Agile System Development:
An investigation of the challenges and possibilities of using Scrum

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Abstract

In order to combat the different obstacles and issues with system development many of the system development firms of today use some sort of system development method to structure their system development projects. However, there are different challenges with using agile system development methods. This research addresses the different challenges that exist when using Scrum as a system development method by viewing it from different key stakeholder perspectives. The research has been based on a single case study approach that has investigated a high-tech system development firm with more than one hundred employees. The case study was conducted by interviewing six stakeholders of the firm. This research shows that there are a number of core challenges within the firm. These challenges are connected to five different themes: collaboration, coordination, communication, Scrum as a support unit and transition processes revolving around Scrum.

Keywords: System development, agile methods, dynamic methods, IT-management

1. Introduction

In today's industry of development of information technology (IT) many failures within the development processes occur. The conclusions have been placed squarely on human and organizational factors rather than technical factors (Robey & Sahay, 1996). A lack of planning might result in increased costs and even project abandonment (Avison & Fitzgerald, 2006). This constitutes one factor that may cause information systems development projects to escalate. Project escalation exists in project environments that both encourage the progress of the project and gives contradictory information within the project. According to a research carried out by Keil (1995) as much as 35 % of IT-projects suffered from some form of escalation in terms of continuing a failing course of action, by continues following a failing course of action, despite evidence in the form of negative feedback. Escalation represents one example of the complexity involved in achieving successful systems development. Keil's study showed that it is important that management does not only focus on the technology, but also to manage other factors that can promote escalation. For example, project, psychological, social and organizational factors in order to effectively manage system development projects. These factors represent challenges that can lead to project escalation. The same results may also be the cause by the system not making use of the user's business knowledge. Failure may also be due to poor methods, techniques and tools (Avison & Fitzgerald, 2006).

System development is a complex activity and is traditionally something that is affected by the budget, time, problem escalation, etc. (Schwalbe, 2011). In general, the purpose of using system development methods is to formalise and secure processes and quality in systems development projects. Because of these factors' system development projects can be seen as a complex collection of different "processes" that are difficult to understand and forecast. Against this background System Development Methods (SDM) have been used to handle these factors. Olerup (1991) stated that system development is a very complex process that involves many steps, but that the use of SDM may provide a reductionist subdivision of this process into plausible and coherent steps. Lately, agile system development methodologies
(ASDM) have been proposed as potential solutions to classical challenges related to system development projects. A variety of potential benefits of using ASM have been proposed, but there may also be challenges involved in using such methods. This thesis investigates a firm that has been using the Scrum method for over a year. The overarching purpose of the research was to explore what challenges there are using agile methods in general. The key features of the agile methods are based on iterative and incremental development, where requirements and solutions evolve through collaboration between self-organizing, cross-functional teams. Agile methods emphasize adaptive planning, evolutionary development and delivery, a time-boxed iterative approach and encourages rapid and flexible response to changes. It is a type of conceptual framework that promotes foreseen interactions throughout the development cycle (The Agile Manifesto, 2001). This approach of SDM has become more popular within the last ten years. However, the implementation of this kind of process has resulted in different ways of performing system development and may require both smaller or greater changes within firms (Björkholm & Brattberg, 2008). Therefore, this research has a focus of understanding the challenges of using Scrum as system development method within a firm. This research specifically investigates key stakeholders, the people responsible for working with development projects of firms’ technical infrastructures. The most important job for the key stakeholders is to be able to monitor the organizational requirements and search for different strategies, techniques and tools to use system development methods that are both cost-effective and efficient, in order to achieve the goals that the firm is aiming for.

This research focuses on the role of system development methods in projects and the dynamics that exist within the use of system development processes. On a more pragmatic level this research addresses how the internal key stakeholders of a firm view the use of the agile system development method Scrum. The firm where the case has been conducted is a high tech system development firm, where they have different Scrum teams that work in various ways. Different key stakeholders involved with system development have been interviewed. This research relies on a single qualitative case study of the high tech firm dealing with system development and technical support. The firm, here called System Development Corp, makes use of the agile systems development method Scrum. Against this backdrop, the research question that this research aims to address is:

**How do different key stakeholders view the challenges and possibilities of using Scrum in system development?**

This research has also tried to understand how different stakeholders are involved in system development projects. It has been conducted as a case study, where the data collection method consisted of semi-structured interviews of different key stakeholders in the organization. The focus is on examining the dynamic relationship that arises between Scrums flexibility and stringency. Therefore, this research will contribute to shed light on various aspects and perspectives that exist about the use of system development methods internally in a firm that works with system development within their projects.
2. Related research

ASDM is a collection of methods that is a common aid in the field of system development, especially the use of the method Scrum that constitutes a development approach that has been widely adopted in the industry. However, there are challenges and potential possibilities when switching to an ASDM like Scrum. The use of agile methodologies have emerged over the years. Because of this increase in use it is important to provide a basic understanding of ASDM. The transition from a more traditional waterfall model development approach to an agile method approach may generate different types of implications within firms.

The understanding of agile methods will also make it easier to understand that SDM are processes that are affected by different aspects of organizational topics. A SDM can be interpreted as a tool that helps "an organized collection of concepts, methods, beliefs, values and normative principles supported by material resources" (Iivari, Hirschheim & Klein, 1998). More specifically, an SDM is codified into a set of goal-oriented procedures that guide the work and cooperation of the various parties (stakeholders involved in building of a application). The SDM are affected by the technique, tool or method, context and consists of a well-defined sequence of elementary operations, which permits the achievement of certain outcomes if executed correctly (Iivari et al., 1998). In the early days of system development the use of SDM was viewed as a rigorous and meticulous process of the formalized methodology. However, most of the developers today who use SDM are not following methods rigorously. Instead a variety of methods and development processes in firms exist. The purpose of SDM is to create a support-function by viewing the SDM as a unique methodology-in-action that is created for each specific development project (Fitzgerald, 1998). The SDM is not applied in the same way by different system developers. According to Fitzgerald (2000) the methods are most probably used in the same way by the same developers in different projects. The use of SDM has instead resulted in uniquely adapting methods as a methodology-in-action that has been created for each specific system development project. This basically means that there are specific adaptations of the same methods in different system development projects, which will result in a method that are specifically created for a specific system development project.

The following sections reviews relevant research related to the area of concern of this research. Section (2.1) provides a general background about Agile Software Development (ASD) methodologies to illuminate the core features of the ASD. The next Section (2.2) zooms in on Scrum as a method and describes the specific characteristics of it. Following this description the search focuses on research that exists about the challenges with Scrum.

2.1 Agile methodology

As stated earlier ASDM are commonly used by developers in different system development projects and are adapted according to how the developers work. The main principle of agile methods is to be able to work flexible with the development of systems. The thoughts behind ASDM center around self-organizing and cross-functional development teams to have a close collaboration with the customer (Beck et al, 2001). Therefore, it is important to have a close and continuous communication between the customer and the developers. This communication is necessary to ensure that the developer is able to meet the requirements of the customer and their satisfaction of the product that is being developed. The agile
methodologies also emphasize having adjusted planning, incremental development and delivery, a time-boxed iterative approach and a promoted rapid and flexible response to changes in the development environment (Abrahamsson, Warsta, Siponen & Ronkainen, 2002). Agile methods are methodologies that are developed to adapt to the changes that might arise unexpectedly. However, it is important to understand that the agile method is a collective name of several different methods for developing software. Some examples of methods that belong in this branch are: eXtreme Programming (XP), Dynamic Systems Development Method (DSDM), Crystal Clear and lastly, which is the Scrum that is in focus of this research. Agile methods have had an interesting development from 1983 towards the present (Abrahamsson et al., 2003). This shows that the evolution of agile methods for software development have chosen different types of directions in order to overlap gaps that exist within system development projects, by adjusting the SDM after the projects `unique and ideographic forms. These methods are all following the main attributes of agile development: incremental, cooperative, straightforward and adaptive. The agile methods of today represent a more rapid and flexible development that is the prevailing business current climate of firms.

Traditional system development approaches are typically based on a more rigid waterfall model development approach, which is more inflexible and delivers the product in the end of the project (Langefors, 1973). An example of such a method is the System Development Life Cycle (SDLC), which is influenced by the traditional systems development perspective (Avison & Fitzgerald, 2006). The basic foundations of thinking in agile methods consist of four different values that are sometimes different from the traditional system development approach. Firstly, is to value the individuals and interaction higher than the use of processes and tools within the development process (Björkholm & Brattberg, 2008). Secondly, is to emphasize the creation of the software to be working, rather than to value complete documentation of the development process as within more traditional system development methods. Thirdly, is to value the collaboration between the customer and the agile development team higher than trying to negotiate about the contract. The final value is to prioritize the response of change within the development rather than trying to follow a planned process. These four values are the cornerstones of agile development.

