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# **Agile Process Recommendations for a Market-driven Company**

**-Based on an industrial case study**

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## ABSTRACT

In this master thesis problems in a small market-driven software development company are discussed. Problems such as fast changes in the company are a result of the constantly changing market. The fast changes must be managed within the company with tailored process covering the needs like short time-to-market. Misunderstandings when managing ideas from marketing and challenging issues such as communication gaps between marketing staff and developers are discussed. These problem areas are identified by the case study through interviews of selected staff. The problems adhere from fast changes and lack of processes and structures. This paper has recommended several points influenced by agile software development with Scrum and XP. The recommendations are chosen to fit the problem areas identified by the interviews. They will work as a starting point for the company to improve the situation and to use XP and Scrum for further improvements.

**Keywords:** Market-driven, Agile, Process, Communication.

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# 1 INTRODUCTION

For market-driven companies the market department has the role to analyse the market and gather the necessary information for the development procedure. The described needs and requirements the marketing department gathers must be translated and documented so the technical staff can both understand and use it according to their developmental needs. This is a problem that must be managed; other problems that exist in these companies are late changes and information misunderstanding. These kinds of problems and misunderstanding are not rare. A case study done in five market driven companies, addresses the same kind of problems. The case study performed by Karlsson *et al.* (2002) describes gaps and misunderstandings between developers and marketing staff and how customers always change their minds. The thin line between the market department and the developers can cause problems in form of bad information flow.

For achieving good results by using processes, it should not be enough to establish them in the organisation. Improvement should take place since the organisational needs changes along with time. There are models used by organizations to improve their processes for development and maintaining software. Models and frameworks for software process improvement are aimed to improve the organization. More specifically it is about efficient work, efficient processes and process maturity. For processes to be successful in market-driven companies they must also cover needs such as time-to-market. Since the company is developing products for a market the time-to-market aspect must be covered by the processes in use. Many programming companies are moving to agile methods because of their emphasis on agility and time-to-market (Reifer 2002). Agile methods apply agile values and practices which defines simplicity and the easiest way for developing. Late changes are not ignored by these methods and instead they are managed for achieving good results. Processes such as XP (Beck 1999) and Scrum (Schwaber and Beedle 2002) are two agile methods that provide practices and roles for agile development. These processes manage changes late in the development cycle and emphasises communication and interaction in the company. These two agile methods will be used for recommendations and guidance to problem areas identified in the company.

Improvement suggestions are possible first after a study of the company behaviour and how they actually manage the flow between the marketing department and the developers.

## 1.1 Reading guidelines

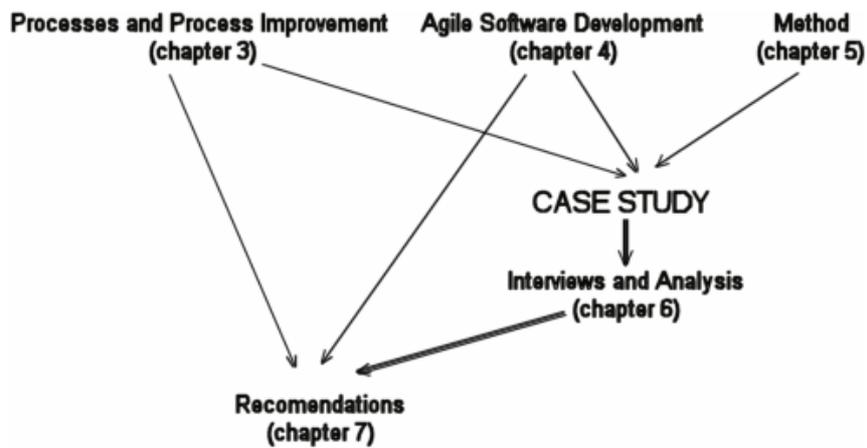
The subject in this thesis belongs to the field of software engineering. The intended reader should have basic knowledge in software engineering to gain the best result from reading this thesis. With knowledge in software engineering it should be easier to understand and reflect over this master thesis.

### 1.1.1 The structure of the thesis

This master thesis is structured by presenting the theoretical approaches first as introduction chapters. Then it will present the case study and the empirical approaches as interviews. Final the recommendations are introduced from information gained from the theoretical- and the empirical approach.

Figure 1-1 visualizes the flow in the thesis.

**Figure 1-1**, Structure of the master thesis.



Chapter 2 (The Company) describes the company and the problem areas. The problem details within the company will be identified further in chapter 6. The next chapter, Processes and Process Improvement, defines different process definitions and an introduction to process improvement. The information presented in this chapter will be used for the recommendations in chapter 7. Chapter 4 (Agile Software Development) describes and identifies agile values, agile practices and agile methods. This chapter also aims to gather and analyse information for use in the recommendations chapter. The Method and research choices chapter, chapter 5, presents and describes the research method chosen for this master thesis. The method described in this chapter and the data collection technique will be used in chapter 6 for the case study. Chapter 6 (Analysis and conclusions of the case study) provides the reader with the research analysis, the conclusions that has been drawn about the case study and the problem areas. The identified problem areas in this chapter will be used in the next chapter. The recommendation chapter, chapter 7, reflects over the information gathered in the previous chapters to present recommendations for the company problem areas in chapter 6. The last chapter, Further research present several areas identified to be interesting for further study.

## 2 THE COMPANY

The company in this thesis works with software product development, founded in January 2000. The company has 15 employees, 80 % of them have a technical background. The company focuses on software development within telecom and mobile services marketing. The core product of the company is a technical platform for mobile communication. The main idea behind the platform is to make it easy to develop new mobile services.

The projects performed at the company are small and project members can be included in several projects at the same time. The projects within the company are all dependent on the prioritization. The prioritization can suddenly change and new projects with higher prioritization start. Projects with a former high prioritization can suddenly be frozen.

The workflow and directions can change from week to week. It is therefore important that the process in use is flexible, easy to work with and not heavy and complex. They must be able to use an easy and flexible process which is efficient for the work and activities at hand. This is a rather small development company and cannot afford to spend time on implementing and using time consuming processes.

Since the company already has a technical platform, the major focus is on providing new mobile services based on that platform. To address what kind of products to develop, the marketing department must analyze the market. The result must be documented so the developers can start their work.

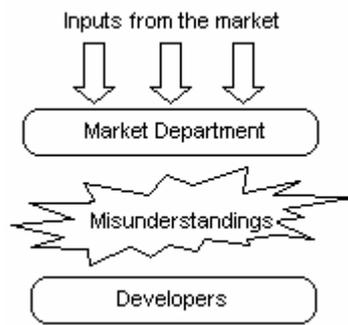
One of the problems starts here (Figure 2-1), the ideas that are presented by the marketing department, to often orally, it is done from their point of view and no or little consideration is put on the development point of view. The developers have rough time to understand the presentations since they do not have the same view on the product as the marketing department. The marketing department do not share the same view as the developers in the company and vice versa. The gathered needs and requirements by the marketing must be documented and translated so that the technical staff can both understand and use them according to their developmental needs.

An industrial survey by Karlsson *et al.* (2002) points to the same problem:

*A project leader describes a gap between marketing staff and developers. The marketing department's task is to write requirements, which in their opinion means writing down ideas for the next release. Concurrently, developers expect the requirements to be written down clearly enough to start coding*

The research by Karlsson *et al.* (2002) contains problem areas identified at different market-driven companies. There are no recommendations or solutions presented for the problem areas in the same research paper.

**Figure 2–1**, the problem area relies between the market department and the developers



It seem to exist a gap between the marketing staff and the developers, the gap includes communication problems and misunderstandings. Better communication and collaboration between these groups are needed, in order to increase the understandings of the requirements and thereby increase the quality of the final product (Karlsson *et al.* 2002).

Since the communication between these two parts is not as good as it should be, the result will be problems with on time-to-market. Rapid changes, as a result of the market situation cannot be managed, since there is no efficient communication flow. These problems are addressed by the employees and are explained further in chapter 6.

Another problem is lack of processes within the company. There are no documented and defined development processes and no procedures for defining projects. This has not been a problem for the company before but since they are starting to be more and more market driven this part has resulted in problems. The problems can for example be: Poor project planning, poor documentations, untenable resource planning, no project definitions and no goal definitions. There are some documentation and planning but they are not done according to a process or a model, most of these are performed ad-hoc. All these problems are somehow a result of the fast changing requirements and prioritisation of the projects. Prioritisation within the company changes depending on the market and there is no fast and efficient light weight process that manages the mentioned problems. The company want to be as flexible as possible and does not have time to follow a heavy and complex process.

The picture that appears is that this software development company is immature when it comes to managing processes, problems and using processes. That is a fact and many of the employees share the same picture. They are however not willing to use what ever that shows up for improving the company. By the interviews in chapter 6 it appeared that there is a documented process in the company but there is no one that uses it. Only one of the four interviewees mentioned the process. This explains that there have not been any forces from the management to use the process and no agreements within the company to follow the process. The employees must be motivated and time must be given to use processes, this motivation force must come from a higher level of management. The management must also understand the benefit of having the employees using the processes fitted for the company needs. In the current situation the management has not put resources for this purpose.

## **3 PROCESS AND PROCESS IMPROVEMENT**

This chapter introduces processes and software process improvement. First, a short overview of different processes definitions, then an introduction to software process improvement is presented. In the latter part the processes improvement lifecycle will be introduced. Last in this chapter it is discussed how changes affect software process improvement and how people reacts on changes that will affect them in an organization.

### **3.1 Processes**

Since 1980s, the importance of processes and their role in a business has been increasingly recognized (Kotonya and Sommerville 2002). In many cases, the analyses of business processes showed that they included redundant activities, unnecessary duplication of information and inefficient flow of work between one process participant to another (Kotonya and Sommerville 2002).

Knowledge shared between workers is an important issue and processes help to create a foundation for the organization to share knowledge. Implementing and applying process thinking gives a better structure to the work, orders up and decreases chaos.

The definition of process is different from literature to literature.

For defining process and software process there are three relevant definitions in relation to this thesis:

- A course of action or proceeding, esp. a series of stages in manufacture or some other operation (Concise Oxford Dictionary, cited by Zahran 1998).
- A specific set of technical and managerial practices to successfully complete projects (Wiegers 1999c).
- A defined way to perform some activity, generally involving a sequence of methods or procedures designed to accomplish a specified result, and typically established by technical specialist (Humphrey 1989).

