3. Evolutionary design through refactoring
  4. Technical excellence and good design, testing with development simultaneously, often and easily compiling, automatically repeatable, should discover errors
  5. Working software as a measure of progress, integrate software as often as possible
  6. Promote sustainable development, working amount must match with amount of time.

- Customer collaboration
  1. Customer-centered development, customers need to be represented in whole development process.

- Responding to change
  1. Welcoming change, developers help customers improve their understanding due to changing requirements (Lochan, 2011).

Figure 3.2 Manifesto for Agile Software Development (Highsmith, 2001).

All agile manifesto factors elaborated the trust relationship between each participant, developer, customer and manager. And the trust relationship narrowed participant interval, closed them to a union and concentrate them on core project benefit. This
trust relationship is one of the most important key point for SME software development.

All agile manifesto article indicated the working sequence during development processes. The working sequence appealed by a quite novel pattern and achieved project-build goal that is accomplish project business values, speed development processes, improve development adaptability, enhance development flexibility. This project-build goal is also according to management requirement of SME software development.

![Developer and Customer Working Cycle](image)

Figure 3.3 Developer and Customer Working Cycle (Develop, Delivery, Feedback working cycle)

All agile manifesto clauses are found on the high customer participation rate of project development processes. Customer participation rate impel them to realize truly project development condition simultaneously with development procuring, grasp development results with iteration delivery, respond to development activities and feedback their minds to development course. Developers could work according to customer feedback in coming development processes with high pertinent rate. Development, Delivery partial product, customer Feedback, next Development, are the elements of whole developer and customer working cycle. The cycle repeats again and again during overall development period. One hand, customer thoroughly understand whole project, explicitly comprehend what them truly want depend on ceaseless reiteration of developer and customer working cycle. On the other hand, the cycle enhances the finial software product completely achieve development goals, perfectly accomplish product business values, immensely avoids un-useful development and over-engineering, reduces redundancy functions, saves development.
period and cost. All these characters proved mighty supports for the local SME to apply it.

The Agile Principles, twelve items supple to the Agile Manifesto, is another largely key content for agile methods core aim. It facilitate the two most well-known and widely used agile methods, Scrum and XP.

Similar, it supports elaborate, sufficient and efficient application precepts for SME software project development through agile methods. And it is the crucial foundation for agile project management of each agile methodologies.

**The Agile Principles**

1. the highest precedence is to satisfy the customer requirement via early and continuous working software delivery,

2. welcome requirement changing, even at the end of development. Agile procedures manage change for the customer's rival advantage,

3. deliver working functional software frequently, from a couple of days to a couple of months, with a preference to shorter time scale,

4. business people and developers must work together daily throughout the project,

5. build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done,

6. the most efficient and effective method of conveying information to and within a development team is face-to-face conversation,

7. working software is the primary measure of progress,

8. agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely,

9. continuous attention to technical excellence and good design enhances agility,

10. simplicity--the art of maximizing the amount of work not done is essential,

11. the best architectures, requirements, and designs emerge from self-organizing teams,
12. at regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly (Larman, 2003).

Most of Agile Principles hallmark immensely enhance the possibility of agile methods apply into the local SME software development project. And the limitations of the local SME supplied an exclusive circumstance for agile methods application of really practical case.

Dalsland Travel Sweden AB, the local SME, engages few employees, was insufficient on development cost and un-capacious physical office room. All the restrictions played a crucial role to choose a lower risk, lower cost and high speed development method for its website development project.

For Agile Principles, the most highest priority was to satisfy the customer. The local SME thought early and continuous deliver working software in a couple of weeks to a couple of months. Frequently working software delivery is an effective path that local SME manager to realize the development rate and result. Thereby, the local SME estimated reliable condition of development cost, development period and development remain. Furthermore, the local SME has strong confidence with project development control, obliterated scruples for development processes and eliminate the fear for development failure.

And from the perspective of human resource, the local SME is lack, a few of staff. And it is also an evident communication character, steps are relative simple and procedures are more fast. This character makes face-to-face communication become immensely possible. And face-to-face communication would enhance the trust relationship between customer and developer, reduce misunderstand.

On the other hand, lack human resource is another factor for development management. The local SME has not redundant employee to manage developer(s). Developer(s) must be high competent and self-manage for development job. Meanwhile, the local SME has to adequately trust developer working capabilities. And these elements facilitate self-organizing teams possible.

From the perspective of the local SME physical condition, a narrow office room, is furthest coincide with the requirement of 'business people and developers must work together daily throughout the project'. And several features reflected,

a) fast delivery, quickly customer respond and feedback due to customer and developer work together,

b) fast, effectively communication, face-to-face conversation at anytime, anywhere,
3.1.1.2 What is Scrum and XP?

Scrum and XP are the two most wildest used development methods of agile methods.

Scrum was established to enable forces on empirical process control for software development rather than the traditional defined process control model (Schwaber & Beedle, 2002).

Its distinctive features reflected in several aspect like: strong promotion of self-organizing teams, avoidance of specification plan and daily team measurement. And the most crucial practices are:
- Self-directed and self-organizing team
- No external addition of work to an iteration, once chosen
- Daily stand-up meeting with special questions
- Usually 30-calendar day iterations
- Demo to external stakeholders at end of each iteration
- Each iteration, client-driven adaptive planning

Figure 3.4 The Cockburn Scale (Lane, 2006).
As hinted in Figure 3.4, The Cockburn Scale, Scrum covers almost all cells. It has been used on both small projects which only composed of seven or less people, and larger projects which involved hundreds of developers. And on the other hand, Scrum should be applied across all software development domains from life-critical to more casual. (Larman, 2003).

![Figure 3.5 Methods Classified by Ceremony and Cycle Length (Larman, 2003).](image)

Figure 3.5, Methods Classified by Ceremony and Cycle Length, showed that the length of Scrum is absolutely accuracy, usually 30-calendar days. And on the other axis, Ceremony, Scrum is very flexible for what and how many work-products an iteration needs.

The local SME only engaged one developer for its website development work. It is means the only developer could work on his own way in his prefer velocity. And this development style creates a favorable opportunity for Scrum's 30-calendar day iterations.

Although the biggest weakness of the client, the owner of website, the local SME, is lack of human resource but it also lead to an evident strength for Scrum application. The client has not sufficient time for iteration demo very often.

Each iteration one time. This also make demo after each 30-calendar day iteration be possible.

Meanwhile, other employee in the local SME also had not enough time to interrupt development iteration or add extra work once developer chosen the Sprint Backlog which is driven by stakeholders.
These graphs, meanwhile, also indicated all XP’s characters. For The Cockburn Scale, XP could be applied into projects involving roughly 10 or less developers and not for safety-critical systems. However, people applied it into larger teams more often recently.