With these four cornerstones, agile development emphasises the combination of creative teamwork with an intense focus on effectiveness and maneuverability. Also, agile software development stresses the quality in the design instead of creating a product that focuses on quantity (Highsmith & Cockburn, 2001). The agile methodology approach is sometimes seen as being confused with being ad hoc or “cowboy coding”. The design of agile methods allows to create "complete" products during an ongoing basis, in a smaller part of a sum. As opposed to traditional SDM that delivers the product as a single part directly to the customer instead of splitting the process up into smaller manageable parts.

However, there are critics that suggest that the implication of the emergence and adoption of new agile methods need to have a clear range measurement to understand the level of applicability (Abrahamsson et al., 2002). The methods also explain how the interface of different parts of the software development life cycle would be implemented, which are not emphasized in today’s development of agile methods. In addition, it is also suggested that the focus of today’s development should be placed on method specialization than generalization (Abrahamsson et al, 2003). This approach could be viewed that system developers should
adapt the method specific to systems development project where the method is used within, basically customized the method after the given systems development project.

To sum up, agile methods are characterized to be a type of methodologies that aims to be adaptive against the different changes that might appear unexpectedly. However, depending of which type of ASDM that is being used, different elements of the method have to be taken into consideration since each method has different preferences. Therefore, it is important to understand the different individual mechanisms behind each specific SDM before it starts being used within firms.

2.2 Scrum

One of the most commonly used agile methods is the Scrum method that focuses on day to day project management. The method is the most widely adopted agile project management method in the industry (Hossain, Babar & Paik 2009). However, there exist both challenges and possibilities in changing to agile method like Scrum. Within system development Scrum is described as a method that is more flexible compared to the traditional waterfall model approach of system development. The development process of Scrum moves through different stages like a relay race with one group of functional specialists passing the baton to the next group (Takeuchi & Nonaka, 1975). Traditional system development projects often move sequentially from phase to phase concept development, feasibility testing, product design, development process, pilot production and final production. However, the development process of Scrum is based on the fact that the delivery of the product is done on a continual basis after each sprint in the Scrum process. In terms of process Scrum thus adopts a different perspective and model compared to the traditional system development methods, which gathers the delivery in the end of the project. Therefore, traditional methods like the SDLC method is more rigid than Scrum that has a more flexible approach to structure the development process.

Scrum is a type of method where the development processes are done together with different stakeholders in order to highlight the challenges and issues from several different aspects. This is achieved by handpicking the development team called the Scrum team. The Scrum team will work in a close collaboration with the customer of the project to enhance the flexibility and ensure that the given requirement is fulfilled according to the customers expectations. Within the Scrum Team there exists a self-organizing and cross-functionality team model (Schwaber & Sutherland, 2011). The team model in Scrum is designed to emphasise the optimization of the development process to be flexible, creative and productive. In the Scrum Team there are three different kind of stakeholders. The first stakeholder is the product owner that has to make sure that each requested feature exist within the product backlog of the product that will be used by the users. Basically the product owner makes sure to steer the project into the right direction. The second stakeholder is the Scrum master that is in charge of making sure that the project is following the given time-frame and that each team member has the necessary resources and tools to get their work done (Björkholm & Brattberg, 2008). The Scrum master manages this by setting up meetings, monitoring the work-progress and release-planning. The stakeholder’s role of the Scrum master resembles a lot like a traditional project manager, but the scrum master is more like a serving-leader rather than a commander. The third stakeholder is all the different actors with professional experience of building the product, basically the developers of the product.
The Scrum team follows different events that is based on time-boxing to ensure that each event has a maximum duration. The events have been planned in advance to ensure that the most appropriate amount of time on planning the development process, Scrum is less likely to waste time within the planning process (Schwaber & Sutherland, 2011). Some of the tools that are used by the development team to monitoring the process of Scrum are: whiteboards, sprint task boards, release burn-down and different kind of software that can be used in the development process. The events within the process of Scrum (See figure 1.1), are specifically established to be able to give the Scrum team a critical transparency and inspect the development process (Expertprogrammanagement, 2010). The risk of not accommodating these events in the development process might result in a decreased transparency and losing important possibilities to inspect and adapt requirements after the final product (Björkholm & Brattberg, 2008).

(Figure 1.0. Framework of Scrum)

The Scrum process starts with creating feature lists of the product are being developed, which is known as user stories that list the role, features and the benefits of the product. The collection of all different user stories is known as the first Scrum artifact, the product backlog. The product backlog could be viewed as a sort of wish list that will make the product that is being developed successful (Björkholm & Brattberg, 2008). Within the product backlog each story will become prioritized and ranked depending on when different release of the product is completed. This is done to monitoring the different releases of the product backlog. There are different tools and techniques that can be used to help the Scrum team to know which step the development processes is on and forecast how the future development process will look like (Schwaber & Sutherland, 2011). After that comes the second Scrum artifact that is the Sprint backlog, which works in the same way as the product backlog but focuses on what should be achieved within each Sprint (Schwaber & Sutherland, 2011). However, there is a difference between the product baklog and the sprint backlog that is how the requirements are prioritize in the sprint backlog and frozen after each sprint meeting, which is not changed until each Sprint planning Meeting. The third and final Scrum artifact is the potentially shipable product increment, which basically is the sum of the product backlog items that have been completed during a Sprint. At the end of a sprint, the product increment has to be "complete", which basically means that it must be useable and accepted by the Scrum team.
The key part of the Scrum is the so-called Sprint. The Sprint is a time-boxed time specified process of the actual development that can vary between 2-4 weeks. The sprint has as goal to produce a "complete" product. Several sprints can exist within Scrum depending on how extensive the system development project is. The “Completed” product is expected to be both usable and potentially releasable product (Schwaber & Sutherland, 2011). During each sprint there are a set of rules that should be followed:

- No changes are made that would affect the Sprint Goal:
- Development Team composition remains constant;
- Quality goals do not decreases;
- Scope may be clarified and re-negotiated between the Product owner and Development Team as more is learned.

The function of the sprint is to give a clear structure that emphasize transparency to show the structure of the design increases the flexible within the development processes (Björkholm & Brattberg, 2008). The sprint basically gives a structure to the process of building the product, how to structure the work and what the expected outcome of the product will look like. The sprint's special ability is to forecast different unexpected risks and over-complexity that might arise during the development, which can result in time delays and increased costs. The work during the sprint is done in five important events (See figure 1.2) namely; sprint planning meeting, daily Scrums, potentially shippable product, sprint review and sprint retrospective (Gestwicki, 2011).

(Figure 1.1. Process of the Sprint)

The first event step in each sprint is the sprint planning meeting where the plan for the development process is established by the whole Scrum team collaborating together (Björkholm & Brattberg, 2008). The sprint planning meeting takes up two important parts of the development process (Schwaber & Sutherland, 2011): What will be potentially shippable product increment resulting from the upcoming sprint and how much work will be needed for the potentially shippable product increment delivery to be achieved? After that when a time-frame has been roughly planned the Scrum team can ask for more detailed questions from the product owner to make an estimation of the work-tasks and time-frame for the more technical aspects of the development process. This is called establishing a sprint goal, which is a kind of milestone to determine how the development should be structured and how long the development process will take. Then the second event comes, which is the event...
daily Scrum, which is conducted every day of the development process. Daily scrum is a 15-minute time-boxed meeting for the Development team to communicate and inspect the work since the last meeting (Schwaber & Sutherland, 2011). The meeting also gives the chance of planning and forecast the work that has to be done before the next meeting (Björkholtm & Brattberg, 2008). The third event is the delivery of the potentially shippable product increment. The fourth event is the Sprint Review, which is an event created to inspect the progress of the development and adapt the product backlog if there is a need for that (Schwaber & Sutherland, 2011). The result of the Sprint review is a revised product backlog that defines the problem of product Backlog items for the next sprint. The product backlog may also be adjusted overall to meet new possibilities. The final event is the Sprint Retrospective, which is involved after each completion of a sprint. During the Sprint Retrospective the team is given a chance to discuss and inspect the development process itself and propose ways to plan and improve the process (Schwaber & Sutherland, 2011). The three reasons for the Sprint Retrospective is (1) to inspect how the last sprint went with regard to people, relationship, process, tools (2) to identify and establish the major items that went well and potential improvements; and lastly (3) to create a plan for implementing the improvements after the way Scrum team conducts the work.

Research has shown that using Scrum do not just come with potential benefits but also new challenges. In a literature review conducted by Hossain, Babar & Paik (2009), made a systematic literature review about using Scrum in global software development. The authors have used twenty different papers to review about the challenges with Scrum (Hossain et al., 2009). The results of this literature review provided information that could be used to understand the different challenge themes that may influence the development process by restricting the use of Scrum practices. Moreover, this literature review addresses how project managers can benefit from the synthesized knowledge about different strategies that can be used to deal with the identified challenges. In this review, the authors came to the conclusion that there are three main themes of challenges: collaboration, coordination and communication processes.