According to Zahran (1998), there are three aspects related to process. First the process must be defined in some way, in paper or electronic document. The process definition specifies activities and procedures for the process. Second is the process learning. For learning the process it is important that the process knowledge pass through the people which are involved. Behaviours and activities should be derived by the process for those involved performing the process. The third aspect is the result of the activities executed by the process.

### **3.2 Software process improvement**

It is identified that process improvement is not an easy task to perform, if no one is working towards improving the process, it will not improve itself (Zahran 1998). Process improvement relies on learning from mistakes and to do changes in the organization. The changes must be performed so the process improvement actions affect the organization in a predicted way. To be successful the goals of the program must directly support the organization's business goals and fit with the culture of the users of the process (Riddell 1998). Goals must be determined and based on the

problems related to the development in the organization. It is also important to select improvement areas where changes can yield the greatest long-term benefits (Wiegers 1999c). Software process improvement should be treated as a project; it must be planned, analysed, designed and implemented precisely like a project should be performed to achieve good quality results (Humphrey 1997; Wiegers 1999b; Zahran 1997).

According to Wiegers (1999a) process improvement is:

Do the practices that give good results and change those that cause problems constantly. There must be careful analysis of success and shortcomings of earlier projects. The primary motivation should be to achieve better software development and management approaches by achieving specific business results. The objectives are not simply to satisfy the models expectations.

The organization must be prepared to spend resources on software process improvement. Organizations that spend less than three or four percent of their budget on process improvement i.e. including training, assessments, consultants, and working groups are dabbling (Wiegers 1999a). Organizations that invest seven or eight percent are pretty serious, and spending more than ten percent of your budget on SPI indicates a major commitment. Another issue that organizations must be aware of is the long term perspective view with process improvement, Varkoi (2002) states that a short time effort does not necessarily change the organization so that improvements will be established and benefits of process improvements can be derived. Process improvement is not problem free. Problems such as lack of time, lack of knowledge, wrong motivations, dogmatic approaches and insufficient commitment are some reasons why they sometimes do not work (Wiegers 1999b). Not every organization that has attempted software process improvement has been successful (Herbsleb *et al.* 1997, cited by Aaen *et al* 2001).

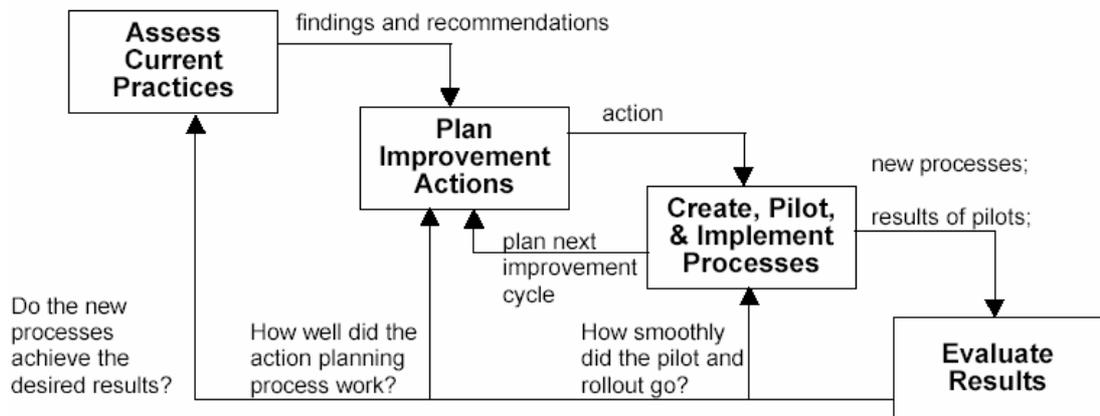
### 3.2.1 The Process improvement cycle

Process improvement never stops, the improvement must be an ongoing process that fulfils new expectations and new improvement plans. Process improvement is a journey, not a destination (Wiegers 1999a). Process improvement can be seemed as a living procedure within the organization which must be monitored and maintained for achieving good result and more effective processes.

Depending on the writer, the names of the steps differ but they have common features. That is, software process assessment, software process improvement plan, and software process improvement action plan are some of the steps for software process improvement (Humphrey 1997; Zahran 1998; Varkoi 2002; Wiegers 1999a).

Wiegers (1999a) uses four steps for defining the software process improvement cycle (Figure 3-1). First, *assess current practices* is conducted after the defining of the business objectives. During this step the current process, problems, and project outcomes are evaluated. Second is *plan improvement actions*. With knowledge from the assessment and from software industry best practices, the improvement goals can be set. Appropriate practices can be chosen for addressing the shortcomings with the current process for moving up towards the goals. Third is *create, pilot and implement processes*. One or two projects can be identified to pilot new processes and make adjustments before rolling them out. The fourth and last one is to *evaluate the results* of the pilot projects are evaluated.

**Figure 3-1**, Process improvement lifecycle.



Zahran (1998) talks rather about a framework for software process improvement than a cycle. The framework is aimed to establish an effective process improvement environment within the organization. The framework consists of these steps:

*Software process infrastructure.* For supporting the process there are two kinds of infrastructure, i.e. organization and management infrastructure. These cover the roles and responsibilities. Technical infrastructure covers the technical tools and facilities. All of them must be in place for supporting the process related activities for sustaining the process improvement actions.

*Software process improvement roadmap.* The roadmap will specify the stages for improving the process, and the characteristics and attributes that the process should satisfy in order to reach these stages.

*“If you do not know where you are going any road will do”* (Chinese Proverb)

*Software process assessment method.* Methods and techniques for assessing the organization’s current software process, practice and infrastructure should be specified. The assessment should be done against a software process improvement roadmap. Strengths and weaknesses with recommendations for improving the process effectiveness are identified by the result from the assessment.

*Software process improvement plan.* When the software process assessment is done the assessment findings are transformed into specific actions for software improvements. The improvement plan is based on the assessment result and should be treated as a project with all necessary characters.

### 3.3 Resistant to change

How do the personnel feel about changes? Is it different to be an object of the change or to lead the change? Change is great when you are its agent; it is only bad when you are its object (Sherwin, D., cited by Humphrey 1997).

Changes can be felt as a threat if one does not understand the benefits and efficiency that changes are expected to achieve. Wiegers (1999a) states that: People naturally push back when they are asked to change the way they work, because they have a comfort level with familiar (if not always effective) practices and a fear of the unknown.

They feel threatened of the unknown and want to stay with familiar and daily procedures that they have worked with. If they are involved with the planning it allows them to understand the change, to see why it should be made, and to learn what to expect (Humphrey 1997).

One solution can be to address the right people. These people should have some leadership character and good influence of the other workers and by that try to convince of the benefits and the efficiency with the change. Another way of overcoming resistance is to show people how the change can help them, presenting it as an opportunity instead of a threat (Humphrey 1997).

A third way to reduce resistance is presented by Humphrey (1997). This idea is to break down a large change into smaller steps, each step is then easier to sell and implement, and resistance is reduced.

It is a good idea to encourage people for the change, if they are involved with the planning their knowledge and understanding about the change will increase. They also understand the main causes why the change must occur and what the long-time benefits are for the company. An example of this is the case, (Lawrence, P., cited by Humphrey 1997) when several factory groups whose productivity was closely matched an identical change was introduced. All the groups except one was closely involved in the change and the planning, they reached higher performance level then before. The group that was not involved dropped their output by a third.

It is therefore important to understand why process improvement occurs and what kind of benefits the new process can offer to the company but also to the individual. If the people feel that the process is too huge to overcome and that they cannot manage to work with it, they will find ways to bypass the unworkable processes (Wieggers 1999b).

### 3.3.1 Organizing for understanding

The impact of a change can result in several kinds of output. By organizing the change, the output is supposed to be easier to manage and control. The change must be accepted and the people involved well informed. This includes people from the different levels within the organization. Working engineers, scientists, supervisors, managers and other that can be involved must be a part of the change.

As the change comes along there are always some kind of resistance. Humphrey (1997) mentions a phase of unfreezing; the purpose of this phase is to overcome the resistance. This phase can be seemed as the stage for the involved people to wake up and understand the current situation. At a first glance it can be seemed that developers, working engineers and scientists are the source of the most resistance. This approach is rarely true, being closer to the problems they generally understand what need to be done better than their managers (Humphrey 1997). It is identified that the supervisors, first- and second-level management present the greatest resistance to change, and as they get convinced they will encourage their people and welcome the change (Humphrey 1997).

The agents who present the change or the people who understand the changes must be aware of this resistance. If there is lack of knowledge in this field of work it might be an idea to consult experienced people for organizing, planning and implementing the change.

### 3.3.2 Plan for a wide spectrum of domains

After understanding the change and the benefits of it, the planning should start as soon as possible. When the people involved are ready for improvements, planning should begin with a plan of action and early implementation steps (Humphrey 1997). If this part of the planning does not occur people will be irritated, as they do not understand the overall benefits of the change and also the current conditions in the organization.

The management should set up a change agent and staff at once to lead the change (Humphrey 1997; Zahran 1998). It is then the duty of the people that lead the software process improvement to think of potential source of resistance to change, and include in their plans means and actions to minimize and eliminate resistance to change (Zahran 1998). The awareness of resistance in an early stage and can be the key to prevent the potential sources to appear or to minimize their impact to software process improvement.

The planning is of course important and essential for the success of software process improvement. Zahran (1998) argues that changes involve a wide spectrum of domains that may need to be changed, for example: cultural changes, behavioural changes, organizational changes, technological changes, and environmental changes. The importance of planning can be identified here, as several imported domains are involved within the change procedure there must exist plans for handling these areas carefully.

### 3.3.3 Time frame and implementation

Implementing the change is also an relevant step within software process improvement. The time for implementing the change can vary depending on what kind of change it is. If the change is pure technical it rarely affects the working habits and can be implemented rather quickly but if the change involves people behaviour it should be performed carefully. Humphrey (1989) argues about time issue when implementing changes that involves people behaviour. He claims that, time must be given for those involved to understand the change, to accept it, and to adapt to its effect on them. Since the time needed to adapt depends on the size of the change, an attempt to move to quickly will increase resistance and delay progress. This identifies the importance to be patient when people are involved. Can perhaps be seemed as a time consuming activity but in long-term point of view it is better to let this activity consume the time needed instead of decreasing it.