On the other hand, XP, for average projects, its time-boxed iteration length is recommended from one to three weeks, slightly shorter than Scrum. And on the ceremony scale, XP only has a small group steps, such as story cards.

Similar with its counterpart, Scrum, XP is another well-known agile method and emphasizes collaboration, skillful development practices and so forth. And the foundation values of XP like, communication, feedback, simplicity and courage. XP has 12 famous core practices,

- Planning game
- Small, frequent release
- System metaphors
- Simple design
- Testing
- Frequent refactoring
- Pair programming
- Team code ownership
- Continuous integration
- Sustainable pace
- Coding standards

One of the most crucial empirical values of XP is Simplicity, *'Do the simplest thing that could possibly work (Larman, 2003).'* The local SME possesses only one project developer who was in charge of the whole website development task. At beginning of development, developer do not exactly understand what he can do or have to do for project, and the customer has not fully ideas about what he really want and what are the main business values for the project. Developer works a little bit the easiest or the simplest thing depend on customer's requirement in order to achieve the business values of the project. And then extend complex tasks, integrate, modify and finish them to accomplish the finial business values and fulfill customer requirement. All the development steps are finished pace by pace and the unfinished components will develop in future period.

Like mentioned above, developer and customer didn't thoroughly understand the whole elements of the website development project. They absolutely need an effective method to realize what he want and what he can do. Hence, Communication, other vital empirical value of XP, became the most beneficial way for each participants of the project. Developer could understand what he can do and how will he do, customer could understand what he really want, how the requirement exposed and how business
value showed via website's functions. And effective communication help to describe each pieces of tiny work detail, reduce communication cost and time. For the local SME communication is more fleet, fast and more shortcut because its scanty staff component. Ideas, information, views and advisement transfer in a second between them.

Scarcity human resource of the local SME did not only prove the communication value of XP in development processes, also it facilitate qualitative and adaptive values of Feedback. The mere uniform customer concentrate all requirement view for story card composing for developer. And the unitary developer could estimate story card immediately without contention with other developer.

Moreover, XP's practical principle, small frequent releases, sustainable pace, simple design and coding standards, lead to another empirical value----Courage. Courage was exposed from fast develop and respond emergency. Developer was encouraged from the small and simple task success and gain sufficient confidence for continuous iterations. On the other hand customer was inspired by frequent partial working product releases and predict the effort of finial product.

For Scrum and XP, very often compatible two development practices. Empirical processes always mixture. For the local SME, the unique office cubicle is the common project room for special questions stand-up meeting. Scrum' 30-calendar day iteration length is shorted by XP into 2 weeks. And the shorter time-boxed iteration length demo partial working product frequently to external stakeholders enhance XP's feedback and communication values for the local SME. The local SME, however, has only one customers to fit Scrum practice, although XP require a group of on-site customers. These overall provide vital opportunity for the local SME to apply Scrum and XP into its website development project.

3.1.2 Survey study

Agile methods (AM) has a plenty of strengths differ from other software development methods. In this aspect, a number of surveys will be listed to identify these strengths for SME software development project.

Abundant data reveal that agile methods (AM) possess absolute evidences that are salient advantage than other development methods. A published survey which research into more than 400 projects discovered that agile methods could be significantly reduced high "software pollution" rate (reflecting un-useful requirements and over-engineering within a waterfall lifecycle) which was caused by long time--six months releases period (Larman, 2003).
The other survey of agile methods results which published by Shine Technologies Pty Ltd., Australia list a lot of strengths for different aspect, showed in Table 3.2.

<table>
<thead>
<tr>
<th>Organization Application</th>
<th>88% improved productivity</th>
<th>84% improved quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of development</td>
<td>46% not changed</td>
<td>49% less cost</td>
</tr>
<tr>
<td>Business satisfaction</td>
<td>83% higher satisfaction</td>
<td>26% better satisfaction</td>
</tr>
</tbody>
</table>

Table 3.2. Research results of application strengths of Agile Methods (AM).

And in the same survey, the most frequently cited positive character of agile methods was respond to change rather than follow a predefined plan, and this character was occupied about 48% (Shine, 2003). All items in this survey, productivity and quality improve, development cost reduce and high business satisfaction supplies a strong evidence for agile methods application in SME software development project. They are appropriately according to the local SME's requirement and business characters, scarcity human resource, limitation of development cost and so forth.

Several studies emphasis on size and success rate, smaller (include less complex) project are more successful rate and productive (Larman, 2003). It is not very direct proof of the empirical values of agile methods, but relevant to the practice of break a larger task into tiny pieces, short iteration period.

Scientists have long been convinced that shorter time frames, with delivery of software components early and often, increase the success rate (Larman, 2003). For the point of development period, a study of failure and success factors in over 1000 UK IT projects said that 90% of the successful projects were less than 12 months duration, 47% were less than 6 months (Larman, 2003).

For the local SME, customer realize the effort that developer's working fix the business values and both of them obtain great confidence depend on the development styles of small pieces of project, short iteration, and so forth.

On the other hand, success is also relevant to cost, another very vital development element for the local SME. Success rate is 68% for cost less than half-million dollar and only 1% for cost between 6--10 million dollar (Larman, 2003). For this point of perspective, the local SME is engaged by Scrum and XP which advocate smaller development team, short iteration and frequent release in order to decline development cost. And all practical experiences of Scrum and XP ensure the success rate of the local SME website development project, its means, high success rates is the foundation of cost reduce.
Software development is a high-change domain is demonstrated by a study illustrated that 25% change requirements in a typical software project, a study showed that 45% of features were never used and a study indicated that 50% project completed the requirement analysis over 3 or more iterations (Larman, 2003). Customer change his requirements when he saw the partial working products and responded feedback to developer for the continuous iteration. Developer and Customer Working Cycle discovered the working cycle between developer and customer and effectively avoid "software pollution rate" (un-useful requirements and over-engineering of waterfall model), and fully complete customer requirements in final delivered product.

Some study showed that the smaller project, the more monthly productivity of staff. And other study indicated that a statistically significant reduction in defects using an iterative method (Larman, 2003). The developer of the local SME develop project in shorter iteration with simpler functions and deliver partial working software to customer. Lower functions partial working software is easily to achievement by developer and easily satisfy customer' requirements. Customer feedback for continuous iteration effectively avoid and reduce defections which occurred during development period. Thus, these ensure the productivity and quality of development processes.

Theories study and survey resource supply a plenty of feasibility evidences of agile methods, Scrum and XP application into real world empirical case. And the local SME was also deeply attracted by all feature and investigative of agile methods. These factors stimulate the local SME's courage to work with Scrum and XP. And during the local SME software development with Scrum and XP, some

Figure 3.6 Success vs. Duration (Larman, 2003)
un-contemplated issues occurred. The local SME turn its attentions to university, sources of valuable assets in professional field: high-educated and skilled people to gain some theoretical and practical guidance. And they will be elaborated in the following aspects.