The first theme of challenges addresses the importance of collaboration in projects. The origin of this problem might lie in the lacking effective collaborative tools, global task boards, suitable bug and issue trackers and globally accessible backlog tool are also reported to be challenging factors (Smith, 2007). Therefore, it is important that the documentation within the project is done correctly. To maintain documentation has also increased team collaboration processes while using Scrum practices (Vax & Michaud, 2008). This will help the Scrum team to be able to manage the documentation in a way to avoid different collaboration challenges that might arise in a Scrum team. The second theme of challenges revolves around coordination, having a lacking and dysfunctioning coordination within a Scrum teams might affect the development of the product in negatively ways, for example: higher development cost, less efficient work, increasing sociocultural difference, etc. (Williams & Stout, 2008). A way of making sure that these problems do not affect the Scrum teams performance is to have efficient team management within the Scrum teams.

The team management has different strategies for managing large distributed teams that uses Scrum to split into small manageable sub-teams (Paasivaara, Durasiwicz and Lassenius, 2008). And, to monitoring the Scrum teams and their performance, by using tools, for example, issue tracker (e.g. Jira), enterprise Wikis (e.g. Confluence), and project management tool (e.g. Scrum works) to have a better documentation and project
transparency (Therrien, 2008). The last theme of challenges is how communication in Scrum teams seem to be affected by cultural differences. With cultural differences comes problems in communication will appear that often leads to miscommunication, misunderstandings or even confusion amongst the team members of a Scrum team (Paasivaara et al., 2008). An example of this challenge would be that the communication in the Scrum teams is not able to conduct an effective retrospective meeting due to the socio-cultural distance involved in the distributed project.

These challenges are products that the projects are missing adequate tools to support the work, having a lacking coordination ability within the firm and finally that there does not exist any formal communication channel might result in cultural differences. However, there are different counter-strategies that can be used to reduce the different asynchronous challenges that circuits around Scrum. One counter strategy is to reduce asynchronous challenges by letting Scrum teams modify or extend existing Scrum practices to reinforce the individual value of Scrum for the team. This would generate a unified understanding about the use of Scrum within the team. Some examples of this would be to remove or add different events, policies, etc. For example, having a local "mini-scrum" in the morning after a late distributed scrum meeting might be very effective in reinforcing the value of a Scrum within the local teams (Holmstrom, Fitzgerald, Agerfalk & Conchuir, 2006).

As a conclusion there exists different standard in-house agile techniques, which can be used to distribute agile environment workload, while other techniques might require some kind of modification like information sharing, documentation levels, communication channels, status tracking & reporting and meeting frequency to avoid negative impact on the Scrum team. As the related literature mentions, there exists a generalizing image of what the features of agile methods are. However, extant research on ASDM does not to any great extent investigate into detail how the implementations of an agile method like Scrum is considered by the different stakeholders whose work is affected by it. Therefore, there are different challenges and potentials that arise when implementing Scrum internally in firms. This is a hollowness that this research will investigate.

3. Research method

This chapter describes the research process of this thesis in terms of research context, the chosen method, data collection and procedures for data analysis. Consequently, the first section describes the context of the research. The second section outlines and motivates the choice of method and why the selection of a case study as method was adequate for research case. The third section describes how the data collection was conducted. The fourth section describes how the analysis procedure of the research was carried out. The final section is about the methods limitations and strengths that concern this research.

3.1 Research context

This research has involved a case study conducted in a high-tech system development firm called System Development Corp located in the north region of Sweden. The firm has been working with system development for many years with various different methods. The customers of the firm are all from Sweden. In the firm of this research there are currently around one hundred people employed and they work with various forms of system development projects. However, within the firm there are several development teams that
use Scrum as the primary SDM. In the firm there are also several different Scrum teams that follow the development method in ways that suit the needs and requirements of the Scrum teams.

System development Corp have had a history of using various different SDM within the firm. The methods that have been used: the Rational Unified Process (RUP) that is a more traditional method, after that changing into a more agile approach by using the DSDM and finally moving over to Scrum as SDM. In the beginning of 2012 the organization underwent a major transition in switching from DSDM to Scrum. The transition of the method was made a year ago and since then the organization has been using Scrum as SDM, when writing this research. The changes of working with an SDM have affected the internal way of working with system development in the firm. From going from clearly assigned position like project manager, tester, developer, requirement manager etc. To have those assigned rolls gradually being erased and working more tightly together in the Scrum team with various assignments. This flatter and more flexible way of structuring the work in projects have involved working closer together with customers in a different way than previously, by implementing the customer more into the development process than before. Some of these changes have affected the working environment by having a more open working-space, using several different tools and techniques to monitoring the progress of work within the Scrum teams. The different key stakeholders will be presented in detail in section 3.3 (data collection), the people that have been interviewed about the challenges with Scrum have all different work assignments and different positions within the firm.

3.2 The Case study Method

This research is based upon a qualitative research approach in the form of a single case study, which has been conducted at System Development Corp. The primary reason for choosing a single case study method was to create a deeper understanding of both the research phenomenon (Scrum) and the research context (System Development Corp). The case study as a research method is accepted as a valid research strategy within IS research community (Klein & Myers 1999) and also one of the most frequent used methods in the most leading journal within the field (Denzin & Lincoln, 1994). Within information system research the case study method can be based on both a qualitative and quantitative research approach. The case study that was conducted was chosen to adopt a qualitative approach. This approach helped the research to create a deeper understanding on how the key stakeholders experienced the use of Scrum within system development projects. When conducting a case study method the questions are often formulated like "how" or "why" questions (Yin, 2007). These types of questions are useful to ask when investigating processes that revolves around the research in order to create a deeper understanding of context within case. For example, in this case the questions asked how the firm had experienced the challenges and possibilities with using Scrum. The question was asked for research a real phenomenon within the phenomenons real context, which the researcher have little control over. In the research at System Development Corp involved investigating the work procedures of Scrum within a real system development environment.

The case study method is also supported by Fagin (1991) that argues that a case study is a method that can be used to make significant interpretation of real events or entity that can be hard to define. Using a structured researcher strategy within case study of System Development Corp it allowed the research to be structured after different events: that includes
the logic design, data collection techniques and specified procedures when conducting the
analysis of the data collected. This provided a more extensive explanation about the case's
specific social context that is under investigation (Yin, 2007). However, the case study as
method should not be considered to be a tactic of data collection or just a design feature
without imposing a research strategy (Stoecker, 1991).

The author Yin (2007) argues that the case study method makes it possible for the
researcher to maintain a holistic perspective to make a significant interpretation of real
events. Such events can for example be individual life cycles, firms management processes,
similar work of others in the same context, international relations and industries growth and
maturity. Within case studies different analytical levels or entities can exist. For example
investigating: individuals, groups, firms, etc,. In this research case studies analytical levels
focused on interviewing different individuals who were key stakeholders within the firm's
Scrum processes. These analytical levels or entities can be used in both case study
approaches, namely single- or multiple case study. The design of both types of case studies
can involve several levels or entities.

Using a single case study approach helped create a detailed understanding of how the
different respondents within the field viewed the use Scrum as a method. This type of
approach was appropriate since this case of System Development Corp could be seen as a
representative or typical case. Using the single case study approach helped create a detailed
understanding of how the different respondents viewed the circumstances and conditions
that are present in the ordinary or every day situation of system development projects. The
data collected was in the form of interviews, the respondents of the interview consisted of six
different key stakeholders. Each stakeholder had different roles in the system development
projects and experience with working with Scrum as method. This resulted that the
triangulation process facilitates that different findings of this research was able to be
presented.

### 3.3 Collection of data

This section explains how the collection of data was done since this research used a case
study approach. The data collection activities in this case study was centered around one type
of data: semi-structured interviews that discussed the research topic of challenges and
possibilities with Scrum. The semi-structured interviews focus on the individual, which
helped the researchers to understand the individual respondents personal perspective
around the use of Scrum as SDM. The respondents was key stakeholder who worked with
Scrum on system development projects within the firm (See table 1.1). The questions in the
interview were related to different themes of using Scrum as an SDM in development
projects. Within these interviews the respondent was asked questions based on different
themes that could help understand the limitations and features of the use of Scrum as a
system development methods (see appendix A, for questions). These answers helped this
research to gain a deeper insight on how the respondent viewed the process and issues
around using Scrum as system development method. This gave the respondents the chance
to give their personal opinion on the use of systems development methodologies influenced
their work position in the firm. The personal opinions generated different views on what the
challenges and possibilities is with using Scrum. The interview was conducted person by
person in System Development Corp's conference rooms, all these interview were digitally
recorded and later transcribed into physically readable versions for further analysis. To
complete the transcribed information there were also additional field-notes taken to supplement about the people’s behavior and other important factors which, affected the interview.