## 3.4 Summary

This chapter provides information and knowledge about processes, process improvements and changes. The definitions of process differ from literature to literature and from people to people. One should be aware of the different definitions and understand them. The section about processes in this chapter provides three definitions related to this thesis. Process improvement is a living procedure for maturing the processes in the organisation. Since needs change from time to time so must also processes be improved to cover the changing needs. There are different approaches for establishing process improvement, this paper talks about process improvement lifecycle and process improvement framework. Improvements contribute to changes in the organisation or the company. Changes must be understood, planed and implemented for the efficiency of the improvement.

The process definitions presented in this chapter will work as a definition basis for the word process and will work as a guideline for the recommendation chapter.

The information gathered and analysed in this chapter will be used as a basis for parts of the recommendations in later chapters.

The case study (see chapter 5) that will be performed for this paper will address problem areas within a company. Some of these problem areas will use the information gathered in this section for improving the problems. The case study will also investigate if there are plans for software process improvements like presented in this chapter. Improvements do not come without changes, changes must therefore be planned and people within the change domain must be a part of the plan. The case study will try to address what kind of resistance there are in the company for changes. Information in this chapter about this part can be used for further analysis in later chapters.

## 4 AGILE SOFTWARE DEVELOPMENT

The purpose of this chapter is to give an overview of agile software development and agile methods, such as: Extreme Programming and Scrum. This chapter aims to gather and analyse information for use in the recommendation chapter.

### 4.1 Introduction

*Over recent decades, while market forces, systems requirements, implementation technology, and project staff were changing at a steadily increasing rate, a different development style showed its advantages over the traditional one. This agile style of development directly addresses the problems of rapid change (Cockburn and Highsmith 2001).*

The company need to be flexible and also be fast on responding on changes. The communication must be more effective and the development must be structured so it can be fast, efficient and flexible. The company is then in need of something dynamic and new, something that is *Agile* and partly extreme. Agile software development is all about doing enough through communication, collaboration, study, practice, and experimentation.

According to Reifer (2002) in his survey, on how good agile methods are, he mentions that many programming companies are moving to agile methods because of their emphasis on agility and time-to-market. Lets not forget that the company in this paper has emphasised the great importance to be on time in the market, hence agile methods (4.5) can be used for this approach. Reifer (2002) also mentions in his summary that small software developing teams are using agile methods for quick time-to-market.

### 4.2 Agile Values

There have been changes to the software development community in the last decades. The simple development that followed a single line of requirements have changed to rapid changes to the development, changes that must be attended during the development process (Kutschera and Schäfer 2002). This has result into a turbulent, high speed and uncertain technology world, requiring a process to both create a change and respond rapidly to change (Cockburn and Highsmith 2001). Quick time-to-market makes it impossible to have a complete requirements specification. Project goals and system functionality need to be frequently adapted. Well known methodologies have therefore proposed “lightweight” approaches for software development. These methodologies have formed the “Agile Alliance” and their manifesto (Kutschera and Schäfer 2002).

The Agile Alliance (<http://www.agilealliance.com>) and the Agile Manifesto (Beck *et al.* 2001) have promoted the values of agile software development, the key values are:

➤ **Individuals and interactions** over processes and tools

This means according to Kutschera and Schäfer (2002) that the successful outcome of the project depends more on the interaction of skilled professionals than on a well-defined process or latest tools.

If the individuals cannot interact and work together then it does not matter how good process and tools the organisation uses. Every individual must be appreciated and recognized.

➤ **Working software** over comprehensive documentation

This statement means that working software is far more important and the documentation should be reduced to an appropriate level. Extensive documentation does not mean that the actual problems have been well understood. Instead it incorporates significant overhead every time requirements are added or have to be changed (Kutschera and Schäfer 2002). When new releases are produced at frequent intervals the developers are urged to keep the code simple, straightforward and technically as advanced as possible. Therefore documentation should be done as it requires nothing more and nothing less (Abrahamsson *et al.* 2002).

➤ **Customer collaboration** over contract negotiation

Active customer collaboration can help the team to understand what the customer really wants and needs. This is one of the critical success factors of a software project (Kutschera and Schäfer 2002).

➤ **Responding to change** over following a plan

Following a plan is important but when changes shows up they must be respond and managed. To deliver a system in time that implements requirements no longer important to the user, is useless (Kutschera and Schäfer 2002).

The principles say that document as much as needed, not more or less. Keep the customer involved with small releases and close interaction. Be flexible as changes come along, important to deliver a system that fulfils the latest requirements.

According to Cockburn and Highsmith (2001) the dominant idea behind agile development is that the team can be more effective in respond to changes if it can:

➤ **Reduce** the cost of moving information between people

The agile team works to:

- Place people physically closer
- Replace documents with talking in person and at whiteboards.
- Improve the teams sense of community and morale so that people are more inclined to relay valuable information quickly.

➤ **Reduce** the elapsed time between making a decision to seeing the consequences of that decision.

The agile team works to:

- Make user experts available to the team or, even better, part of the team.
- Work incrementally.

## 4.3 Agile Principles

Agile manifesto (Beck *et al.* 2001) has promoted the principles of agile software development:

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Working software is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity, the art of maximizing the amount of work not done, is essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

## 4.4 Agile Methods

After analysis of the agile methods, Extreme Programming (Beck 1999), better known as XP, and Scrum (Schwaber and Beedle 2002) were chosen for this paper; these are two agile methods (Abrahamsson *et al.* 2002; Ambler 2001). The analysis was based on how the method can fit the problem areas (chapter 6) with solutions and recommendations. XP and Scrum were chosen because of their flexibility and efficiency for fast development. XP can be seemed as a software development process and Scrum more like a management process. This is the difference between these two. Scrum does not need any specific engineering practices and can be adopted to manage whatever engineering practices used in an organisation (Abrahamsson *et al.* 2002). There are efforts to integrate XP and Scrum together. Scrum is seen to provide project

management frame work that is supported by the XP practices to form an integrated package for software development teams (Abrahamsson *et al.* 2002).

It is important to understand that these methods can be applied piece by piece, Beck (1999) mentions that:

*“If you want to try XP, for goodness sake don’t try to swallow it all at once. Pick up the worst problem in your current process and try solving it in the XP way.”*

#### 4.4.1 Extreme Programming

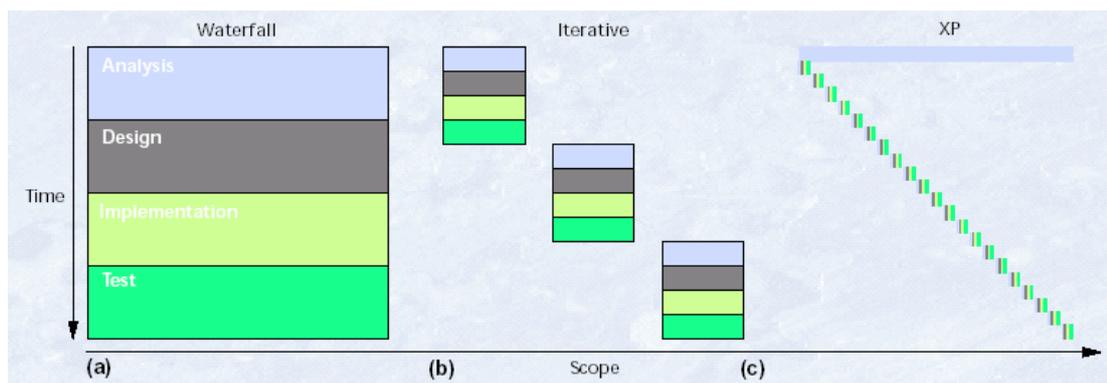
This methodology introduces an efficient approach to software development and is designed to deliver high quality code as soon as possible. It first started as “*simply an opportunity to get the job done*” (Haungs 2001, cited by Abrahamsson *et al.* 2002) with practices that had been found effective in software development process during the preceding decades (Beck 1999b, cited by Abrahamsson *et al.* 2002). Problems from traditional development models with long development cycles have been evolving this methodology (Beck 1999).

Customer satisfaction is prioritised number one and flexibility is a part of XP since XP responds to late customer changes in the life cycle. The entire process model stresses therefore customer satisfaction and evolves around it (Wells 1999). The methodology is designed to let the customer be involved through out development and deliver software that corresponds to the needs of the customer (Wells 1999).

Development, planning, designing, coding and testing are all parts that are affected by XP. Communication and customer participation are two parts of the methodology, hence poor participation and bad communication can decrease customer satisfaction. XP does also focus important issues such as feedback, simplicity and courage.

Since XP embrace late changes the documentation is minimal. It does not place great emphasis on producing documents. It rather prefers to deliver tested software, but it still needs detailed requirements (Lappo 2002). Short iterations and release makes it possible to deliver quickly and the customer can see a return on the investments they have done. The iterations can be two to three weeks long and leads to a release every three or four month.

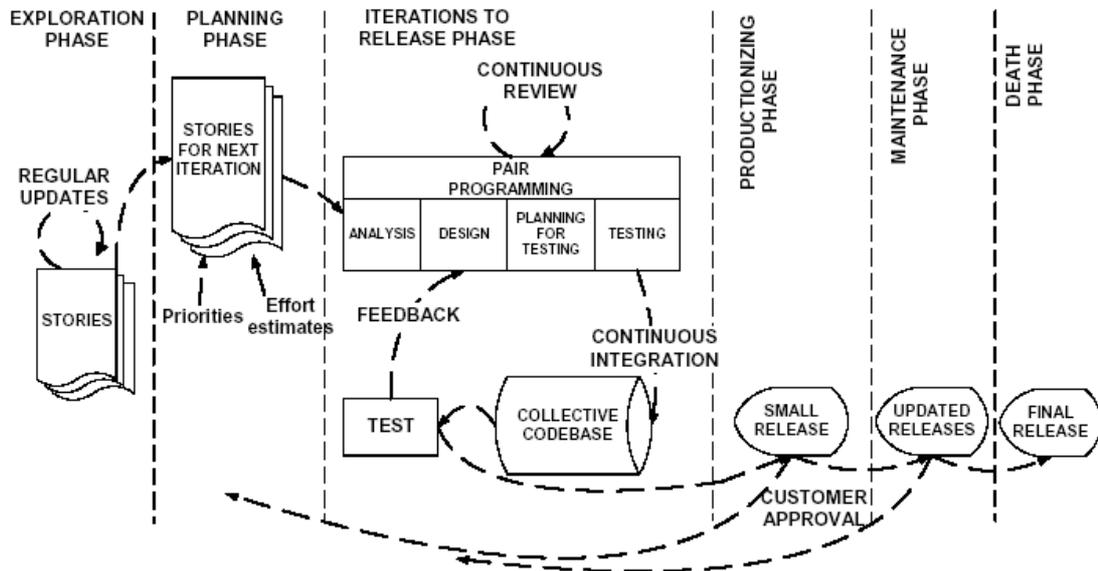
**Figure 4-1**, The evolution of the Waterfall Model (a) and its long development cycles (analysis, design, implementation, test) to the shorter, iterative development cycles within, for example, the Spiral Model (b) to Extreme Programming’s (c) blending of all these activities, a little at a time, throughout the entire software development process (Beck 1999).