3.2 Observation

Observation is one of the most important techniques of research work. It is a research technique that researcher systematically planned watching, recording and analyzing events of interest (Blaxter, Hughes & Tight, 2010; Kothari, 2008). Generally, it could be classified as different types depend on a number of considerations, like: structured vs. unstructured observation, participant vs. non-participation observation (naturalistic observation) and so on (Ryabor, 2008, 1; CSU, 2006).

Structured observation is the methods which provides a complete list of expected behaviors and requires only that the observer check them (Ryabor, 2008, 1). On the contrary, unstructured observation does not need that list (Ryabor, 2008, 1). Participant observation is the methods which the researcher systematically observe people behaviors while joining in their activities in the social situation under observation (Macionis & Plummer, 2005). Otherwise, in non-participant observation, the researcher or observer concentrates on observation without any participation (Ryabor, 2008, 1).

In this thesis, the researcher, the author, jointed into the actual specific context, the SME website development project. Participated into the development team, worked with the developer and business-man, systematically watched, observed, recorded and wrote down each tiny developing and working behavior, discussion particulars throughout whole project. Found out all problems and supplied the solutions, gave suggestions for applications of Agile Methods, oriented development procedure and others. All the participant activities were belong to participant observation domain and attempted to verify application principle of Agile Methods, examined theoretical knowledge of Scrum and XP, tried to carry out some new practical tips. All of these efforts according to the goal of answer the requirement questions.

3.2.1 Case study

Case study, a type of observation research, is that using a versatile data gathered in several different ways, involves a thorough descriptive analysis and examining of a single individual, group or event in a limited environment. (Ryabov, 2008, 2; CSU,
A Small (Micro) business, Dalsland Travel Sweden AB which only composed by 1~2 employees worries about its economic survival in the rapidly open world and fierce competition business environment, it needs a website to expand business. According to the limitation of development costs, shortage of time and resources, professional staffs lack and equipments restrict, its attention turn to time-boxed iterative development and time-boxed evolutionary delivery, Agile Methods.

It was Monday, 24. Oct. 2011, Mr. Bruce (Shen Bin, the author) jointed into the local SME company, Dalsland Travel Sweden AB as development consultant who was in charge of guide and orient website development work with Agile Methods.

At the first, it was two weeks for pre-requirement training from 24.Oct. 2011 to 4. Nov. 2011 for website developer, Mr. Lars, and business manager, Mr. Huang, with Agile Methods, Scrum, eXtreme Programming (XP).

The main goals of pre-requirement training weeks were narrate an elaborate all the theoretical knowledge, working principles, working features and practical skills of Agile Methods, Scrum, eXtreme Programming, how Scrum and XP work, and role arrangement. The most crucial roles in Scrum are Product Owner, Scrum Master, Scrum Team, Chickens and so on, in XP are Customer, Coach, Tracker, Programmer, Tester, Consultant and so forth. For the local SME, which is lack on human resource, one staff had to play in multi roles commonly. Thus, one staff has to be arranged plentiful daily works, tasks and duties.

It was Monday, 7. Nov. 2011, the first day of the website development project. Mr. Bruce, Mr. Lars and Mr. Huang seated together and made agreement to use time-boxed iterative development and time-boxed evolutionary delivery based on Agile Methods, Scrum and XP. Thus, they agreed that Mr. Lars will deliver the completed product----the whole functional website in 6 months, the end of May, 2012. During the development period, for each iteration, website features and functions may vary, but the finial release date will not vary.

The development plan was that Mr. Lars commit to demo to Mr. Huang a partial working software----website every two or three weeks, each iteration, following Mr. Huang’s feedback. The project will use a combination of Scrum and XP practices, the most commonly combination of Agile Methods.

They re-arranged their scanty office room, all furniture against the wall removed to centre, and all computer devices was placed together. They bought 3 giant white-boards and hung on walls, white-board mark pens and static-cling sheets were also bought for the practice of Scrum and XP.
They also arranged the roles of Scrum, XP for the development project. One staff has to play in multi-roles due to the human resource lack of the company. Mr. Huang played in Product Owner, On-site Customer, Mr. Lars played in Scrum Master, Scrum Team Member, Coach, Tracker, Programmer, Tester, Mr. Bruce played in Consultant, Others and so forth. For this point of view, one staff has to be arranged plentiful daily works, tasks and so on.

On Thursday, 10. Nov. 2011, they worked together for a two-day requirement analysis. Mr. Huang listed all requirements, functions and features for the website, about 2 A4 copy pages. Mr. Lars applied agile requirement analysis techniques for the first time. He chooses 10% of the most architecturally significant, and the highest risky and valuable items from the top-level requirements for the first development iteration. And Mr. Bruce oriented him for this part work.

On the following day, Friday, 11. Nov. 2011, Mr. Lars analyzed the 10% top-level requirement items in detail. He divided requirement items into two categories, functional requirement items and nonfunctional requirement items. For functional requirement items, he wrote use cases for more detail and supply information, and Figure 3.6 indicated an example of use cases. For nonfunctional requirement items, he avoided all vague or ambiguous vocabularies replaced with explicit nouns or specification. Figure 3.7 showed an example of nonfunctional requirement items modification.

On the same day, Friday, Mr. Lars made a plan for his first Scrum and XP
development application. He planned, the development work started from next Monday, 14. Nov, 2011, and after 18 development work days, on 8. Dec. 2011, the end of the first iteration or Sprint, he would deliver a particular layout of website and homepage.

![Figure 3.8 An Example of Nonfunctional Requirement Item Modification](image)

Mr. Lars applied use cases approach to draw graphics for website architectural factors, components, features and functions. He used XP Planning Game to analyzed and estimated the related fine-grained tasks, created the work breakdown structure, work schedule and work estimates.

He decided to estimates his development work with his available Ideal Engineering Hours because he had to leave two or three working hours for his daily commonly tasks such as, company computers maintaining, computer and drivers troubleshooting and so forth.

After that, Mr. Huang refined and re-prioritized the Product backlog for the first iteration and chose goals for the first iteration, which driven by highest business value and risk.

And on the same day, he recorded all the development task items to a Scrum Sprint Backlog with Microsoft Excel spreadsheet. Wrote iteration development tasks on the giant white-broads. And he also took several picture of giant white-broads graphic by digital camera as documentation copy.

The following Monday, 14. Nov. 2011, the first development iteration be started.

On Monday, 14. Nov. 2011, morning at 9:30, the first Scrum daily Stand-up meeting was held by Mr. Lars, Mr. Huang and Mr. Bruce. Mr. Lars played as a pig, and Mr. Huang and Mr. Bruce played as chickens during each iteration.
Mr. Lars talked with the Three Scrum Questions, "What did you do yesterday?", "What will you do today?" and "Are there any impediments or problems in your way?". He represented all works he had done on last Friday in detail. And the tasks he would do on today. The impediments he met during last Friday also elaborated.