<table>
<thead>
<tr>
<th>Position within the firm</th>
<th>Years of experience within the firm</th>
<th>Length of interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment Manager</td>
<td>20 years</td>
<td>35:15</td>
</tr>
<tr>
<td>Scrum Master/ Team manager</td>
<td>10 years</td>
<td>47:31</td>
</tr>
<tr>
<td>System developer/ Tester</td>
<td>5 years</td>
<td>32:36</td>
</tr>
<tr>
<td>Project Manager for maintains/ HR</td>
<td>12 years</td>
<td>27:48</td>
</tr>
<tr>
<td>Head of system development</td>
<td>1 year</td>
<td>21:02</td>
</tr>
<tr>
<td>IT Architect</td>
<td>9 years</td>
<td>16:04</td>
</tr>
</tbody>
</table>

*(Table 1.1. Interviewees, years of experience and length of interviewee)*

### 3.4 Procedure of data analysis

The analytical procedure within this research was split up into two different categories. The coding of the data was done after all the interviews had been made and interview data had been transcribed to text. Then the transcribing text was categorized into different themes. This resulted that the data became categorized into two different categories. The first category is based on a grounded approach, a bottom-up perspective. The second category is based on a more theoretical approach that has a top-down perspective. The purpose of doing the analysis this way was for the research to investigate how the different key stakeholders within a high-tech system development firm view the challenges with using Scrum. This resulted in discovering challenges and possibilities that have been identified in the related literature or had emerged within the firm.

Findings in earlier related research (2.2) present three different generic types of challenges when using Scrum as a method for system development. The three generic types, which was found was focused on: collaboration, coordination and communication process. These three generic types of challenges could be viewed as the sources of the different challenges that exist within the use of Scrum. Those challenges that were identified were put in the first data category. In addition to these three generic types of challenges existing in System Development Corp, the research also was open to identify other other types of challenges that emerged when the data was analyzed. This resulted in finding two other generic types of challenges with Scrum, which was put in the second data category. The findings of the data analysis resulted in a total of five overall theme of challenges with using Scrum. This analytical procedure helped to both investigate and categorize the challenges that identified and linked the challenges to different generic types.

To summarize, it was important to gradually analyze the various challenges that were both influenced by a more theoretical perspective view, but also to have an open mind to different interpretation of new challenges that emerged within the context of System Development Corp. The analysis focused on how different key stakeholders with different knowledge and experience view the challenges that exist with using Scrum as a system development method. This allowed the different stakeholders to describe how they are experiencing Scrum as a method that supports their work. This analysis procedure was both influenced by a
theoretical perspective, but also based on the collected empirical data. And, because of that it is important to understand that this developmental procedure helped understand how data should be interpreted from both a theoretical perspective and a practical perspective that has been presented.

3.5 Methodological limitations & strengths

A potential weakness of this design is that a case study further in the process may prove to be something else than what the researcher thought at the beginning of the research. A single case study is a type of study that requires a careful consideration of the potential of the specific case to be able to minimize the risks that information may be misrepresent and also to maximize the accessibility or access needed to be able to collect information related to the case (Yin, 2007). The weakness with a single case study design is that it is a very exposed approach since the researcher have to lay every ounce of gunpowder on one shot. Usually when conducting case studies there is a recommendation to use several cases when conducting a case study because of the analytical benefits there is of having two or more cases. Often the results tend to be of a higher significance than a single case study.

However, there are also situations where a single case study can be used as a representative case that is the beginning of a further research process. The single case can be a fundamental part of a multiple case study. In such situation a single case study should not be regarded as a "whole" research itself (Yin, 2007). A single case study should instead try to be specific to show (a) the variation within the defined process that is of investigation (for example, based on the view that different stakeholders have on the process) and (b) the steps of the process that exist before any formal decision on the process has been given even before implementing changes within the process. Therefore, it is important that the reader of this research is aware that the focus of this research is presenting a narrow view of the generalizations of one firm. This research focuses on the reader by viewing this as an interpretive case study with "rich insight" that describes the broader and diffuse implications within this representative single case study (Walsham, 1995).

4. Results/analysis

This research has investigated how different stakeholders experience the challenges and possibilities with Scrum. In general, the respondents have experienced the method Scrum as a positive change of working with system development project. However, there are evidences that show that there are also exists challenges experienced by the different respondents. The result chapter is a gathered review of how the different stakeholders within the firm viewed the challenges and possibilities that exist with Scrum and have been clustered together into five themes.

4.1 Collaboration within Scrum

This section revolves around the topic of collaboration within Scrum, since Scrum is a method that emphasises on having the Scrum team working together to solve different tasks. Within Scrum the work is done together with every Scrum team member, the work becomes a more democratic way to perform system development because all stakeholders have something to say about how development should be done. However, this way of conducting system development projects requires a working collaboration with the different
stakeholders. In this kind of development project the Scrum teams is required to have a working collaboration that is supported by various strategies, techniques and tools to work.

The head of system development described how the collaboration of different Scrum teams are conducted and how the structure of the scrum team affects the development project.

"It's hard to say that it has entirely to do with the change of method how to conduct a project, but you could say that the method makes the division of roles become a little different than before. In a Scrum team a team member needs to know a little bit of everything. This makes different types of demands on the skills that we insert in the Scrum teams, if you are a specifically trained developer, tester or project manager for example. Then, it becomes more difficult where to place you within the firm of today then it was before when you had a need for specific professional knowledge and experience. So I think this may have an impact on the demand that the need for knowledge and experience has been expanded."

The head of the system development firm described that the change of SDM might not be the only underlying reason for the changed structure of performing projects. However, within the Scrum team there exist different ways of assigning specific tasks to specific roles. In Scrum the development process emphasizes that each team member should have experience and knowledge of each part of the development process that is performed, instead of having a specific person responsible for each task. The development process is based on the fact that each team member should be involved in the different stages of development. The members of Scrum teams are required to have an overall knowledge about different knowledge areas. This is a contrast compared to how the development processes were done before when each person had been assigned to a specific role like: developer, tester, requirement manager, project manager, etc. This way of structuring different roles makes it difficult for the firm, which is working with SDM like Scrum to employ people that are more specifically specialised on one role within a system development project. This basically means that the people of a Scrum team is required to have an extensive resource of knowledge to be able to work together and complete the given tasks. A similar statement that was said by project manager for maintains/ HR-manager was:

"The border between different roles that existed in projects before, has now become blurred when working with Scrum. Now the focus instead lies on the fact that the group together will solve the tasks. So then it's good if people in the Scrum teams have different experience, not that you as a developer only knows how to develop. That makes your role inflexible within the Scrum team since Scrum is about conducting the work together. There exists no need for having a pure developer, tester, requirement manager, interaction designer, etc. These kinds of borders between the roles are disappearing when working with Scrum. Therefore, it is beneficial if you as a team-member for example know different programming language since we have different products with different languages."
The manager stated that the boundaries that exist between the different roles are being erased. This means that the project team instead of having to solve different tasks individually have to work together to solve them. Therefore, it is good if the Scrum team members have a wide variety of knowledge and experience around working with system development projects. This means that the Scrum team needs individuals who are not only specialized in a single development role; instead the benefit is to be flexible within the team. This makes the Scrum team more responsible for managing the given deadline together, rather than a project manager would have if the manager had the full responsibility. But, since the Scrum team has a more “flatter” hierarchy there is a need to have different utility functions. For example, the manager mentions it is very benefiting if the team members of the Scrum teams have knowledge about different programming languages. Having this utility function enables the team to work more efficient than if the members should focus on being specialized on only one programming language. This is supported by the IT Architect that explained that the firms different Scrum teams are helped by Scrum as a method by creating a wider knowledge sharing of different work tasks that exists in system development projects.

“*In Scrum teams we focus on using risk diversification. This means that there is not only one employee that has knowledge or experience to develop our GUI or database for example. Instead, this means that we are trying to ensure that all team members must be able to work with all sorts of tasks. That's a deliberate strategy from our side and that means that the responsibility is something every Scrum team must take themselves.*”

The IT Architect viewed that having a risk diversification makes the Scrum teams more flexible and multifunctional when working with different tasks in system development projects. The IT Architect explained that to us this way of risk diversification makes each of the Scrum teams member required to have knowledge and experience about everything that is being developed within system development projects. System Development Corp have made this choice deliberately. Because of that the responsibility of how the knowledge sharing will be done is to be decided by is each specific Scrum team. Another topic similar to sharing knowledge was given by the developer/tester. This person mentioned how the collaboration within Scrum stresses around the people within the Scrum team.

“*It's easier to gather around the board every morning, which makes you get this personal contact by just asking: How are you today? It is important that it becomes a social thing to gather at the whiteboard and talk it through. *”

The developer/tester described that the collaboration around Scrum is something that is influenced by the personal contact that exists within the Scrum team. The person also described how the social aspects of system development is affecting the process, by asking questions about the team members well-being. The system development process evolves from being an individual task given assignments to becoming a collaboration process that is affected by other social aspects that revolve around the Scrum team members.