#### 4.4.1.1 Process

Exploration, Planning, Iteration to Release, Productionizing, Maintenance and Death are the five phases of the XP lifecycle.

Figure 4-2, XP Life cycle (Abrahamsson *et al.* 2002)



The lifecycle begins with the **exploration phase**. During this phase the story cards are written by the customer. Since this is an iterative process each set of story cards are included in the belonging release. Each release includes their set of story cards, in this way it will be easier for the customer to approve the small release and can participate in the procedure.

The **planning phase** sets the priority order for the stories and an agreement of the contents of the first small release (Abrahamsson *et al.* 2002). The stories are estimated by the programmers and a schedule is done according to the estimations.

The description of the **iteration and release phase** are visualized by figure 4-2. There are several iterations within this phase before a release is done. The schedule set in the planning phase stage is broken down to a number of iteration that will each take one to four weeks to implement (Abrahamsson *et al.* 2002).

Before releasing in the **productionizing phase** the system must be tested and checked. Changes can still be found and decisions are made if they can be included or not in the release. In according to the release the XP project must keep the system in the production running and also producing new iteration for new releases. In order to do this the **maintenance phase** requires an effort also for customer support tasks.

As the customer is satisfied and does not have any more stories to be implemented the **death phase** is introduced. During this phase the necessary documentation is written as no more changes are in progress for architecture, design or code. Death may also occur if the system is not delivering the desired outcomes, or if it becomes too expensive for future development (Abrahamsson *et al.* 2002).

#### 4.4.1.2 User stories

The requirements engineering part of XP is handled as a set of user stories, the user stories are written by the customers as things that they think should be included in the system. Each one of the stories must be business-oriented, testable and estimable (Beck 1999). The traditional requirements specification is replaced by the user stories

and the biggest difference according to Wells (1999) is in the level of details. User stories should only provide enough detail to make a reasonably low risk estimate of how long the story will take to implement. As the time comes for implementing the story the developers will get a detailed description of the requirement face to face with the customer. Misunderstandings decrease since a direct communication will be established between the developers and the customer. The user stories build up a foundation for the release planning and acceptance tests. User stories serve the same purposes as use cases but are not the same, they are similar to usage scenarios but not limited to describing a user interface (Wells 1999). The stories are formulated and written on index cards.

#### 4.4.1.3 XP Practices

The main characteristics of XP can be summarized as communication and coordination, customer participation, continuous integration and testing, limited documentation, pair programming, collective ownership of the code. Despite the constantly changing requirements in small to medium sized teams it aims for successful software development (Abrahamsson et al. 2002).

Beck (1999) introduces the practices as follows:

*Planning game:* Customers decide the scope and timing of releases based on estimates provided by programmers. Programmers implement only the functionality demanded by the stories in this iteration.

*Small releases:* The system is put into production in a few months, before solving the whole problem. New releases are made often, anywhere from daily to monthly.

*Metaphor:* The shape of the system is defined by a metaphor or set of metaphors shared between the customer and programmers. This “shared story” guides all development by describing how the system works (Abrahamsson et al. 2002).

*Simple design:* At every moment, the design runs all the tests, communicates everything the programmers want to communicate, contains no duplicate code, and has the fewest possible classes and methods. This rule can be summarized as, “Say everything once and only once.”

*Tests:* Programmers write unit tests minute by minute. These tests are collected and they must all run correctly. Customers write functional tests for the stories in an iteration. These tests should also all run, although practically speaking, sometimes a business decision must be made comparing the cost of shipping a known defect and the cost of delay.

*Refactoring:* The design of the system is evolved through transformations of the existing design that keep all the tests running. Restructuring the system by removing duplication, improving communication, simplifying and adding flexibility (Abrahamsson et al. 2002).

*Pair programming:* All production code is written by two people at one screen/keyboard/mouse.

*Continuous integration:* New code is integrated with the current system after no more than a few hours. When integrating, the system is built from scratch and all tests must pass or the changes are discarded.

*Collective ownership:* Every programmer improves any code anywhere in the system at any time if they see the opportunity.

*On-site customer:* A customer sits with the team full-time.

*40-hour weeks:* No one can work a second consecutive week of overtime. Even isolated overtime used too frequently is a sign of deeper problems that must be addressed.

*Open workspace:* The team works in a large room with small cubicles around the periphery. Pair programmers work on computers set up in the center.

*Just rules:* By being part of an Extreme team, you sign up to follow the rules. But they are just the rules. The team can change the rules at any time as long as they agree on how they will assess the effects of the change.

#### 4.4.1.4 XP Roles

XP defines a separation between the roles for the different tasks. The roles are divided into programmer, customer, tester, tracker, coach, consultant and manager (Big Boss). The separation makes it possible for the involved within the role to just do what they are supposed to do. The roles are presented by Beck (1999b) cited by Abrahamsson *et al.* (2002) as follows:

*Programmers:* Programmers write test and keep the program code as simple and definite as possible. The first issue making XP successful is to communicate and coordinate with other programmers and team members.

*Customer:* The customer writes the stories and functional tests, and decides when each requirement is satisfied. The customer sets the implementation priority for the requirements.

*Tester:* Testers help the customer writes functional. The run functional tests regularly, broadcast test results and maintain testing tool.

*Tracker:* Tracker gives feedback in XP. He traces the estimates made by the team (e.g. effort estimate) and gives feedback on how accurate they are in order to improve future estimations. He also traces the progress of each iteration and evaluates whether the goal is reachable within the given resources and time constraints or if any changes are needed in the process.

*Coach:* Coach is the person responsible for the process as a whole. A sound understanding of XP is important in this role enabling the coach to guide the other team members in following the process.

*Consultant:* Consultant is an external member possessing the specific technical knowledge needed. The consultant guides the team in solving their specific problems.

*Manager (Big Boss):* Manager makes the decisions. In order to be able to do this, he communicates with the project team to determine the current situation, and to distinguish any difficulties or deficiencies in the process.

The roles clearly define the tasks and responsibilities within them and through this way the task misunderstandings can increase.

## 4.4.2 Scrum

Scrum is a product development methodology. Scrum is used to manage the system development process for high quality products that manages late changes during the development cycle. Scrum is an empirical approach which introduces the ideas of flexibility, adaptability and productivity (Schwaber and Beedle 2002). Scrum concentrates on how the team should function to actually produce a flexible organisation in an environment where changes instantly appear.

According to Abrahamsson *et al* (2002) the main idea of Scrum is that systems development involves several technical variable (e.g. requirements, time frame and resources) that likely changes and it is therefore important for the development process to be flexible and respond to changes.

According to Schwaber and Beedle (2002) Scrum does not require any engineering practises and can therefore be adopted to manage any engineering practice used in the organisation. It can still change the work drastically, for example the project manager

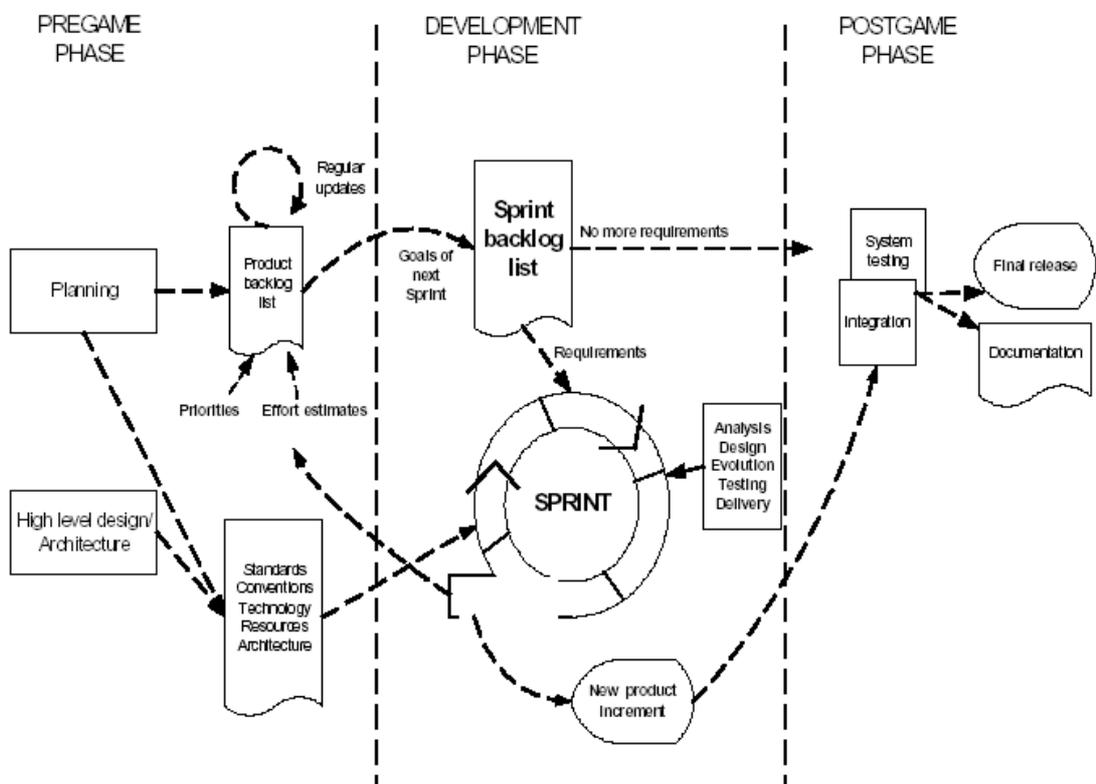
in Scrum (Scrum Master) does not manage the team, the team is self organizing and makes it own decisions (Schwaber and Beedle 2002).