After Scrum meeting, in about 25 minutes, Mr. Lars chose all development tasks for the first iteration, there were not any volunteer for tasks choosing and he wrote his name beside tasks he had chosen. He took digital pictures of giant white-broads for documentation copy.

Mr. Lars reserved about 3 work hours for his daily common works, it was mean he only had less 4 available Ideal Engineering Hours for development works.

On Tuesday, 15. Nov. 2011, their work stated at 9:30 also with the Scrum stand-up meeting. Mr. Lars claimed the three questions and elaborated impediments he met on Monday's development works and wrote them on the adjacent whiteboard. He also worked without any volunteered, all development works had to be done by himself.

Same to Monday, Mr. Lars left about 3 hours for his daily works, and it was about 4 hours for development works.

On Wednesday, after 25 minutes stand-up Scrum meeting, Mr. Lars turned his attentions to database system and website development environment installed. He spent Monday and Tuesday for domain name registered.

Mr. Lars adopted one practices of XP ---- test-driven development approach. As the day progressed, some problems arose. Since there was only one developer for the whole development processes, so that, one of the most important XP practice ---- pair programming had to be bypassed. It mean that no more extra external ideas about programming or development for him. And Mr. Bruce had to frequently recommend him that keep everything or each piece code simply and clear for review.

On Tuesday, 29. Nov. 2011, after daily Scrum stand-up meeting, Mr. Huang presented some new ideas, features and functions for the website, such as, insert Swedish-English dictionary to homepage. This claim upset the development iteration works processes and it is not allowed for Scrum development principles. Mr. Bruce reminded him again that any additional extra feature, functions for iteration is forbidden. A requirement items contract would be signed if he forget this crucial development principle and made this kind of trouble again.

As the day progressed, on Thursday, 8. Dec. 2011 was arrived. On the morning 9:30 an end-of-iteration demo held by Mr. Lars instead of commonly daily stand-up Scrum
meeting. Mr. Lars showed up website domain name which he registered and a just could be loaded coarse homepage. He also presented all database he build up and indicated whole items of each tables. Mr. Huang satisfied with his development works especially Mr. Lars had to be in charge of his commonly daily tasks. The only thing Mr. Huang mentioned that were some lack of aesthetic perception for the homepage.

The remained part of Thursday and Friday, Mr. Lars consumed them for a second requirement analysis and iteration 2 development work planning session. Another 10% of top-level requirement items for second iteration development works. He updated them into Scrum Spring Backlog spreadsheet and wrote them on giant white-boards. He took pictures of giant white-broads changed by digital camera for documentation copy on the end of Friday. And second iteration period he planned was three work weeks from Monday, 12, Dec, 2011.

On Wednesday 15, Dec, 2011, an unexpected event occurred. Mr. Lars claimed he had to quit from his job due to his personal health problem. It happened very suddenly for everyone and the development works. The local SME lacked staff for daily work, meanwhile, the Agile Methods development project had to be paused by this terrible human variation.

The local SME and Mr. Huang shelved website development works and busied for new staff hired.

Until the middle of Mar, 2012, after more than 3 months staff recruitment, Mr. Rajeev Singh jointed into the local SME and was in charges of daily computer system works and especially the Agile Methods website development project works.

Mr. Rajeev took over the uncompleted Scrum website development works. A short meeting held on by Mr. Huang, Mr. Bruce and him. On the meeting Mr. Rajeev claimed his points of view for his Agile Methods working experiences that the second Sprint or second Iteration should be cancelled due to it was paused more than 30 days. But it was not mean the whole Scrum development works had to be cancelled also. All development completed parts of website could be used for continuously Scrum development works. Mr. Huang and Mr. Bruce agreed with his discussions.

Mr. Rajeev spent two and half working days for realized and analyzed all partly completed achievements from the beginning of Scrum development project. He had to reviewed all works from codes reading, graphics watching, Product Backlog and Sprint Backlog browsing and so forth since there were bare documentation left.

He also spent another three working days for a second requirement analysis and iteration 2 development work planning. He used the same XP practices for requirement items chosen from the updated Scrum Spring Backlog spreadsheet. He re-wrote all the iteration tasks on giant white-boards because they were very vague
after more than 3 months. And the new coming iteration period he planned was three work weeks from Monday, 2. Apr. 2012, and the end-of-iteration demo of second iteration would hold on 26. Apr. 2012, in 18 work days

Mr. Rajeev played multi-roles in Scrum Master, Scrum Team Member, Coach, Tracker, Programmer, Tester for the Scrum development project like his predecessor. Meanwhile, he also played common computer and business roles for the local SME's daily works. On this practical case, he had to split 2--3 working hours from everyday iteration time for certain daily usually works.

The second iteration started by daily common Scrum stand-up meeting with Three Scrum Questions at each morning 9:30 and all subsequent mornings. During the second iteration, Mr. Rajeev played role, pig, and Mr. Huang and Mr. Bruce played chicken.

The end-of-iteration demo of second iteration was held on Thursday, 26. Apr. 2012 by Mr. Rajeev on morning 9:30. He showed up modified homepage with more flash and logo, modified database tables with refined row and field. Mr. Huang put up enormous satisfaction on his works.

On Thursday afternoon and Friday, Mr. Rajeev did the next requirement analysis and iteration development work planning. He chosen else 15% of top-level requirement items for iteration development works. He updated requirement items into Scrum Sprint Backlog spreadsheet and wrote them on giant white-boards. He took digital pictures of giant whit-broads for documentation copy as his predecessor done. The following iteration period he planned was three weeks from Monday, 30, Apr. 2012.

As the development days progressed, iteration by iteration, all development works completed on Thursday, 20. Sep. 2012, by the finial Scrum demo after 6 development iterations. Mr. Rajeev delivered the finial completed website to the Product Owner, the Customer, the Stakeholder, Mr. Huang. Mr. Huang put up an enlarge satisfaction on his works and offered him an infinite appraisal of the height.
4. Results and Analysis

This chapter is another core part of this thesis. It includes three vital aspects, Analysis of observation, Problems and solutions and Analysis of solutions.

All effects of these three aspects came from previous research work, literature review, participant observation, data collection, and case study. The purposes of them were supply a clear view of research results, like, what were the main problems occurred during the project, how to produce the solutions and how to accomplish them. Moreover, another intention was that to show and indicate the way to achieve the research questions.

Problems and solutions aspect elaborated all problems, issues, impediments and all solutions occurred during development iterations. Analysis aspect focused on strengths and weaknesses comparison of all solutions and try to disclosed some hidden potential knowledge gaps.

4.1 Analysis of observation

The integration completed whole Scrum website development project and successfully accomplished the scheduled features, functions, goals and business values. It progressed with Scrum and XP practices which were the most popular used in a very large wide areas.