Another thought that was given by the assignment manager emphasised on how the collaboration when using Scrum is affected by using a unified terminology.
"We get a unified terminology that can be used together with pair programming, which is a thing we do here. The development process becomes more associated with quality also because we are at the same time learning from each other, which is important. When humans sit together and do something, not only do we learn from each other, but the solution's quality is also improving within the team. This will result on the fact that the progress of the project will go further ahead if you work together rather than if you sit alone and work."

The assignment manager viewed that the unified terminology that is being used within the different Scrum teams can be used when doing pair programming for example. This basically means that by having a common unified terminology the Scrum team can implement various different techniques that can help increase the efficiency of the team, paired programming is one of those techniques. However, the uses of techniques and other various tools are not the only way of improving the efficient of the Scrum team. The Assignment manager also tried to explain that another important factor helps the team to increase the quality of the work. That is to help the team members of the Scrum team to learn from each other. When the Scrum team are sitting together working with the different tasks, the team members are learning from each other and this increases the quality of the solutions that are being developed. Basically the assignment manager is saying that rather than sitting alone without anybody to talk and discuss the problem with. The progress of the work will not increase as fast as it would when the developers are sitting together with the team members and work on the tasks together.

A summarization of this section states that the collaboration within the Scrum team is something that has affected the hierarchy, roles, techniques, tools, ways of working together and learning from each other within the Scrum team.

4.2 Coordination within Scrum

The second section analyses how the coordination within System Development Corp. is executed. In the firm there is a need for different tools to support the coordination progress of the project. The different tools that are used in the firm are: Whiteboards, JIRA, ClearCase and regression tests. These tools are used to visualize, monitor and control the progress of the development processes that are done by the different Scrum teams. However, the two most discussed tools mentioned during the interviews was Jira and the whiteboards. The first tool is JIRA that is a Software configuration management system (SCMS) for project planning, monitoring and support in the firm. JIRA is used by the employees of the firm to quickly manage different tasks and problems within the projects and also to facilitate business planning and development. With JIRA the team and project managers can keep projects up to date, which increases both the quality and documentation of projects. The second tool is the whiteboard that helps the team to update and coordinate the work more visually than JIRA.

Below the project manager for maintains/HR explained that the two most commonly used tools within the firm of today are the SCMS JIRA and whiteboards.

"We have a tool called Jira that is our task management system. All measures done is reported by JIRA. All kinds of measures are registered as a task in JIRA."
We also handle the projects with JIRA by creating errands within them, and then the projects are divided into a number of tasks. Everything that is handled passes through the JIRA. Besides that, it is our whiteboards that we mainly use as tools within the Scrum teams.”

As the assignment manager explains JIRA and the whiteboards are the two tools that are used in the firm to support the communication and enhance the coordination of the progress of the work. JIRA is the SCMS that is used within the firm to monitor and handle the different errands that are sent by the customers. Within JIRA each project is downsized to smaller manageable pieces and are chosen to be distributed to the different Scrum teams that exist in the firm. All different errands passes through JIRA are visible to all the different Scrum teams. The Seconed tool mentioned by the manager is the whiteboards that are also used in the development process. Since these are the two tools that are most commonly used by all of the different Scrum teams to monitoring and handle different errands.

The Scrum Master/team manager viewed that there exist benefits of using JIRA compared to using the whiteboards for coordinating different stakeholders.

"JIRA is good for our business, for product owners because they can follow the progress of our sprint. That saves time in a different way than using whiteboards. Once the board has been cleared away from the post-it, written text and notes, then the information is gone and you can often never re-create the scheme that had previously existed. While with JIRA you can go back to the old sprints and see how the planning of the sprint was structured.”

The Scrum master/team manager considered JIRA to be a tool to enhance the coordination with the different stakeholders of the development process and to update the progress of the development processes during the projects lifetime. The manager viewed that JIRA is able to be more efficient compared to the whiteboard, in the aspect that JIRA is able to store and retrieve information about the changes that have been made during the projects lifetime. The benefit with JIRA compared to the whiteboard is that the whiteboard is not able to store and access information that has been written on the board. While, in JIRA the user can have access to all stored information about the structures and changes that have been done during the project. However, the developer/tester explained that the use of whiteboards have other benefits compared to only using digital tools. The whiteboards are used within the firm because the whiteboard offers possibilities that cannot be achieved with only using digital coordination tools like JIRA that are based on software, but instead can be archived by using whiteboards.

“The Scrum team I am a member of uses whiteboards in the development process to monitor the project progress. However, there also exist online tools that have the same functions as a whiteboard, but we have decided not to implement these kinds of digital tools in our Scrum team. That is because we apply the aspects of Scrum that fits our way of working. One of those aspects are the whiteboard. The whiteboard makes it easier for us to gather in front of the board every morning and coordinate the work that should be done instead of having a digital Scrum board.”
The tester/developer stated that the use of whiteboards have other benefits that needs to be taken into consideration that the digital tools cannot achieve. And, since the way that the different Scrum teams apply different aspects of Scrum to support the way of working with development projects the teams are able to use resources that they seem to fit in the system projects. The Scrum team where the developer/tester is stationed has chosen to use the whiteboard that supports their internal coordination better then using digital tools. However, some of the benefits with using whiteboard and one challenging aspect with having a whiteboard that has been noted by the head of system development.

“One thing that I think about whiteboards is that it becomes very easy to visualize the progress of the project. The effort of each employee's contribution becomes very clear to the other members of the project. What I mean is that when you have a stand up meeting and receive tasks to share and everyone sees after a while who it is that takes many tasks and who takes the least tasks. This thing with personal effectiveness becomes very visible in a different way than before, so it's also a new type of challenge to manage.”

The head of the system development viewed that the use of whiteboards within the different Scrum teams have many different benefits. The first benefit was that the use of whiteboards helps the Scrum team to have a more visual and clear understanding on what stage the project is on. The second benefit was that it becomes easy to see which team member contribute the most with the projects tasks in the project. This makes the development process and the identification on every different members work in the project more transparent, which helps the coordination within the Scrum team becomes more efficient. However, this also leads to a challenge that the head of system development have noticed and that is that the personal efficiency of each team members within the Scrum team becomes more transparent. A new kind of challenge that did not exist within the old way of conducting development project has appeared.

4.3 Communication when using Scrum

The third section concerns how Scrum affects the communication within the development process in system development projects. When using Scrum there are different ways of communication. This section analyzes the relationship between Scrum and communication from the perspective of the different stakeholders. Since all the stakeholders have different position with the firm that helps highlight how the communication within Scrum are seen from different perspective. This section makes an analysis around having a common terminology, communication within Scrum teams, direct communication with fellow colleagues and finally one challenge that exist with the communication of Scrum. The IT Architect explains how Scrum is a more business oriented compared to risk oriented.

“The view on traditional methods focus more on risk management, for example RUP that is very centered around the risks within projects, while Scrum is more focused on business values in the projects. These different philosophical grounds are what I think are the difference between the two methodologies approaches, and that is also what is the key to Scrum’s efficiency.”
As explained by the IT Architect the traditional methods have a greater focus on risk management in projects. Scrum that has an origin from agile methodologies, is more focused on the business values rather than the risk management aspects of project. The IT Architect compares the two different methodologies and explain that the difference between the two methods lie in their respective philosophical approach where both methods originate from. To know the origin of the methods helps enhance understanding of the method. That the philosophical ground is what makes Scrum to be so efficient. The Scrum Master/team manager explains that Scrum relies on an understandable communication within the Scrum team and that the benefit of having a more unified communication.

"The key-benefit with Scrum is to have this kind of framework that enables everyone to know what is expected because we work in the same context, we use the same language with each other, which makes the development more flexible."

The Scrum master/team manager explains that a main benefit within Scrum is that the method relies on a close communication. Scrum is also able to provide a sort of framework each team member can lean on when needed. And, by having this framework the team is able to have a better communication channel that is supported by the common terminology. The terminology becomes useful when the Scrum team is working within the same context of the project. It makes the communication and work more efficient than if the team members would not have the same terminology.

The Project manager for maintenance/HR experienced the effects of the Scrum to make the communication for the Scrum team as positive.

"It is better than if several people are involved and think because you get a lot of more ideas on how to develop tasks better. The development becomes much more based on how the Scrum team does its work, rather than if a few members of a management team would decide how the Scrum team should do its work.

The Project manager for maintenance/HR experienced that by having more people involved with generating ideas to increase the efficient of the Scrum team. This is done by the Scrum team members by sharing their insight on how things should be reconfigured to support the Scrum team better. This way the ideas revolves around the actual practice of how Scrum team is doing their work. The people that are giving their ideas are actually the members of the Scrum teams that are working with Scrum as a method. This is done instead of a group of manager that perhaps do not have a good insight of the work procedures should manage the structure of work of how the Scrum team conducts their works.

An example of more how the communication was done more practical, was given by the system developer/tester.

"You do not call someone, you do not need to send mail, but instead can you have testers besides you, which is good because that person can notice something that I might have overlooked. Then, the tester only needs to tell me that this does not look good and show on his/her screen what is needed to be corrected. And, since
we have meetings every morning it becomes a natural way of communicating to address the problems and issues raised and to become aware of it."