Scrum can be applied for small project teams, project groups consisting of five to nine members and if more engineers are involved multiple teams should be formed (Schwaber and Beedle 2002).

#### 4.4.2.1 Process

The scrum process includes three phases: Pre-game phase, Development phase and Post-game phase. They are introduced by Schwaber (1995, cited by Abrahamsson et al. (2002); Schwaber and Beedle 2002):

**Figure 4-3**, Scrum lifecycle (Abrahamsson *et al.* 2002)



During the planning part of the **pre-game phase** a product backlog list (see 4.4.2.2) is created. This list contains all the thing that the system should include and address, including functionality, features and technology. The list is prioritized and never finalized, hence it emerges and evolves along with the product. The requirement included in the product backlog list can come from anywhere: users, customers, sales, marketing division, customer service and engineering. The list is constantly updated with more and detailed items, and also more accurate estimations of the priority. The planning part also includes the definition of the project team, tools and other resources, risk assessment and controlling issues, training needs and verification management approval. The architectural part of this phase, the high level design of the system including architecture is planned based on the current items in the product backlog.

Scrum Teams (see 4.4.2.3) take as much as they think can turn into an increment of product functionality within iteration (Sprint) from the product backlog list. This takes part in the **development phase** in Scrum. Each sprint is planned to last between one week to thirty days. Each sprint includes software development phases such as:

requirements, analysis, design, evolution and delivery. During this phase the architecture and design evolves and a management representative enforces the Scrum practices and helps the team to make decisions or provides resources as needed.

The **post-game phase** appears when the requirements are completed. Such as no more items can be found and no new ones can be invented. The release of the system makes the final preparation of the system. Tasks such as: documentation, integration and system testing takes place.

#### 4.4.2.2 Scrum Practices

The Scrum practices have been evolving through thousands of development projects (Schwaber and Beedle 2002).

The practices are presented according to Schwaber and Beedle (2002):

*Product Backlog:* This is a list which contains all the requirements based on current knowledge. The requirements can come from everyone which has an interest in the system. It can be customers, project team, marketing and sales, management and customer support that can include items in product the backlog. The items can be for example, features, functions, bug fixes, defects and technology upgrades. The product backlog items are listed according to their priority, high priority automatically drives the development activity. A high product backlog item is provide with more detail than a lower prioritised item and it has also been more thought about.

*Sprint planning meeting:* This meeting contains two parts of participants. The first part includes customers, users, management, product owner (see 4.4.2.3) and scrum team (see 4.4.2.3). During this part of the meeting the goals and functionality of the next Sprint will be identified. The second part of the meeting consists of the scrum master (see 4.4.2.3) and the scrum team, the input to this meeting is the product backlog. The job that is done during this part is how the product increment should be implemented during the Sprint.

*Sprint Backlog:* During the sprint planning meeting the sprint backlog is created. The items in the sprint backlog are selected by the scrum team with the scrum master and the Product Owner according to the prioritisation in the product backlog. These items are stable during the next 30 days, during the sprint.

*Daily Scrum meeting:* The Daily Scrum meeting is a 15-minutes meeting for the scrum team to share information. During the meeting the team explains what it has accomplished since the last meeting, what it should accomplish to the next meeting and what problem are in its way.

*Sprint Review meeting:* At the last day of the sprint a sprint review meeting is held. The scrum master and the scrum team present the result of the sprint for the management, customers, users and the product owner. The meeting can result in new backlog items and perhaps new directions.

#### 4.4.2.3 Scrum Roles

The roles in Scrum consist of: Scrum Master, Product Owner, Scrum Team, Customer and Management. Each one of the roles consists of practices and purposes. The following roles are presented according to Schwaber and Beedle (2002):

*Scrum Master:* The Scrum master is a new management role introduced by scrum. The scrums master works in a way to ensure that the project follows the practice, values and rules represented by scrum. The scrum master also cooperates with the project team, the customer and the management during the project to be able to identify the current project situation. The scrum master is responsible to keep the team working as productively as possible.

*Product Owner:* The Product Owner is selected by the customer, the management and the scrum master; he makes the final decisions of the tasks related to product backlog. He is responsible for the project, managing, controlling and the product backlog list.

*Scrum Team:* The Scrum Team is the self organized project team that makes necessary decisions according to achieving the goal of each sprint. The scrum team makes the appropriate selection of the backlog items for each sprint.

*Customer:* The Customer is involved within tasks related to product backlog items for the system being developed.

*Management:* The Management is involved with final decision making and setting of goals and requirements for the project.

## 4.5 Summary

This chapter provides information about agile software development. This includes agile values, agile principles and agile methods. Agile values present a set of key values for agile software development; these key values are used for setting the basis for agile software development which concentrates on individuals and customer satisfaction. The principles presented by agile helps to understand agile thinking, the principles highlight the importance of delivering in time, changing requirements and simplicity. Agile methods such as XP and Scrum are used for fast development and flexibility, XP can be seemed as a development process and Scrum more like a management process. They both apply agile values and principles.

The interviewees in chapter 6 have explained how the current situation in the company affects them, it is however important to do the best in the situation. There are a lot of changes within the company, many requirement changes and extreme ways to handle the situations. Agile points out important issues such as communication, interactions, fast and flexible respond to changes. For example the company have problems with communication and does not document very much, agile points out that it is more important to have a good communication flow instead of too much documents. The company can use this point to improve their communication by adapting agile thinking. Another example from the company is changes that can appear all the time during the development cycle, this part is not managed well in the company but the employees are used to changes. Agile points out late changes should also be managed. The customer will not be satisfied with a product that no longer is up to date. To deliver a system in time that implements requirements no longer important to the user is useless (Kutschera and Schäfer 2002).

The company does have problems with communication, documentation, structure, process and planning and by using agile values, agile principle and agile methods many of the problems should be easier to manage. There are perhaps other solutions but this paper will concentrate on agile software development.

There have been three theoretical aspects for this paper. The problem areas identified by Karlsson *et al.* (2002), process and process improvement, and agile software development. These aspects are the foundation for the theoretical part of this master thesis. Problem areas identified by Karlsson *et al* (2002) prove that problem areas for this company are not rare and similar problem areas are under investigation in other researches. There are no solutions provided by Karlsson *et al* (2002) at this time. The process and process improvement chapter contributes to information for defining process and process improvement. This information is important for establishing a

process and process improvement understanding in the company. This chapter is also used in the recommendation chapter as recommendations for process and process improvement understanding. The agile software development chapter presents information for further use, the aim of this chapter is to present agile thinking such as agile practices, agile values and agile methods for the reader. This chapter also aims to be used in the recommendation chapter as recommendations for the problem areas presented in chapter 6.

The theoretical part of this paper combines information to recognize and understand problem areas for the company and to use the information for recommendations and solutions.

## **5 METHOD AND RESEARCH CHOICES**

The purpose of this chapter is to give an overview of the different research methods and data collecting technique.

### **5.1 Research methods**

There are four common research methods according to Dawson (2000): Action research, Experiment, Case study and Survey. Since this master thesis is aimed to understand a specific problem area and try to find solution to this problem, case study has been chosen to investigate and analyse.

#### **5.1.1 Case Study**

A case study focuses on a single project; this because case studies usually look at what is happening in a typical project (Kitchenham *et al.* 1995). The case study will investigate process habits and communication behaviours between the marketing staff and developers. It is wisely to choose this method when the research is aimed to investigate a typical situation or project.

Case studies can be conducted in many ways, there are therefore no strict boundaries when investigating a particular situation. The investigations can be performed directly, for example, by interviews, observation or indirectly by studying company reports or company documents (Dawson 2000). Hence, this type of investigation is “free to choose” and can use several types of techniques suited for the situation.

By applying case study to this research the understanding and the knowledge will be easier to understand, since it is a specific case being investigated.

This case study is performed by using interviews. The interviewees were selected by the company and explained as key persons with knowledge about the problems investigated in this thesis.

The case study will also provide possibilities to investigate the company in place which makes it easier to understand people behaviour and problems.

### **5.2 Research choices**

Quantitative and qualitative are two approaches for gathering data in an investigation. Depending on the situation, the methods mentioned in section 5.1 could be used with qualitative and/or quantities investigation applied to it.

#### **5.2.1 The collection approach**

The nature of this study is to gather as much information as possible about the problems and issues around the problems. Also try to find out “hidden” information from people to better understand the problems.

For choosing an approach it is important to understand the nature of the study, the purpose and the type of the situation. Trost (2001) talks about a rather easy way to choose an approach:

*If the indication is to present the study as frequencies, quantitative approach should be chosen. If the study will point out how many percent of the people will do this or the other, quantitative approach should be chosen. But if there are in the nature of the study to find out peoples behaviour, people's ability to separate or discern, qualitative approach should be the right one.*

How can you tell which approach is better than the other? Trost (1997; 2001) claims that none of them is better than the other, it is the situation of the investigation and the purpose of the study that makes the appropriate choice between them.

The qualitative approach is flexible and with high variation level. A very simple example of the characteristics with qualitative approach: The interview questions are straight and simple, on the other hand the answers will be complex and with great amount of information. The outcome will include a large amount of information, which needs hard work to find interesting events, patterns and other important issues (Trost 1997). The quality within this type of investigation is the information that contains human aspects and explanations, which can help to discover something that is unknown or "hidden" (Lantz 1993).

The qualitative interview can sometimes be called as *unstructured* or *not-standardized* interview (Kvale 1997). These kinds of interview have a couple of leading questions, and from them the interviewer will be able to ask questions related to the discussion for eliciting right knowledge. It was obvious that the qualitative approach was chosen for this study.

The choice was also based on:

- To understand the interviewees.
- To understand the problems by allowing them to talk freely about the topic.
- To understand what they really think the problems are.
- To understand issues that can or lead to the problems

## 5.2.2 The Interviews

The interviews were conducted with one participant at the time, no group interviews were performed in this study.