The entire Agile Methods website development project composed of 8 increasing iterations. Actual effective period included about 7 months, 26 weeks. There were relative lengthy time for the local SME which only composed of 2 employees. Thus this development process had certain unique characters differ with common Agile Methods development project.

A brief practical procedures analysis should be presented in order to clarified and collected all problems and events of Agile Methods application during the experimental development processes. And all problems solutions were also mentioned. This aspect aimed at problems and issues which were occurred during development processes, collection and elaborated description from beginning to the end of the development project.

- Pre-requirement Training Week. Each staff of the local SME, Mr. Huang and Mr. Lars had not sense and horizon of Agile Methods and its vital composed components, Scrum, XP and all their empirical experiences. They were the first
pioneers for Agile Methods, Scrum and XP application into the empirical context. So, a Pre-requirement Training week which concerns necessary theoretic knowledge and practical experiences should be held by certain professional and skill people. And on this SME website development project, the content of Pre-requirement Training week include, what is Agile Methods, what is Scrum and XP, how they work, why they work, their features, roles and rules, practical principles and some important survey data. Of course, a number of practical tips of Scrum and XP's application also discovered in Pre-requirement Training Week.

- The Common Project Room. Both Scrum and XP's practice requested a special independent working space: The Common Project Room. The Common Project Room should be used only for all employees for Scrum and XP development project, such as, on-site customer, development team member(s), Scrum master, stakeholder and so forth. The Common Project Room should be divided from other business or private spaces in order to avoid external disturbances or influences. For the local SME, however, Dalsland Travel Sweden AB which only has a scant office room for all daily business and development works. The only solution was re-arranged and organized their physical space, like, all furniture against the walls moved together in the centre, bought several giant white-boards, static-cling sheets and so on.

On the other hand, for this project, the scanty common project room supplied the biggest possible for customer participation of development processes. Customer collaboration was one of the most important manifesto of Agile Development Methods. And it throughout all Scrum development aspects. And it ensured efficiently face-to-face communication, development goals achieve requirement and so on.

- Multi-roles Playing. Both Scrum and XP require and have a number of roles who were in charge of different duties, tasks, responsibilities and functions. Scrum had Product Owner, Stakeholders, Scrum Master, Scrum Team Member; XP required Customer, Coach, Tracker Programmer, Tester, Consultant and so forth. The human resource of the local SME was extraordinary less, only 2 staff. Thus, each staff had to played more than just one roles based on human resource condition. It was mean, each staff had to played multi-roles. In detail, Mr. Huang played in Product Owner, On-site Customer, Mr. Lars (Mr. Rajeev) played in Scrum Master, Scrum Team Member, Coach, Tracker, Programmer, Tester, Mr. Bruce (non-employee of the local SME) played in Consultant, Others and so forth. On the other hand, tasks, duties and works arranged to each staff was increased.

- Before Iteration, Non-volunteered Tasks Chosen. Agile Methods, Scrum and XP development application was not only first time for the local SME, also for each staff, especially for the developer, Mr. Lars. He played multi-roles during his development period and was in charge of plentiful duties, tasks and works. For requirement analysis before the first iteration his get a lot of tasks had to finish, such as, domain name registered, requirements items prioritizing, requirements
items estimating, drawing use cases graphics, requirement items modifications, tasks chosen for first iteration and so on. Although he worked with Mr. Bruce's guide, but his performances seemed prentice and awkwardly due to skill lack of Scrum and XP's application. All tasks and works for first iteration generated and Scrum team member(s) had to choose for works. On this website development project, however, there were mere one Scrum team member, non extra developer to shared development tasks and works with him, in fact, the only developer had to do every development tasks himself compulsively, non-volunteered.

- Iteration Daily Working Hours. Generally speaking, the common iteration daily working hours for each developer in Scrum and XP are eight. On this Agile Methods website development project, daily working hours would be less. Mr. Lars (and Mr. Rajeev) was not only in charge of Scrum website development project works, also daily common business computer technical supply works simultaneously. He split 3 or more hours from daily Scrum development working 8 hours for his daily business computer technical supply works. It was mean, there were only 4 or little more available Ideal Engineering Hours for each day Scrum development works.

- Self-directed, Self-organizing Team, Pair Programming. Both Scrum and XP encouraged and promoted team work. The development team was empowered with the authority to solve all problems and issues they met during development iteration. Manager and Scrum Master did not guide them in how to achieved the iteration goals, order development works and solve problems. On this website development Scrum, the development team composed by only one developer. It is mean, the only developer had to done everything himself. He had to direct and organize his iteration works by himself without any external resource and help. He must kept very high level and strength individual working, direction, organization and problem-shooting abilities to finished all iteration works and fulfilled all iteration goals. Self-direction, Self-organizing Team was real a huge challenge for individual iteration developer. Pair Programming, one of the most core practices of XP, require two programmers work together at one computer in order to peer pressure for procrastinating avoiding, defects reduction, team improvement and so on. On this development project, there were only one programmer, pair programming aborted. The single programmer worked in an individual independently status. All the iteration development tasks were implemented without any broadly thinks and ideas. No more thinks rotated, no more programming skill change, no more discipline practice shift, and no more counterparts peer observance, no more collages to carry on when he was stuck, no more people to reviewed his work in order to reduced defects and so on.

- Scrum Master Firewall. Scrum Master is one of the most important roles of Scrum. It is in charge of keep iteration team away from any external interruptions, removes reported blocks, provides resources for problems solving, team member works' monitoring and so on. On this Scrum development project, Scrum master was played by the team member, tester, programmer, coach. The developer had to be in charge of all duties which should be arranged by another people. He had a
strong initiative and authority to do them himself in order to kept iteration development in planned pace.

- Communication. One of the most vital core principles of Agile Methods is face-to-face conversation. Normally, face-to-face conversation exists between customer and Scrum team, Scrum team member and team member. On this Scrum project, face-to-face conversation between customer to Scrum team was natural, effective and efficient. On the other hand, however, face-to-face conversation between Scrum team member to team member was so different. All face-to-face communication between Scrum team members was very less, even empty. Scrum team composed by only one developer, thus, all team member face-to-face conversation, in fact, was communication with himself. He really had no people to communicate with. On this Scrum and XP case, all staffers worked together in common project room, the only scanty physical office, every day. The narrow common project room made all kind of communication fast and effective. And fast communication saved working time, reduced development period and decreased development cost.

- Documentation. Documentation is neither Agile Methods' core principle or Scrum. XP's practice is minimal or "just enough" documentation with the goal of getting to code fast. On the other hand, traditional report composing documentation are instead of special files formations such as: Product Backlog, Sprint Backlog, Release Backlog, Story Card, Use Cases Graphics and so on. During this Scrum website development project, less documentation composing brought a plenty extraordinary benefits for the individual developer, he needn't to put so much attentions for documentation composing and avoid to split minutes from his compact daily Idea Engineering Hours. On this project, staffs used digital camera took pictures of Story Cards, graphics on the giant white boards in order to simplicity documentation composing processes.