A more practical view of how the communication works in the Scrum team was given by the system developer/tester. This person described that instead of using formal communication channels, which is time-consuming the tester could basically just ask the developer/tester that is within the Scrum team. This eliminates the different bottlenecks that are created when calling people, sending emails, etc. Instead, the tester in this case can just say that he/she has found a problem that just needs to be shown to the developer to fix it. The developer/tester experience that Scrum makes the communication flow more natural within the daily meetings, which makes it easier to deal with problems and issues that might come during the project lifetime.

However, there are not just benefits and downsides with having this kind of informal unstructured way of communicating. The project manager for maintenance/HR experienced that one of the challenges with the communication within Scrum is related to the HR questions.

"One of the challenges with Scrum is that the method does not mention anything about projects from an HR perspective. In earlier projects this was included in the role of the project manager where you should think of the staff and other related factors. Within Scrum however, the role of Scrum Master does not pronounce how the HR questions should be handled, how to give feedback to the staff and how to manage the issues that might arise within the project. These kinds of questions are also not mentioned in Scrum's framework. The Scrum team has to deal with these issues themselves and that's challenging sometimes."

The project manager for maintenance/HR viewed that one of the bigger challenges with Scrum as a method when used in system development projects, does not mention how a project would be conducted from a HR view. Within the system development projects that is influenced by the more traditional approach the person that was in charge of dealing with the HR questions was the project manager. The manager was responsible to think about the well-being of the development team and other related topics. However, now when using Scrum the manager has no given guidelines how the HR questions should be handled and by who. Also, other questions that are related to this topic is how the team should be able to give feedback to each others and how the team should manage these issues that are related to HR. And, since the questions are not mentioned in Scrum as a method the team has to handle themselves in the way they are experiencing being the best approach, which can be seen as a challenge with Scrum.

As a summary of this section viewed that the different stakeholders experienced many benefits with having a common terminology, a close communication within Scrum teams, and a direct communication with fellow colleagues. However, the challenges presented related that the HR questions need to be structured in some way for the Scrum team to be able to improve growth potential of each individual member.

4.4 Scrum as a support unit
When investigating how the practical use of the method Scrum was viewed by the different stakeholders there existed a general unified view that Scrum as a sort of support unit that helps the Scrum teams to facilitate their tasks by structuring work procedure in systems development projects. But, there also existed different practical areas of use where Scrum could be applied. The general view was that Scrum worked like a sort of framework that could support the system development process. The respondents also described that they liked that they could add or remove different parts of Scrum to adapt to their given work situation. The quote below is from the Assignment manager who gives an explanation that the practical aspects of the Scrum might differ between the different Scrum teams that are using Scrum since the way of applying the method, depending on how the Scrum has been assembled together.

"We are slow to change, so we want to move towards any direction, by taking it in gradual changes. How much we use the method as support or framework depending on how good we think Scrum is and how well Scrum adapts to the situation because we have customers that are affected by us. We cannot just change working the way we want, but we must have gained the customers before we can change our work procedures.

However, depending of how the chosen Scrum approach adapts to the given situation there might be different ways of working. Therefore, the general image of the practical application of Scrum was viewed to be an incrementally and iterative process, where the different Scrum team had applied it to the group individual way of working. Another comment that supports the earlier presented view of Scrum as a framework or support from the Scrum Master/Project manager that was consistent with all other respondents view of the practical aspect of Scrum.

"For me Scrum is a support unit and also a framework to relate to, by making sure that everyone knows what is expected of one another. Scrum simplifies the existence of everyone if all have the view of how we should work together, so you do not have to reinvent the wheel again and again. Except that we know that we're working like this and we do it because we think it will be an easier and better way of working. So when a new person comes into the team it's pretty important to explain how we apply Scrum."

Like the assignment manager the Scrum Master/Project manager also explained Scrum as a sort of support and framework that is used to unify a set of rules that can help the scrum team to avoid repeating the same processes in the development. The Scrum teams need to be aligned each specific project using different strategies. The Scrum master also emphasis that it is useful to have a framework when a new person is being implemented in an existing Scrum teams. However, in that case it is also very important to explain to the person what differs the specific Scrum teams work procedures of working compared to other Scrum teams.

Every respondent that was interviewed viewed the method as a framework and support unit for their work assignments by having something to structure the work after. Also, having
the same understanding of how to structure the work created a common set of rules that can be followed when working. These seems to be very beneficial for the different Scrum teams when implementing new personal.

A challenge that was noted by the project manager for maintenance/HR was that since the assignment of projects of today is split up the project into smaller manageable tasks to different Scrum teams this makes the development process harder to create a general image of how the project is going on.

"A challenge that exists when we are distributing the work between different teams. For example, in our projects we spread out all the activities to different Scrum teams. The challenge is to still keep the project together. Earlier when you put together a project you received the entire project track of what was done within the project. Now on the other side, we have sprints where everything ends up in the different groups, so that is also a challenge. The benefit of this approach is that we can focus on a project. We can now take on a specific part of the project really early and work all the assignments of project on the same time, so that's a big potential benefit as well.

The challenge is to maintain the holistic perspective of the project together with all the other Scrum teams that are being assigned with different tasks. Each Scrum team does not have the same set of procedure to follow. So there might exist some miss-alignments on how the work procedure will be performed. This manager also comment that there exist benefit with having a set of structured guidelines to follow. The manager describes that the benefit is that the project can start really early and that their work is done in parallel with other areas of development.

The general image of the practical aspects of Scrum was that it can both function as a support unit or framework for the different stakeholders to lean on when conducting their different work assignments. However, one of the challenges that was articulated was noted when using Scrum differently within different Scrum teams. However, there is a possibility that the wide holistic perspective of the project might decrease for each specific Scrum team. And, that the assignment of different development tasks are being distributed to different Scrum teams that follow a custom made Scrum approach.

4.5 Transitions to using Scrum

The final theme that emerged as a result of the interviews when discussing how the transition to change the method to Scrum was experienced by respondents. The transition of Scrum had been experienced to be beneficial to the respondents. All the respondents had different background with using different methods. Some people had been with the firm since they were using RUP (Rational Unified Process), DSDM and moved towards using Scrum. Other respondents had experience with working with Scrum earlier, etc. However, while every stakeholder had a different background with working with Scrum, they still viewed the transition as a positive impact on their work procedure. All of the respondents had experienced that working with both the DSDM and making the transition to Scrum, which became the point of focus of this discussion. Below the assignment manager gave an explanation on how it had been to work with DSDM.
“Earlier we followed DSDM until a year ago. Then we had the project teams you had to put a number of resources that should be involved in the project. The typical project often involved a representative of the customer that helped ensure the requirements, a developer, a tester and lastly a project manager. The way of following projects was more traditionally really. First the project started with a start-up meeting, then after a plan was structured, the requirements of project was written and when the documentation was done it began. And, when the development was finished the product was tested and verify after the given requirements of the project. This was done to get more people from the business to look at the solutions if they approved the product, then it was delivered. The delivery date was often decided long in advance; it has become a bit different compared of today. "

The assignment manager experienced that using the DSDM method, that also is an agile method, was more influenced toward a more traditional system development approach. That emphasised more on having roles and a structured plan to follow. The delivering date was set long in advance and get the at the product in the end of the project, which is little different with Scrum, which also has a set date of delivery, but the delivery of the product is done incrementally after each sprint. That makes it possible for the customer to follow the progress of the process.

This perspective was also shared by the Project manager for maintains/HR-manager that described the transition from DSDM to Scrum in this way:

"The method we used before was called DSDM that also was an agile method, but not in the same way as Scrum. Scrum is really more structured around having meetings every morning and you will be working in various tasks. With DSDM on the other side we worked more structured than we do today. DSDM was more influenced by the waterfalls model. I also think there are very few people who adopt a method to the same extent as today. Instead, we pick the parts that work and use them method, right now, we use a large part of Scrum, a larger part of Scrum than we did with DSDM earlier. "

The project manager for maintains/HR-manager explained that the transition from DSDM to Scrum has involved different structures that the DSDM had. A difference is that Scrum focuses more on how meetings between different stakeholders who are involved in the project is handled differently and meetings are more structured than before. The project manager for maintains/HR-manager experience that DSDM was more structured towards the traditional waterfall development model than it is today within the development stages. The manager has also viewed that the use and adoptions of development methods are not applied to the same extent as the formal view of the method is explained. Since the Scrum team where the project manager works on have adopted specific parts of Scrum and exclude some parts that do not fit the managers Scrum team. The procedure of Scrum have been adjusted to a further length than the development process was done while using DSDM as method. Another thing that was viewed by the IT Architect was how the process of defining requirements in Scrum was seen as a weakness of the method.
"One thing when you compare Scrum with RUP where you have a very clear defined requirements process in Scrum does not exist. In Scrum the requirements process more ad hoc based and I experience it as a weakness."