The interviews were taped with high technical recording device. This device could then transform the recorded interviews as sound files to a PC (Personal Computer). This made it easier to type them down and analyze them. Hence, interviews are rarely analyzed directly from tape-records but instead typed down and then analyzed (Kvale 1997).

### 5.2.2.1 Questions

The questions were divided in sections about processes and process improvement, problems between marketing staff and the technician staff, and project related discussions. Questions used during the interviews are available in Appendix A.

These questions were used as starting points for conversations. During the conversations other questions came up to collect detailed data. Qualitative interview has high variation in their approach. The standardization will be low but on the other hand

there are no structures that must be followed exactly. This technique makes it possible to steer up the interview and make a more thoroughly research. The questions helped the interviewee to talk freely about the topics brought up. According to Trost (2001) the order of the question can differ depending on the situation they are asked, and the interviewee can be able to steer up the interview.

#### **5.2.2.2 Data collection**

The interviews were taped (section 5.2.2) and notes were taken during the whole interview. The notes were helpful when the taped interviews were written down. When the interviews were written down the reliability of them was questioned.

Traditionally, reliability is how a measurement can be stable and not exposed to misleading factors, the interviewers should ask the same questions, the situation shall be the same for everyone (Trost 1997; Trost 2001). The procedure must be the same for everyone to become a high reliability, otherwise, the result will be misleading and the reliability will decrease. This approach is for defining high reliability with quantitative approach. For gathering reliable data for this master thesis the interviews were send back to each one of the interviewees by electronic mail. The feedback from the interviewees made it possible to understand if the interviewees were correctly understood. The taped interviews were checked against the notes to be sure that the notes were correctly written. In this case the information could increase in reliability since it have been checked towards the notes and the interviewees.

## **6 ANALYSIS AND CONCLUSIONS OF THE CASE STUDY**

The purpose of this chapter is to provide the reader with the research analysis and the conclusions that has been drawn. This chapter will also bring forward problem areas which have been identified during the analysis of the interviews.

### **6.1 Interview Presentation**

The intention is to give an overview about the interviews and then a summary of the most important information gathered from the interviews.

Four persons were interviewed, the first two interviews are with persons from the technical side and the other two are with persons from marketing. Since it is a small company the amount of the interviewers could not be more. The information from the interviewers will reflect the problems within the company.

The presentation will be a mix of the data gathered during the interview, analysis and conclusions.

The presentation has been divided into eight parts. The first part includes the interviewees' knowledge about process and process improvement within the company. The second part involves how ideas are communicated between the marketing and technicians. The third part includes discussion about documentation. The fourth part discusses how quality and structure are affected by problems in the company. The fifth part brings up how changes will be managed in the company. The sixth part discusses project management. The seventh part includes how project planning is managed. Finally the eighth part discusses the marketing department influences.

The first two interviews include all the eight parts since they are able to answer them. The other two interviewees were not able to discuss some of the questions because of lack of experience and some of the questions were not relevant. For every topic described there are selected questions for them presented in Appendix A with the same topics.

#### **6.1.1 Interview person one**

This employee is 26 years old male and has been working within the company since he graduated from the university. He is working as a developer since he started right after the foundation of the company and has an education degree in software engineering. He finds his role important and has no intention to change it.

His opinions and thoughts are highly important since he will provide the study with a technician view of the problems within the company.

##### **6.1.1.1 Processes and Process Improvement**

The interviewee explains that there are no processes in use for development in this company. There are no documentations that provide a foundation for process work either. There are however been weak attempts to implement processes but mostly there are only some informal procedures that are used from time to time.

There has not been any information from the company to introduce a suitable process or a framework for our development. It does not seem to be any kind of interests from

the upper management to do this, they do not have the knowledge to see the benefits with processes.

The interviewee also says that during his first days he was looking after requirement specification and once he asked for it the answer he got was: *There are no requirement specifications.*

- *“We have just been running straight ahead without looking around us!”*

There have been discussions to introduce a simple and suitable process but there are no one that has the energy to apply the plans. At the same time that they want a process they do not want to be formal as Ericsson.

The knowledge about process improvement is weak; there have been no attempts from the company to introduce these kinds of topics.

#### **6.1.1.2 Ideas and communication**

The marketing side of the company are responsible to come up with new ideas for new products and for products that already exists. The ideas are not well formulated from them and not structured at all. The ideas often turn up orally: *“I have met some people and they have done these features, it should be good if we could do them to”*.

There is no pre-planning and no structure for handling the ideas, nor any documents that represent the ideas in details. If the idea is good enough it should start up a planning procedure to investigate if it is profitable.

The interviewee person highlights several times that it is important to:

- Have a clear goal view.
- Understand what we really must do.
- How the company will be affected.
- Do resource planning.
- Do time planning.
- Do activity planning.

- *“There are no concrete goals and no concrete endings”*

The marketing side has the power to make the decisions, which is right, since they are aware of “what the market wants”. There exists a prioritization list made up by the marketing side that steers up the different projects. This list can change from day to day and people must run from project to project. The employees become frustrated when they cannot finish a single thing but always start a new project with no end.

The communication flow works from the both side but it is felt like the marketing side have problems listening to feedbacks. The communication lacks between these two “parts” when it comes to listen to each other. If there is any frustration about a project, the only thing that can perhaps happen is a lower prioritization to the project. The contribution of changing the prioritization from day to day or week to week is bad focus on the project.

The interviewee person mentions that it is very hard to focus on a single project, the focus on the project should remain until it reached the project goals which are not always clear. In the other hand, since we are driven by the market we must be flexible and develop products as soon as possible.

The problems have been brought up several times during important meetings but there have been no time to perform actions to improve the situation. It seems like the upper management does not care or does not see these problems as important.

The solution for these problems explained by the interview person can be if there is a simple structured process which describes:

- Goals
- Time
- Costs
- Activities
- Resources

A continuously evaluation of the process should result in a better and more effective process work.

- *“Always a lot of talking but no action takes place.”*

#### **6.1.1.3 Documentation**

The ideas from the marketing side are not documented at all. There are presentations about ideas but they can not be counted as formal documents. The only communication that exists is an oral dialog. There are no requirement specifications and neither any kind of specification that provides an overview of the ideas presented by the marketing side. Since there exists no documents there are problems when someone wants to go back and see what the decisions are or what requirements that must be fulfilled. No specific tools or standards are used for documenting.

The interviewee person mentions that the only procedure that somehow helps them is the two hours long technical meeting every second week.

#### **6.1.1.4 Quality and structure**

Since there are problems with documentation and communication, the interviewee mentions that these problems are connected to development quality, product quality and efficiency of work. The lack of documentation provides a great risk to the work. If the person responsible for a product suddenly quits or in some way not be available all information about the product/project will be lost since the person is the only one who knows everything. If there were some kind of structure in the company, risks like this would be decreased and the quality would increase.

The interviewee is very positive to working in a structured way by using suitable processes and/or models. There would also be a positive effect to the company if processes and/or models were used. For example to do resource planning, follow-ups and measure resources such as cost and time to achieve better work speed and work efficiency. These steps do not occur in the company.

#### **6.1.1.5 Changes**

Changes to the organization and work habits can be positive and negative depending on what kind of changes it is and which parts of the company that will be affected.

The interviewee mentions that any kind of changes that provide a better situation for them are welcomed by him and he would not resist to them and embrace them.

- *“It is not enough to talk about to introduce a process on a meetings, it demands follow-ups as well.”*

#### **6.1.1.6 Project management**

*-“The projects are very unclear when it comes to project goals; this is very dangerous because the timeframes will also be unclear and diffused. “*

Since there are no follow-ups when it comes to project time and cost there are problems to look at the project status and check if there are enough time and resources to finish up the project. Goals and project finishing are not defined and no documentation about this kind of information is available.

*-“There should be more structure, more follow-ups and better project management. ”*

#### **6.1.1.7 Project Planning**

The project planning differs depending on the customer. The interviewee person highlights that it should be some kind of template that must be followed very strictly for the benefits of the project and the planning should not depend on the customer.

An example of how the project planning affects the product:

The marketing department has the job to provide a customer with a new demo. This job is presented for the project members and that the work must be started immediately. The project members does not have the time to start the project planning but instead they start implement the demo. The implementation is done very fast and no restrictions are followed because “it is just a demo”. Since it is a demo it does not have to be strict planning and documentation.

When the demo is then presented to the customer and there are positive feedbacks, the marketing department orders the project members to continue the work and build up a real product. Instead of starting over and plan for the product and start a new project with real project definition the product is build on the demo implementation.

Considering the interviewees background in software engineering, he means that the company has difficulty to understand to how a real product is developed in comparison to a demo or a prototype. The planning is not satisfactory and some of the products end up with bad quality.

He also mentions that it is important that definitions and planning should be available, such as:

- Project definition
- Goal definitions
- Resource planning
- Follow-ups

#### **6.1.1.8 Influences from marketing department**

The marketing department has the authority to influence the projects, which is right since the company is market driven. If there is a customer with a lot of potential and money it would be unwise to not let the marketing department start a high prioritized

project. There should also be an understanding on the marketing departments behalf when they brakes up a project and the contribution to that.

#### 6.1.1.9 Conclusions

The conclusions below are summaries identified from the analyses of the interview.

➤ **No foundation for processes or standards**

At the same time that there are clear need for structure and processes there is also distrust to processes because of to much overhead and inefficient work.

➤ **No goal definitions**

The interviewee makes it clear that there does not exist a good goal definition for projects, which explains in detail the overall picture.

➤ **Documentation problems**

This provides a risk to the company since there are no documents that can be checked if something goes wrong, like if someone important suddenly becomes unavailable during a long period of time. Difficult to follow up project when there are no documentations of them. Almost impossible to perform traceability, since there are no documentations.

➤ **Embrace changes**

It is positive that changes will be welcomed if processes are introduced. It is clear that the interviewee is aware of the current situation and urges for changes.

➤ **Lack of project planning**

The lack of project planning has affected the quality of some products. There is no plan that defines: Project goals, project definition, project resources and project cost.

### 6.1.2 Interview person two

This interview person is a 36 years old male employee. He is one of the founders of the company and has been working for 10 years in the software business. He has also been working at Ericsson and another consultant company. His current position in the company is as Architect Manager. He is experienced in the software business and been involved in many projects and therefore needed for the case study.