- Blocks Gone In One Day. One Scrum practice is blocks reported at the Scrum meeting are ideally removed before next meeting (Larman, 2003). On this project, Scrum team only had one developer who was played of multi-roles simultaneously, like, Scrum Master, team member, coach, tracker, programmer, tester and so on. He was arranged a lot of iteration tasks for daily work. And he also had to cut 3-4 working hours out to do other daily business computer jobs due to he also was in charge of company commonly duties which was out of Scrum development works. Everyday's Idea Engineering Hours for iteration tasks only 4 or more hour. It is mean, if a block was removed by 5 hours, it would spent more than one iteration working day. On this case, Mr. Lars (Mrs. Rajeev) left one or two iteration working days per work for Block which occurred during the iteration week to removed or solved them. And day(s) for Blocks removed called Blocks Gone Day.

- Daily Build. Scrum requests that integration and regression test across all checked-in code for the project at least one day. On this practical case, code integration and regression test always happened in two or more days due to the real daily Idea Engineering Hours was very less and plenty daily development
tasks had to be fulfilled.

- Coding Standards. This is a vital practice of XP. It is beneficial for each programmer in frequent refactoring, keeping the same coding style, programmer swapping and so on. On this practical case, the only one programmer used his way for code composing and it was easy for him to review, test and refactor. However, when he left, the replacement developer met some problems to read and understand his codes also hardly to keep the same coding style.

All the scheduled features, functions, goals and business values of the Scrum website development project were accomplished by the final integration. Meanwhile, a number of unique characters differ with common Agile Methods development project was appeared during this experimental development processes. Description and analyzing them in order to clarify distinctions of this Scrum development project with common one. Another aim for this part is to present its particular application approach for people who are interested of this case.

4.2 Problems and solutions

A number of problems, issues and impediments appeared during the local SME's Scrum website development period. They blocked and procrastinated development working, reduced development working efficiency and decreased productivity. Meanwhile, the development cost increased due to the normal development period impact when problems, issues and impediments occurred.

The local SME turned its attention to university, sources of valuable assets in professional field: high-educated, skilled people, and plenty of contributions and lecture resource for Agile Methods application into software, when it met problems.

Most of all problems, issues and impediments solved in a very short time when they were occurred. Some of them removed by discussions and concessions between daily business works and Scrum development works so as to complete whole Scrum website development project.

Problems, issues and impediments and their corresponding solutions listed and appeared in pairs in below aspect,

- Problem 1: Pre-requisite training before Scrum development project started. On this practical case, both business man, Mr. Huang and developer, Mr. Lars were the first time for working with Agile Methods, Scrum and XP. They had no ideas what are them and how to do development work with them. And they also worried about whether the novel development approaches brings all strengths and
benefits for the local SME like people claimed.

Solution: **Pre-requirement Training Week.** A pre-requirement training week should be held before Scrum development project started. Theoretical foundation of Agile Methods, Scrum and XP should be elaborated and illustrated to both business man and developer. To explain to the local SME staffs what are Agile Methods, Scrum and XP, why the novel development methods are the most suitable on their website development project, why and how the new development methods work, what the business and technical benefits the new methods could bring for the local SME. And on the other hand, the local SME staffs would gain all information and practice skill they want from lectures resources and contributions of Agile Development Methods and its components, Scrum and XP by high-educated and skilled professional people. A sufficient pre-requirement training week could lay a solid foundation for subsequent development work, and supply a protection for Agile Methods application into a practical environment, the local SME business website development processes.

- Problem 2: Multi-roles for each staff. In Agile Methods, especially Scrum and XP, a number of roles had to be played by people in order to supply a strong backup for development working normally and successfully accomplished the features, functions, goals and business values of project. On this practical case, each staff played of multi-roles due to the limitation of human resources. Mr. Huang played all roles of business aspect, Product Owner, On-site Customer and so on. Mr. Lars (and Mr. Rajeev) played roles of Agile Methods domain, Scrum Master, Scrum Team Member, Coach, Tracker, Programmer, tester and so forth. Of course, they were in charge of all duties for each role. On the other hand, all staffs had to play their original role of daily work simultaneous. So many roles and rules for one staff made them easily confused for daily works.

Solution: **Super-customer, Super-developer.** This case was a practical application of a combination of Scrum and XP. Roles functions and duties for identical domain were nearly analogy, for example, one duty of customer (product owner) of Scrum is chooses the goals from the Product Backlog for the next Sprint (iteration), and for XP, picks stories for release and for iteration is one of customer duties. Regardless chooses the goals for the next Sprint or picks stories for release were similar function and take parallel effects in this project. Combined customer of Scrum and customer of XP for just one roles who was in charge of all duties of both aspect and named Super-customer was a suitable way for this Scrum development project.

Another example, Scrum Master in Scrum is 50% developer, on this practical case, developer was programmer too. Listens to progress is one of Scrum Master's rules, it is similar to tell progress, the one of tracker's rules of XP, on this development project. Meanwhile, on this development case, the Scrum Master
was in charge of all duties which belong to Scrum Team Member, Coach, Tracker, Programmer, Tester and so on. It is mean, Scrum Master was Scrum Team Member, Coach, Tracker, Programmer and Tester. Thus, merge all roles with whole rules together and name the united role as Super-developer was a better way for development aspect works.

- Problem 3: Before Each Iteration. During a Scrum meeting, developers volunteer to choose iteration tasks they want. This is one of Scrum development practices. On this development project, developer had to finish all iteration tasks compulsively because no more people to share iteration tasks for him.

  Solution: **Cancel Volunteering.** Due to all iteration tasks were arranged to the mere developer compulsively, volunteering task choose was insignificance. Developer adopted all iteration tasks automatically and compulsively. Cancelled, removed volunteering process in order to increased Scrum meeting efficiency, reduced Scrum meeting time, cut Scrum iteration processes and so on.

- Problem 4: Split some time out of daily Scrum works. The local SME is composed of two staffs. They were arranged all the daily business, technical and other various duties. They had to cope with not only everyday necessary events also works for trivial but crucial things. Especially for the developer, he generally had to split more than 3 hours for his daily common works from everyday Scrum development working hours.

  Solution: **Daily Real Scrum Hours.** On this case, everyday Scrum development working time was less 8 hours, even only 4 or 5 hours. It really hard to according with normal requirement of Scrum daily development works. Thus, after discussion and concession, each staff agreed that the daily Scrum development time (or Ideal Engineering Hours) fixed at 4 hours, and other 4 hours used for daily common miscellaneous works.