The IT Architect compared how Scrum and the more traditional SDM RUP differed. One weakness that was viewed by the IT Architect was how the requirements process is structured. When establishing requirements the RUP method was experienced to be more clearly structured than the requirement process of Scrum. In Scrum the IT Architect experienced that the establishment of requirement process is more unplanned and that sometimes can be seen as a weakness. Another respondent viewed that the transition from DSDM to Scrum had affected how the Scrum team establishing requirements had been affected by the transition. The respondent in this case is the Scrum Master/Team manager viewed that the process of establishing the requirement have been changed compared to how it was before.

"Before, the customer could say that the firm should develop the requirements or the customer could say I want to have this system and so then I wrote the requirements and juggled it back and forth between the customer and asking: is this the way you want it? The answers could be: Ah this and that, but not that. Today the customer has the role of being product owner, which has to follow the development process all the time in the project. Getting all the stakeholders implemented in the development process is little bit challenging."

The Scrum Master/Team manager emphasised that the transition have implemented the customer more within the process of establishing the requirements. Previously a one way communication existed where, questions are exchanged between groups and customer. This way of communication could be seen as something that is hampering the efficiency of establishing the requirements since the development team does not have a structural communication with the customer. However, the Scrum Master/Team manager viewed that the customer is more involved in Scrum process of today, since the customer that is called the product owner is the person who is updated of the progress of the whole development process. The Scrum master/team manager also points out that there is a challenge with synchronizing every stakeholder that exists within the Scrum process. Another person that is also mentioning how the requirements establishing process have been affected by the transition from moving away from the traditional approach. Becoming more influenced by the Scrum approach is the head of the system development firm. This person is comparing the more traditional approach of developing system compared to the agile method Scrum. This challenge is something that the head of the system development firm is also mentioning during an interview.

"One of the challenges with Scrum when compared to using traditional systems development methods is that you have the plan that extends quite far in the future. And, the development process often involves many people who want to know what to do and what will happen in the next step. Scrum is a type of method that is unclear when dealing with those questions and sometimes I feel that the person that is ordering the product, views Scrum as a method where the person doesn’t
need to specifying the requirements since it follows an iterative work approach. This is something that could be seen as a risk with Scrum.”

The head of the System Development Corp mentions that one challenge is the establishment of requirements. That the transitions from a more traditional system development approach to the agile Scrum approach have had some challenging implications around establishing the requirements for the project. The head of system development describes that the traditional way of conducting system development is a process that involves having a plan that extends far into the future.

This was often done to manage the question that was asked: what was happening during the development process? Within Scrum the head of development viewed Scrum as a method that is unstructured around the establishment of requirements compared to the traditional approach of developing systems. The risk with Scrum is when establishing the requirements as the head of development experienced. That the customer can often be a bit biased when establishing the requirements, when Scrum is used as a method. The head of developer believes that this might be due to the customer perception of Scrum as a method that is following an iterative and incremental approach, where the customer does not need to specify the requirements carefully because the process is based on an agile approach.

In sum, the transition from DSDM to Scrum involved both challenges and possibilities. Even though the DSDM method is also of an agile approach the method seems to be more related to the traditional way of conducting development project. In the DSDM method it seems to emphasise on having both more structural work procedure and having specific roles within the development project. While compared to the Scrum approach that is more emphasised on having the customer more involved since the delivery of the product is done after each sprint. One of the challenges with the transition to Scrum is the way of establishing the requirements that have undergone some changes. Since the Scrum teams have a closer connection to the customer there exist two noted phenomena that have been registered by the Scrum master/team manager and the head of system development. Firstly, that it is hard to make all the stakeholders synchronized within the development process. Secondly that the customer's perception of setting how the requirements might affect the specification process of establishing the requirements.

5. Discussion

The aim with this research was to investigate what kind of challenges and possibilities there are with using Scrum as an SDM. This research has used a single case study approach to investigate this research area by interviewing different key stakeholders within System Development Corp. The findings of this research confirmed to earlier mentioned research of the challenges and potentials with Scrum in the related research literature section (2.2). This research has presented findings that confirm the challenges with Scrum can be connected to three clustered theme. This research has also found two additional new theme of challenges that relates to Scrum as a support unit and the transition from other methods to scum, which the previous research does not mention. Using the single case study research approach, this research has identified different challenges that can both relate to previous research and the emergence of other challenges with Scrum in this case. This research contributes to help understanding Scrum as a method for system development by both
confirming previous research and also presenting new findings about the area of system development.

5.1 Challenges of collaboration, coordination and communication

The three clustered themes that was presented in the previous related research was collaboration, coordination and communication (Hossain et al., 2009). While this particular case study contained evidence of challenges at the three levels previously identified, it also contains evidence of the opposite that is contradicting some aspects of the challenges. Thus, simply stating that Scrum comes with a set of discrete challenges and possibilities may be too simplistic.

The first theme has been shown to experience as a challenge that exist within Scrum namely, how the collaboration affects the Scrum team (Williams & Stout, 2008). In this research the investigation has identified that the collaboration challenge when using Scrum as an SDM affects the different boundaries that exist with the roles. The difficulty that has been identified in this research indicates that it has become harder to create a more holistic approach to system development projects. When the Scrum team members roles do not have the same boundaries compared to the traditional development teams. The different stakeholders have experienced that the collaboration in Scrum have erased the boundaries that existed among the roles of the development team that used a more traditional influenced SDM. The blurring of roles in Scrum compared from a more traditional influenced system development project team is that each member of team members where individuals within the group, who each received a special given task to be solved individually.

However, in Scrum teams the work emphasises on having a greater collaboration than a traditional way of structuring projects compared to use traditional methods. Basically this research showed that collaboration within the Scrum team makes the individual’s personal responsibility for the development becomes more allocate in Scrum teams, allowing team responsibilities grow larger. This can be seen as a challenge to deal with since if the roles within the Scrum teams are becoming more and more blurry there is a risk that there is a need that members of the Scrum teams have to be closely monitored in some way. Therefore, it would be interesting to investigate two areas of reflection. The first area is about the effects by how the boundaries between the roles become dissolved could be, for example how should the allocation of responsibility between of all members within the team be distributed? The second area to be investigated is if the answer of the challenge lies in having some kind of micro-coordination within the team?

The second theme of challenge is about the coordination within Scrum, that enables the Scrum team to structure the progress of the project. It is stated that there is a need for tools, techniques and methods to support the Scrum team to monitor the development progress (Smith, 2007). However, the challenge that has been identified correlates to the performance of each team members within the Scrum team is becoming more transparent. This could be seen as a problem namely, how the Scrum team will be managed when each individual performance becomes more visible within the firm. The difficulty of this problem is to know how to treat each individual’s performance. For example, how the Scrum team will handle situations such as when a person is underperforming in their work by taking less tasks to work with. While, another individual is overachieving, by taking the greatest amount of tasks within the team. The challenge relates to how the Scrum teams should manage the individual
achievements. An interesting reflection would be to use tools, techniques or methods to monitor the performance of the individual, but also to help manage and measure the different individual performance. It is important to reflect around, which tools, techniques and methods that would be adequate to measure the performance. This could perhaps be solved by implementing some kinds of gamification based tools, techniques or methods within the Scrum process that allows the members of the Scrum team to both know how they are performing as individuals and as a part of the team and how the team is performing within the system development projects.

The final theme of challenge that has also been identified in the earlier related research is the communication theme of challenges. Within Scrum it is important that the communication between the different stakeholders is close and maintained during the development process. This is done to ensure that every stakeholder have a common view of where the progress of the project is. However, if there are different cultural interpretation within the communication, it might create result in misalignment in the communication. The communications will then build on misunderstandings or even confusion amongst the team members of Scrum (Paasivaara et al., 2008). The challenge that has been noticed in this research associated to communication challenge theme that focus on knowing how to adapt a HR perspective after the Scrum method. This is seen by some key stakeholders as a how the evolvement of the Scrum team since it is important understanding how the Scrum team can improve themselves. There is a need to align the HR with Scrum to establish a common communication channel that can be used for improving each stakeholder's growth potential. Without a common working communication that helps to improve and self-reflect over the individual work. Without a way to reflect the performance of work could be seen as pointless and unconstructive for the individual, which might result in a decreasing performance related to the work. This category of challenge discuss how Scrum teams should use some kind of synchronous communication to enhance the efficient in the Scrum team (Hossain et al., 2009). This implies that firms should fuse both the HR perspectives together with Scrum as a development method. In some situation this could result in a kind of framework based on both the flexible communications. The communication should be able to adapt to each specially designed system development projects, but also be able to have a kind structure that makes it easier for the individual to evolve.