#### 6.1.2.1 Processes and Process Improvement

*- "It is easy to feel impeded by the process instead of fast and effective development. "*

The interviewee person comments that there exist a process in the company intranet but the process is not followed by anyone, the process is not either updated. The process is influenced by Rational Unified Process (RUP) but it has not been used in any circumstances. Just a "dead" documentation that nobody use. The process was established at the beginning when the company was founded. The explanation why they did not use the process is according to the interviewee:

We all had clear goals in the beginning, and because of that we did not have any use of processes. We knew what to do and the tasks were clear. It is

during the late year that the need of processes has grown within the organisation.

*-“Processes are needed for our organisation and work. ”*

Since processes have not been used from the very beginning there are no habits in using processes. The need of processes has grown during the years and there are needs towards better structure in the organization and development.

The company has not been good at informing the employees about processes and process improvements. There have not been any attempts to do it either. The person responsible for processes and process improvements has not done a good job. Perhaps not his fault since this kind of task requires resources and those resources were not available for him.

#### **6.1.2.2 Ideas and communication**

The ideas are managed well but they are not analyzed and documented thoroughly so that the technicians understand them clearly. The technicians cannot understand:

- What the goals are.
- Which task they are responsible for.
- How they should proceed.
- When should it be realized?

There should be more and better documentation to decrease problems between the marketing department and the technicians. This should be supported by a process within the organisation that describes what should be documented and why it should be documented.

This problem has been discussed several times and actions have been taken but the upper management has always turned down the idea. Thereby, there have been no possibilities to treat this wound in the organisation.

#### **6.1.2.3 Documentation**

The documentation is irregular and not complete. There are no standards, templates or models for a complete documentation that everyone follows.

#### **6.1.2.4 Quality and structure**

*-“If the developers do not get the overall picture of the products goal, there is a great risk that the product will be done according to the developers own goal. Bad quality with other words.”*

Structure and process can be identified with large and heavy documentation which will be felt complicated and unnecessary from the marketing side but all this seems to be necessary by the larger part of the technical side. However, there are positive aspects for introducing a suitable process that provides the company with structure and order. It is explained by the interviewee in this way:

Better and clear task with clear and simple interfaces. This makes it better (and faster) to focus on the important points within a project. When these

points have been identified it will be easier to draw conclusions about cost, time and technical choices.

#### **6.1.2.5 Changes**

There is a great need of changes in the organisation and the development process. Changes are seemed as possibilities for achieving better structure and better work. The employees are aware of the problems in the company and improvements must be done. The problem here is that the company situation is rather bad and all resources are put on fast developing and sales.

*-“All organisational and structure related changes which leads to better need- and requirement management are welcomed by me.”*

#### **6.1.2.6 Project Management**

The size of the project can be between single man projects to projects with six members that extend for about six months. The projects are not that huge since it is a small company. The project members can be included in several simultaneous projects; the projects can have the same prioritization and also be as important as the other. Ones the project members are included within this, they will have hard time to manage all the work. This happens quite often since there are no project plans and no resource plans for the projects and project members.

The interviewee comments that the project members should feel safety within a project and not feel stressed.

Question that should be discussed and answered before a project can be conducted are:

- What are the project goals?
- Who will be included in the project?
- How should it be performed?

#### **6.1.2.7 Project planning**

There are no project plans related to the projects. There are no project ending, most of them go on for ever and never stop. The project never ends since there are always new projects that must be started. This is not good for the project member since they cannot feel that the project is over and then they can start a new one. The members cannot put the finished work behind and start with new ones. There are product deadlines but they do not say when the project will end.

*-“The project plans are not documented, improvement must take place.”*

The projects must be defined and documented, also documented project plans must be available. The documentation does not have to be in detail but a simple overview of the project and the members allocated to it. This seems very simple but it is not done at the moment in the company.

#### **6.1.2.8 Influences from marketing department**

The marketing department has the power to influence and steer up projects. Since the company is market driven the marketing department must have the right to influence the projects. There are benefits with this procedure, the company responds to the market such if the market goes up and down the company changes the prioritization

within the projects and product development. The prioritization changes makes it complicated for the people involved with the changes, the result of it is lack of focus, no clear goal and no documentation.

Instead of frequently interrupt the developers, the marketing department should gather information during a period of time and then set up a meeting with people that will be involved in the change. Marketing department must also have the right to change the prioritization with no further notice but it should not be as frequent as now.

*-“There are sometimes no possibility to finish the ongoing work before something new must be started.”*

#### **6.1.2.9 Conclusions**

The conclusions below are summaries identified from the analyses of the interview.

➤ **Lack of process and structure**

Processes have not been used from the beginning and therefore there have not been any habits for using processes. The needs have grown for processes and organisational structure. The people within the company are aware of the problems but there are no resources toward improvements.

➤ **Communication Problems**

The communications suffer since goals are fuzzy and unclear. Developers have hard time to realize what they must do and unclear task when goals are not presented clearly.

➤ **Lack of project planning**

The projects are not planned good; there are no documents that present project goals, project definition and project resources. The project members suffer from it when they often are involved in simultaneous projects with high prioritisations.

➤ **Documentation Problems**

There are no templates, standards or models for creating a good foundation for the documents within the organisation. Since it does not exist a document standard the organisation and the people within it will suffer from bad communication, bad traceability and no clear goals.

### **6.1.3 Interview person three**

This interview person has only been working in the company for 2 months, his role during these 2 months has been to work and help the marketing department. He is 28 years old and only a project based employee. He is a former project manager at an industrial company. The reason that this person was chosen to be interviewed was to see if he has noted the same problem areas as the other employees. He has been very useful for this study, he has also contributed with very important and useful information.

Some of the questions have been cancelled since this interviewee person does not have enough knowledge about those parts of the company organization.

#### **6.1.3.1 Ideas and communication**

There are three persons in the marketing department and the main objective has been to sell and spawn for new ideas. Problems from their point of view have been more

directed to the upper management. The communication to the upper management has been very poor; there have been information flow from the marketing department but no response from the upper management. The upper management controls the marketing department and they must do as they say. Nothing of this happens actually at the company since the upper management is placed somewhere else.

The interviewee person does not feel like if this is a real marketing department, instead there should be a real marketing department that defines the objectives and goals. These parts do not exist in the company.

The communication problem is directly related to the prioritization list. Everything must be done according to the list. It does not give place to good communication flow between the technicians and the marketing side. The marketing department is directly responsible for the prioritization list and the decisions connected to it.

Since the prioritization list can change from day to day the people must run between projects and their focus will be lost. There are no clear tasks within the organization thanks to the list.

There should be clear tasks so the people within the organisation can concentrate and focus better. It is too much running from project to project, this will also affect the communication flow since there are no structures at all.

*-“I would not feel good about these kind of situation; people are perhaps used to it. ”*

#### **6.1.3.2 Documentation**

The documentation is very poor within the organisation; there are no structures, processes, models or templates that should provide a good foundation for documentation in this company.

The only documentation that has been available was made by interview person four which also is included in the marketing department. The idea behind the documentation was to evaluate the project goals and to provide the marketing department with feedbacks. This has not worked at all, no feedback from the technicians appeared. The documentation was done in vain.

There should be changes to the situation. Since there are no documentations the traceability is also impossible and it would take time to trace faults.

*-“It feels like the time I have been here has been meaningless. ”*

#### **6.1.3.3 Quality and structure**

Structure will provide better quality, there are however no activities that follows any kind of structure.

*-“There are clear relations between quality and structure. ”*

#### **6.1.3.4 Changes**

The interviewee person response to changes is: If he himself worked at the company as a fulltime employee he would not ignore and resist to changes but instead welcome them and change his current work habits.

The interviewee person is fully aware of the problems despite his short time at the company, he also highlight organizational changes for better software development.

### 6.1.3.5 Project related discussion

The interviewee person has not seen any project plans for the project that have been conducted during the short time he worked at the company.

Problems that are related duo project planning relates to lack of structure. Since there are no structure or process that includes project managing there are also problems that affect the people within the project and also the organisation.

The marketing department must have a strong influence on the development. Once they have identified a possible customer or a product, the project related to them must be high prioritized. It should be a mix of technicians and marketing to achieve the best result, no side should be the one that makes all the decisions.

### 6.1.3.6 Conclusions

The conclusions below are summaries identified from the analyses of the interview.

#### ➤ **Communication problems**

It is obvious that there exist communication problems between the marketing department and technicians; and between the marketing department and the upper management.

#### ➤ **No clear tasks**

The working tasks change as the prioritization list changes. The developers will have hard time to focus and concentrated on the project.

#### ➤ **Documentation problems**

The lack of templates and models affects the documentation. Since there are no documentations the information will be lost and the traceability will almost be impossible.

#### ➤ **Lack of structure**

The projects and the activities within the company do not follow any kind of structure or process. This contributes to communication problems within the project group and with the other projects and managers.

## 6.1.4 Interview person four

This interview person is 37 years old male. He is also one of the founders of the company and has been working for 5 years in the software business. The interesting part about this interview person is that at the beginning he worked as a system developer but since a couple of years ago he started to work more and more at the marketing side. His opinions are highly interested because of his background as a technician. He has the ability to look from the both sides of the problem, both the technician view of the problem and the marketing view of the problem.

Since his current work consists of marketing some questions has not been discussed consistently.

### 6.1.4.1 Processes and Process Improvement

The interviewee has a background from software engineering and is familiar to processes and process improvement. There has never been a chance to introduce processes and process improvement in the company. Presumably because of no

existing processes and no improvements. It has always been fast swings in the company.

According to the interviewee there are no processes followed or documented.

*-“There exists a chaos, in that chaos there are always a little structure. “*

The information about processes and process improvements have been poor, couple of years ago there was a presentation about how the development flow should be processed. The presentation did not result in any kinds of action. For the moment there are no plans for introducing processes in the organisation.

#### **6.1.4.2 Ideas and communication**

Almost all ideas from the marketing department are communicated orally to the developer or developing team that is concerned. The idea is not documented and no follow-ups of the ideas occur. There are no description of the idea, the goal and the results of them.

According to the interviewee the problem is that many ideas and projects are directly communicated to the developers and not through a resource-manager. Often these kinds of communication are performed orally. Another problem that is related to this is no clear goals and no limited requirement specifications. The background of the problems is the unclear goal of the company. The result too this has been to many ideas at the same time since people have been running in many and different directions.