- Problem 5: Agile Methods do not promote formal documentation composing. For XP, it claims minimal or "just enough" documentation with essential goal for fast coding and requirements. Although the requirements of documentation composing for Agile Methods, Scrum and XP are very less, but it also a huge task for just only developer in Scrum iteration project, especially on this Scrum website development project.

  Solution: **Digital Pictures Documentations.** High-technology supplies a lot of conveniences and benefits for people's daily life and working. Digital camera is an obvious example. On this Scrum project, the only one developer used a digital camera to take picture of everything he want to stored. For example, at beginning of each iteration, he took some picture of giant white-broads for documentation copy when the requirement items changed or arranged by people. All the digital
pictures regarded as documentation copy, record and store for future review and working tracked. On this project, the only one developer was not only had a number daily development works, also had only 4 hours for all iteration tasks. He really had not more time for each documentation composing. To took digital pictures of each tiny work changed as essential documentation could save plenty time for his daily works, improved his development work efficiency, reduced development cost and so on.

- Problem 6: Scrum advocated a practice that blocks gone in one day. On this practical case daily real Scrum hours was only 4 hours, constrainedly satisfied everyday essential Scrum work demand. Developer had not enough time for blocks removed.

Solution: **Blocks Gone Days.** On this development project, each day only left 4 Ideal Engineering Hours for daily Scrum development works. Just constrainedly satisfied everyday demand. It was not enough time for blocks removed. On this particular occasion, all staffs discussed and agreed that reserved one or more Scrum development work day(s) per week for blocks removed when any blocks, impediments and issues occurred during the Scrum iteration processes.

- Problem 7: professional people, expert lack. On this development project, the local SME composed by only 2 staffs and all of them were the first time to applied Agile Development Methods and its components into empirical domain. They were lack of professional knowledge and practice skills of Agile Development Methods field and eagerly aspired for specialty supplies by skilled people.

Solution: **Specialists Supply.** An MIT colleague summarized that knowledge is global, but learning is local (Williams, 2002). On this Scrum development project, the local SME turned its attention to local university, Uppsala University which is source of valuable assets in professional field: Agile Development Methods application, for specialist supply. Mr. Bruce, a master student of Information Systems, was regarded as a guide, supporter, coach, and expert of Agile Development Methods for the local SME website development project. He trained staffs for professional comprehends of Agile Development Methods, guide them for Scrum and XP's practices application, monitored them for Scrum and XP iteration works, coached them for development in correct direction, supplied solutions for them when problems occurred during development processes and so on. All the business values were completely accomplished, all the scheduled features, functions and goals fulfilled and whole Scrum development project implemented successfully under Mr. Bruce's main works and assistances.

A number of problems, issues and impediments occurred during the local SME's
Scrum website development processes due to the special condition, just only one developer. Problems, issues and impediments should be removed and solved in order to kept the Scrum development procedure implemented normally. Several problem solutions, such as: **Pre-requirement Training Weeks, Super-customer and Super-developer, Cancel Volunteering, Daily Real Scrum Hours, Digital Pictures Documentations, Blocks Gone Days, Specialists Supply** and so forth, ensured Scrum development works accomplished, the scheduled features, functions, goals and business values successfully. On the other hand, all the problems solutions increased development efficiency, reduced development costs, encouraged developer confidence for development aims achieved successfully.

### 4.3 Analysis

This aspect is a vital component of qualitative research methods. Generally speaking, analysis was happened accompany with data collection (Pratt, 2006). For this aspect, all the analysis composed by both strengths and weaknesses of all solutions of problems removed. Aims and goals of all solutions are remove problem, keep development successfully, achieve development targets and so on. However, all solutions also brought some inconspicuous potential issues--weaknesses. A brief analysis is necessary to compare, clarify and enhance comprehend of them. Analysis based on this empirical project and trying to disclose the potential issues for each problem solutions. The purposes of analyze are giving a full comprehend of the solutions.

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requirement Training Weeks</td>
<td>Sufficient domain knowledge learning and reviewing</td>
<td>Maybe redundant for skilled developer</td>
</tr>
<tr>
<td>Super-customer and super-developer</td>
<td>Simply and concentrate redundancy roles and rules</td>
<td>More power, hard to control</td>
</tr>
<tr>
<td>Cancel volunteering</td>
<td>increased Scrum meeting efficiency, reduced Scrum meeting time, cut Scrum iteration processes</td>
<td>Compulsively choose tasks, unwillingness tasks adopt</td>
</tr>
<tr>
<td>Daily Real Scrum Hours</td>
<td>Split daily common works from IEH</td>
<td>Delay Scrum development periods, reduce development efficiency</td>
</tr>
<tr>
<td>Digital Pictures Documentation</td>
<td>Saving developer working time, increasing</td>
<td>Hardly to understand</td>
</tr>
<tr>
<td></td>
<td>development efficiency</td>
<td>Left and delay Blocks remove concentrate</td>
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<td>---------------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Blocks Gone Days</td>
<td>Increasing development efficiency, Blocks remove concentrate</td>
<td></td>
</tr>
<tr>
<td>Specialists supply</td>
<td>Consultant assistant, keep development work successfully</td>
<td>Maybe impossible for every project</td>
</tr>
</tbody>
</table>

Table 4.1 Analysis of strengths and weaknesses comparison of solution

In the table, pre-requirement training weeks bring strengths for sufficient domain knowledge learning and reviewing, weaknesses are obvious, it may be redundant for people who are skilled for Agile Development Methods. Super-customer and super-developer simply and concentrate redundancy roles and rules for all staffs. However, staffs become hard to control with more power. Cancel volunteering increased Scrum meeting efficiency, reduced Scrum meeting time, cut Scrum iteration processes and so on. But developer had to choose tasks compulsively and adopt some unwillingness tasks. Daily real Scrum hours, it split daily common works from daily 8 Ideal Engineering Hours. However, only 4 daily IEH delay Scrum development periods and reduce development efficiency. Digital pictures documentation keep advantages as saving developer working time, increasing development efficiency accompany with the weakness, digital documentation are hardly to understand for stronger people who want to read them. Blocks Gone Day, increasing development efficiency, Blocks remove concentrate, meanwhile it left and delay Blocks remove time. Specialists supply bring benefits for professional consultant assistant, keep development work successfully. And weaknesses of it may be not possible for each project anytime.
5. Suggestions

In the end, but not the very end of this thesis, some suggestions for people who are interested in the application of Agile Methods into Small (Micro) Enterprise (SME) software development project.

For this point of view, people who are working or studying in Agile Development Methods, Scrum and XP application, or other potential people in this area are welcome. Based on the goals and targets of this domain, practical case experiment, some theories and suggestions irrelevant to Agile Development Methods and its components, like, organization behavior, business management, website programming and human resource are not in the core scale of this thesis.