As a summary of the first section of the discussion has established that the three different themes of challenges exist within System development Corp. The three challenges affects the three themes of challenges earlier mentioned in previous research, namely collaboration, cooperation and communication. As demonstrated in this section, the three different themes of challenges have affected the firms use of Scrum in different ways. In the case of System Development Corp, these three themes of challenges revolves around enlarged responsibilities for the Scrum team. The presentation of the performance needs to find an appropriate way for both the individual of the scrum team and the scrum team itself to reflect the progress of the development, and by this might help to implement a working HR-perspective within Scrum.

5.2 Challenges discovered within the firm

The result section revealed that there are two themes of challenges around viewing Scrum as a support unit and the transitions to using Scrum. The first challenge addresses that it might be hard for newly hired employees to become integrated in the firm. The newly hired
employees might have a hard time dealing with using a Scrum as a method that is adjusted specifically against the firm's Scrum teams preferences. These preferences of the team might build on a development process that has been refined over the years of both knowledge and experience. That adjustment to the method could therefore be seen as a challenging obstacle for new employees and also affects the Scrum teams by having a more narrowed holistic perspective about how the firm handles development projects since the project divided into smaller manageable tasks for the Scrum teams to handle. Which, is one of the features that agile software development stresses on the quality of the product (Highsmith & Cockburn, 2001). This challenge can be seen as a paradox that contradicts itself, as well as saying that agile methods must be adapted to the development team to work for best practices. However, this creates problems for new employees to be established within the development team as it exists unofficial rules to follow to be synchronized with the other stakeholders involved in development work.

This is perhaps the possible effect why the demand for people with expanded competence in Scrum teams are preferred to people with expertise knowledge within the firm. To have Scrum team with broad expertise makes that the members of the Scrum team can adapt to various kinds of tasks within a system development project. This basically boosts the efficiency of the Scrum team. However, with these kinds of requirement on members competence in the Scrum teams could be seen as a paradox. For example, if the requirement for increased competence were to escalate over the course of time. This could possibly result in the expertise of different knowledge areas that have been built up within the firm will gradually decrease, which could result in the company losing valuable specialised knowledge that has been built up over the years.

In earlier research it is stated that developers should try to adapt the method that is used after the system development project preferences (Abrahamsson et al, 2003). This way of adapting the method after the project is also supported in the agile methods philosophy that says it is to prioritize the development to adjust the method after the changes that might arise within the development, rather than trying to follow a planned process (Björkholm & Brattberg, 2008). This may result that Scrum can be considered a method that can be applied in many possible ways within the firm's various Scrum team. The advantage of this procedure is that the method can adapt specifically to the Scrum team that uses the method. Adaptation of method can be a matter of adding or replacing certain events, policies, etc. to adapt the method for Scrum team's preferences. This means that Scrum can be seen as a kind of abstract meta-method that really can be applied in any way. A meta-method is developed for a specific purpose, so-called specification techniques that allow to use is specifically limited. The problem of meta-method is that the method is not suitable to use in all situations since the method has been designed specifically after a given situation or process. A counter strategy to ensure that the use of the method is clearly defined is to have a proper documentation on how to use the method and in, which context the method is intended for. This can be seen as a sort of custom designed framework for the adoption of the meta-method should be executed. However, there is a risk that the custom designed framework will not be documented since there is no person who is responsible for the documentation. If there are no general guidelines on how it is structured or how implementation processes are, the method might present a risk for novice users. This can create problems for firms that are hiring new employees. This basically means that the so-called meta-method can act like a barrier that is important to keep in mind when the firm is employing new staff.
The second challenge that has been discovered existing in the firm involves how the transition of using Scrum in the firms have created implications on the development process. One of these implication is how the contact with the customers and developers have changed compared to the traditional system development approach (Beck, et al, 2001). Having closer contact with the customer makes it important for the Scrum team to emphasize that the customers realise that they are playing a more important role in the development process than within the traditional approach. Some of the key stakeholders have experienced that when establishing requirements the customer can sometimes be biased when using Scrum as development method. The potential challenge that has been noticed by some key stakeholders is how to implement the customer in system development projects. Previously when using methods influenced by the traditional system development approach, where the customer did not have the same important role as today. When using methods based on traditional system development methods, the customer just needed to hand over the requirements of the project to the developers and answer some questions during the project life-time. Today the customer has the role to follow the development process all the time during the life-time of the project.

This is an interesting topic of discussion since this type of development approach might not be compatible with every type of customer. It is a given fact that there exist communication software that allows the Scrum team to have a connection with the customer on various geographical location. Some of these softwares are applications like Adobe connect, Skype, etc. However, these kinds of communication software may not always convey the relevant information required. Missing information within the development will have implications of not having a structured process of requirement establishment from the customer. Scrum has no explicit about how these requirement processes to be performed or structured. The missing of structure around the requirement makes the customer responsibilities for structuring the requirements. What are the customer supposed to do if the customer does not have time to participate in the development process? Are they suppose to present some kind of external representatives to deal with this? This kind of development might then involve more and more external stakeholders that might make the goal of the project to escalate. Some of these questions cannot be answered by this research, but this research might instead provide some thoughts to reflect around the implication of not having a structured requirement structure.

To sum up this section one of the possible explanation of the challenges with Scrum is that in some cases when using Scrum there might exist too much iteration that makes the development process hard to handle. However, there are also a possibilities with the roles borders being. If enables the different participants in the project to meet more frequently. This contributes to a more efficient way of handling the project if unexpected obstacles would show up. A way to deal with these challenges could be to investigate literature that is related to how to deal with different network forms in firms, e.g. (Powell, 1990).

6. Conclusions

This research has investigated what kind of challenges and possibilities there are within a firm that is relying on Scrum as its system development method. The investigation focused on different development processes that exist when working with Scrum in a specific firm. One of the aims was to investigate if the previously mentioned challenges in literature existed
within the firm and also whether there could emerge challenges that is not mentioned in previous related literature. This was done by interviewing six different key stakeholder that on a daily basis is affected by the use of Scrum as a development method within the firm. In general, this research have shown that there is a positive attitude towards using Scrum in the firm. However, the key stakeholders also reported that there are some challenges around using Scrum in system development projects. The findings of this research has shown that the clustered themes of challenges with Scrum that is presented in the previous related literature in chapter (2.0) can be confirmed. Furthermore, this research also present two additional challenges that have emerged using Scrum in a specific firm. In summary this research have shown what kind of challenges there are with using Scrum from different key stakeholder views. These challenges that were discovered was connected to five different themes: collaboration, coordination, communication, Scrum as a support unit and transition processes revolving around Scrum.

As a conclusion this research viewed that the system development method Scrum is not a magical silver bullet that is able to solve every problem in any kind of situation without any implication. Instead, Scrum could be seen as a multi tool that is able to deal with most of various unexpected challenges and issues that might happen within a system development project. However, there are always exists trade-offs when designing a multi tool the designer often stands in font a typically design decision. Whether the multi tools design should empathise on being used in specific situation or just be able to facilitate everyday tasks.

This is the same kind of dilemma the Scrum team is experiencing when adapting Scrum as system development method. How to know when the adaption of the method should be based on generalization in a project or when there is a need to adapt the method after specialized process of the system development projects. Therefore, I suggest that there is a need for further research on investigating how Scrum as a system development method should be adapted in system development projects.
References


Appendix A: Interview guide

Interview guide

The focus of this study is to investigate the view of use of system development. The outline in this research is to investigate different perspective around different stakeholders view on the use of system development methodologies.

Rights of the person being interviewed

The respondent has the choice to stop the interview whenever he/she wants, there will be no question about the reason of why the interview was stopped.

Anonymity:

Information about each respondent will be coded to not knowing who the respondent is. The information that will be mentioned in the research will be the level of education of the respondent, years of experience, years within organization and the length of the interview. No other person than me will be able to use the recorded material and the notes that have been written during this conversation of the respondent and interviewers. This material will be stored in a place where no one else will have access.

Interview Questions:

What is your job role within your firm?

What kind of background do you have?

The time of your experience of your work?

Can you describe how a typical workday looks for you?

How does this affect your work role in the use of Scrum, why are you using system development methods in your work?

How do you see the use of Scrum, why do you see them in this perspective?

Can you describe a typical system development project that your firm performs? What is that process like, what job roles are involved, and so on. Why is it structured this way? Do you use different methodologies, technologies in various stages of development?

With your work role what is the biggest difficulties/strengths of using Scrum, Why do you think so?

How did you use the methods and techniques in the past, do you have any noticeable change of any effect. Why do you think it has changed? What are the advantages / disadvantages of today?
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How do you see the benefits and disadvantages of using Scrum in such projects, why do you think you look at them through that perspective?

How do you see Scrum, such as you see it as a tool that helps in practical situations, or more formal guidelines how the system development process should go to, why do you think so?

What type / types of systems development methodologies do you use within your firm?

How is Scrum within your firm, why are they used that way?

How does Scrum add value to your firm, why does Scrum create a value for your firm?

How is the collaboration with other people's job roles by using Scrum, why do you think the collaboration in done like this?

How can the use of Scrum be challenging within the firms context you are working in, why can it be seen as provocative?