In this SME Scrum development project, a few distinct situations appeared developer and coach adjusted their way of applying Agile Development Methods in order to ensure Scrum development work successfully achieved to development goals and targets. Some of the practical adjustment could be regarded as suggestions for actual applications.

A brief list of suggestions of this SME website Scrum development project are in following:

- Pre-requirement training week, whether beginners or skilled people, a short appropriate training before Scrum is recommend.
- Roles, rules combination. Scrum and XP have a number of roles with different rules. For a SME which is merely composed of a few staff, roles and rules combination is a good way to avoid duties and positions confusion, to improve communication efficiency and to reduce development periods and so on.
- Split daily Ideal Engineering Hours. If developer is also in charge in daily common work which is out of Scrum project tasks, 3-4 hours separated from daily IEH is possible to consider.
- Digital picture documentation. For lack human resource Scrum development project, some documentation composing could be replaced by digital pictures which was took for iteration tasks changed.
- Concentrate days for Blocks Gone. Split daily Ideal Engineering Hours and human resource shortage make daily Block Gone impossible. Thus, a concentrate days for Blocks Gone became the concessions in order to keep development work successfully.
- Specialist supply. A skilled specialist in the field of Agile Development Methods is not redundant at anytime for any project, especially for SME.

All the suggestions were generated based on this actual practical Scrum development
project. They are just for people who are interested in Agile Development Methods application domain.
6. Conclusion

A local Small Micro Enterprise (SME), Dalsland Travel Sweden AB, worried about its economic survival in the rapidly open world, it eagerly needed a website to expand business, keep benefits and enhance its competitiveness. In order to save development cost, control development processes, reduce development risk, avoid development failure, improved productivity, it chose Agile Development Methods for website development work. Scrum and XP, the most vital components of Agile Development Methods, are combined together to used for this project.

The local SME was composed by only 2 staff, one of them was the developer. The lack of human resources pressed it to seek for a specialist or professional people to guide, orient and assist them for Agile Development Methods application into the website development project. Mr. Bruce, a master student of Information Systems of the local university, Uppsala University, joined into the SME as a Scrum development project coach, guider, supporter and consultant. His main work and assistance were staff training of Agile Development Methods, coaching development in correct way, supplying problems solutions, and he also played a crucial part in all development goals’ successfully implemented.

This thesis focuses on management values and practices more than requirements, implementation, up-front specifications, the core of Agile Development Methods and its components, Scrum and XP. A number of unique management and practical skills are collected and elaborated in detail. Some of management skills are Pre-requirement Training Weeks, Cancel Volunteering, Blocks Gone Days and they also could be regard as practical techniques for problem solution.

Problems solutions and several suggestions are announced in this thesis. Problems and impediments occurred during the development of this project. They should be solved in order to keep development works going normal. All problem solutions are based on the special practical environment, a Small (Micro) Enterprise website development processes. They were generated by all staff’s discussion and concessions. And they were unique and exclusive for this development project. Of course they also could be cited and regarded as references for other similar Scrum development project.

Suggestions aspect is that the solutions for the problem are not only for Agile Development Methods application into special practical environment, a Small (Micro) Enterprise website development project, also for the knowledge gaps, orientation of future study and research. There are still some suggestions related to management and practical skills and tips, such as, roles and rules combination, daily working hours split into Ideal Engineering Hours and common work hours, concentrated days for Blocks Gone and so on. On the other hand, some knowledge gaps and lacks left for
future study and research, for example, how to transfer and expand product owner domain knowledge and requirement for Product Backlog, XP does not clarify how to write Story Cards and so on.

All solutions for problems removed have both strengths and weaknesses. An elaborated analysis of them enhances the comprehend and discloses the potential issues and so on.

This thesis belongs to applied research scale. Deductive research approach is its working foundation, Qualitative research method was the framework to build up the entire research work. Literature review and participant observation case study were the crucial data collection of Qualitative research method. After concluding the solutions for problems remove and all suggestions of this empirical project, an elaborated analysis which is composed of strengths and weakness of solutions was demonstrated in order to sum up a brief comprehend of this research work. All the thesis work is successfully completed and achieved by all the scheduled targets. The main research questions were also answered, and detailed are as following:

The first research question, how to apply Agile Development Methods into SME website development project context, is focusing on the implementation of Agile Methods used in a real practical event. To fulfill this question, a plenty of crucial theoretical principles, practical tips had been elaborated in order to offer a solid theoretical foundation for it. On the other hand, an actual empirical Agile Methods application project, supplied a veritable working case of Agile Methods application. In this project, all the theoretical principles and practical tips of Agile Methods were accomplished throughout the whole project development procedure and worked normally and successfully. And on the other hand, all the problems solutions also played a vital role to assisted Agile Methods application implemented and achieved all business values.

The second research question, what are the main difference between Agile Methods’ theoretical principles and practical applications in SME website development, is trying to find out the differences, problems when Agile Methods was worked in a specific practical context. Scholars claimed that SME has extraordinary nature like: flexible and quickly to adapt the way to do work better, good at multitasking, less sophisticated, want a solution rather than a machine or service and so forth (Sarmiento, Vásquez, 2012). These natures of SME supplied a perfect condition for application of Agile Methods’ theoretical principles and practical tips. However, since certain practical problems occurred during the project development, they could be regarded as the main differences between Agile Methods' theories and actual practice. All the practical problems and their solutions showed in Chapter 4 like: week for knowledge training, multi-roles playing, non-volunteered, iteration daily working hours, Block remove days and so on. The main difference also could be concluded as: practical rules modified, roles compressed and merged, Ideal Engineering Hours re-adjustment,
Block Gone Days and so forth.

The third research question, what problems or troubles occurred during the development procedure, what are the solutions to cope with, and what are the strengths and weaknesses of them, is based on the second research question. The aim of the third research question is trying to discover some new things, approaches or events for problems solved. Some new things, approaches or methods appeared when the problems occurred during the development procedure in order to ensure the development project succeed. These new things, approaches or events could be regarded as the differences between the of theoretical knowledge and practical processes which can be regarded as knowledge gaps. It also follows research goals. And all the problem solutions are: Pre-requirement train week, Cancel volunteering, Daily really IEH, Digital picture documentation, Block gone days, Specialist supply and so on. And in Chapter 4 analysis of all the solutions are listed in the same chapter.

Agile Development Methods and its components, Scrum and XP are appeared during present few decades, and so widely applied into thousands of software development projects which are from a few developers to hundreds of developers. Their advantages are extraordinarily obvious in increasing productivity, decreasing development cost, reducing development risks, ensuring development success rate and so on. However, in this local SME website development project, certain issues showed up in an obvious fact, people had to adjust Agile Development Methods application way to according to actual working conditions and statuses. And knowledge gaps and lacks which are not elaborated for Scrum and XP are the resources for future study and research for me and all people who are caring for this fields.
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