The interviewee mentions that a solution to this can be a respected and well defined resource planning. New ideas and projects should be based on the available resource.

#### **6.1.4.3 Documentation**

The interviewee is not aware of any existing models or templates for documentation. There is some documentation but this depends on if an idea leads to a project. The documentation is done if it feels needed in the project.

There are no structured and expressed guidelines for documenting in the company. The documentation that takes place is done according to the developers and no common template or model is followed. No consistency.

#### **6.1.4.4 Quality and structure**

Unstructured work and too many “jumps” between unfinished projects make it hard to manage the development and this will results in low quality products.

*-“The employees do not feel good about this situation at all. “*

For introducing right process and/or model the positive effect will be higher quality to the product and the developers will have a more clear and better goal to follow. The negative side effect can be the initiating extra work for establishing the process in the organisation and the time it takes for the establishment. It can also give a negative effect if a wrong process/model is chosen.

#### 6.1.4.5 Changes

Changes introduced by the company management must be followed by the developers. They should also be critically analysed by everyone that follows them.

The interviewee is positive to changes that will help the company and lead it to better manage products that are market-driven.

#### 6.1.4.6 Project related discussion

The project in the company can be everything from one man project to large projects consisting of eight members and everything from forty man-hours to several thousand man-hours with lead-times between a couple of weeks to several months. There are both internal and external projects, the largest project has been internal.

There are many projects in the company, some of them have low prioritization and some of them high. Project members have been and are involved in several simultaneous projects. Since there are no resource planning the involved members can have a hard time to manage projects with the same prioritization.

The marketing department has the power to change the project prioritization. If market-driven product development is applied the market must have strong influences in the development. The company has put all their focus on projects influenced from the market. The company definition differs from the academic definition of market-driven product development, hence lot of projects have not been profitable. Another problem regarding projects and quality is the lack of follow-up on projects being performed. This problem is caused as a chain reaction of poor planning and goal definition.

#### 6.1.4.7 Conclusions

The conclusions below are summaries identified from the analyses of the interview.

➤ **Communication problems**

The communication is too often orally and can cause problems such as information misunderstandings. There are no goal description and no idea description.

➤ **Lack of structure**

It is obvious that the company has no processes, no models and no structures providing a better foundation in the organisation. There is lack of information about processes and structures.

➤ **Documentation problems**

The documentation is not a must in the company. It only occurs if it is felt as needed, which happens very seldom. There are no templates or defined processes for documentation procedures.

➤ **Positive to changes**

Changes that can provide better structure within the organisation are welcomed but they must be critically analysed.

➤ **Better project planning**

The projects are not planned well enough, there are no project definitions and no resource planning. People can have several simultaneous tasks in different projects.

## 6.1.5 Summary of the interviews

The interviewees have been from both the technical side and the marketing side of the company. They have different tasks and working procedures depending on the nature of the current projects. Despite the different tasks, working procedures and departments the interviewees have identified almost the same problem areas (discussed in section 6.3).

The interviewees from the technical side (6.1.1 and 6.1.2) have been able to describe problems and discussions in detail. They have the ability to describe the company situation when it comes to development and activities connected to it better and more precisely. The information gathered from those interviews has given better understanding about problems and possible solutions.

The interviewees from the marketing side (6.1.3 and 6.1.4) have identified the same problem areas as the technical side. They have also out pointed why these problems occur and some of them are related to the upper management. They have a constant contact with the upper management that must approve their ideas. The directives given from the upper management also affect the technical side. The upper management is not always aware of the problems in the technical side and how the directives to the marketing side affect them.

## 6.2 Problem Areas

The intention of this section is to represent the problem areas identified by the interviewees and show what kinds of problems that each interviewee has out pointed.

The problem areas, which have been identified from the conclusion part of the interviews, are divided in five groups: Documentation, Communication, Structure, Process and Planning. These groups include the problems that have been mentioned in section 6.1 by the interviewees. Each one of the interviewees have pointed out problems in each group except interviewee person three (look at table 6-1).

The problems are summarized and listed as below:

### **Documentation Problem**

- No documentation foundation.
- No documentation templates.
- No documentation models.
- No real requirements specifications.
- No project documentations.
- Poor documentations in overall.

### **Communication Problem**

- To much misunderstandings in the oral communication.
- Problems related to the prioritization list.
- Bad communication flow between the technicians and the marketing side, the technicians cannot understand:
  - What the goals are.
  - Which task they are responsible for.
  - How they should proceed.
  - When should it be realized?
- Marketing side has problems listening to feedbacks.

### Structure Problem

- Lack of structure.
- Projects are not structured.
- No organisational structure.

### Process Problem

- No documentation of processes.
- No use of processes.
- No process habits.
- No improvements.
- To little resources available for introducing and maintaining processes.

### Planning Problem

- Bad planning in overall provides problems in the organisation, in projects and also problems directly directed to the individual such as no clear tasks.
- No project planning, this result into bad description of project goals, project definitions, project resources and project costs.
- No documentation.
- No resource planning.
- Poor planning in overall.

The problem areas are then used in the next section to visualize a summarised version of what problems areas that each of the interviewees has brought up during the interviews. The table below (Table 6-1) illustrates that everyone point out problems with documentation, communication, structure and process. Because of his short time interviewee three was not able to say for sure if there are problems with planning. He had however sensed problems within this area.

Table 6 - 1

<b>Problems</b>	<b>Interview Person</b>				<b>TOTAL</b>
	<b>One</b>	<b>Two</b>	<b>Three</b>	<b>Four</b>	
<b>Documentation</b>	X	X	X	X	4
<b>Communication</b>	X	X	X	X	4
<b>Structure</b>	X	X	X	X	4
<b>Process</b>	X	X	X	X	4
<b>Planning</b>	X	X		X	3

The table only shows that there should be improvement in the problem areas. Some of them can be completed and solved if the organisation puts some effort and power to them and some will need a structured organisation with processes.

Despite all the problems that the interviewees think the company have they still manage to work and make deliveries. This emphasises that the staff really works in the extreme. They are flexible and can change from projects to project but this procedure is done ineffective according too them, perhaps to flexible and too many changes.

Changes must be done. According to the interviewees changes are welcomed if they are aimed to help the company to tackle the problems. Changes are needed and the organisation must be more structured. Structure and process must be introduced.

## 7 RECOMMENDATIONS

The idea behind this chapter is to give the reader an overview of recommendations for the company.

### 7.1 Introduction

The recommendations in this chapter will build upon knowledge and information based on literature studies and through the interviews from chapter 6. The recommendations are based on the topics identified in section 6.3. These topics are used in this chapter to identify recommendations from the theoretical part of this thesis. The recommendations are divided in three parts:

- Documentation and Communication recommendations
- Planning recommendations.
- Process and Structure recommendations

The section covering the documentation recommendations contains information about how much documentation should be produced and when documentation should take place. The recommendations are influenced with agile thinking and agile methods presented in chapter 4. The recommendations about communication are building upon how communications in agile methods are done.

The section with recommendations regarding planning contains information and knowledge about how the planning problem in the company can be avoided, also influenced of the agile thinking in chapter 4.

The section covering the process and structure contains recommendations and guidelines for understanding: processes, software process improvement and changes, presented in chapter 3. This section will present the process recommendations for the company.

#### 7.1.1 Documentation and Communication recommendations

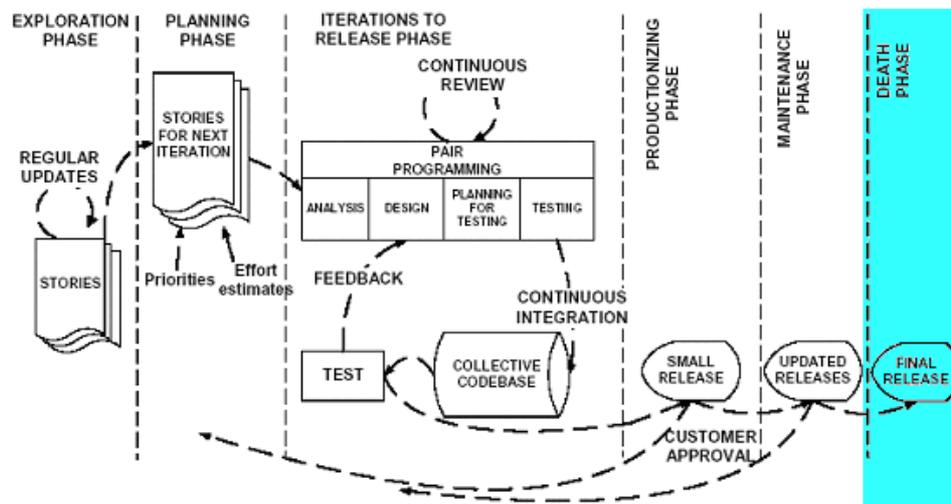
According to the interviewees in chapter 6 there are lack of documentation in almost every segment of the company. They feel that this is a problem and must be changed in the future. They have identified a lack of documentation standards, templates and models. The very little documentation that is produced is done according to the authors' individual style. It is obvious that the documentation has been taken in to the extreme in the company. Lack of real requirements specification has been really difficult in some projects, according to the interviewees. The developers have often themselves derived the requirements only from ideas presented by marketing people.

Agile values (section 4.2) emphasises working software over comprehensive documentation, it is far more important to have working software instead of too much documentation. The documentation should be reduced to an appropriate level. The company should have in mind that too much documentation does not actually mean a better product, instead it can incorporate significant overhead. The company is dependent on the market and must therefore be flexible, efficient and most of all manage short time-to-market (chapter 2). Too much documentation can decrease the flexibility and efficiency of the company (4.2). *In this master thesis it is recommended*

that the company sets up a documentation level that identifies what should be documented, how much documentation and what kind of documentations should be produced. The intention is not to decrease the quantity of the documentation, instead to increase it to an appropriate level. Further they should study agile principles and values to understand them and to apply them in the organisation so that they can be flexible, efficient and on time-to market. During the interviews it was identified that following documentation were requested requirement specification, project plan and documents that describe project goals, project definitions and resource planning.

According to XP (4.4.1) the necessary documentation (except user stories) is done at the last phase of the development cycle, in the death phase (Figure 7-1).

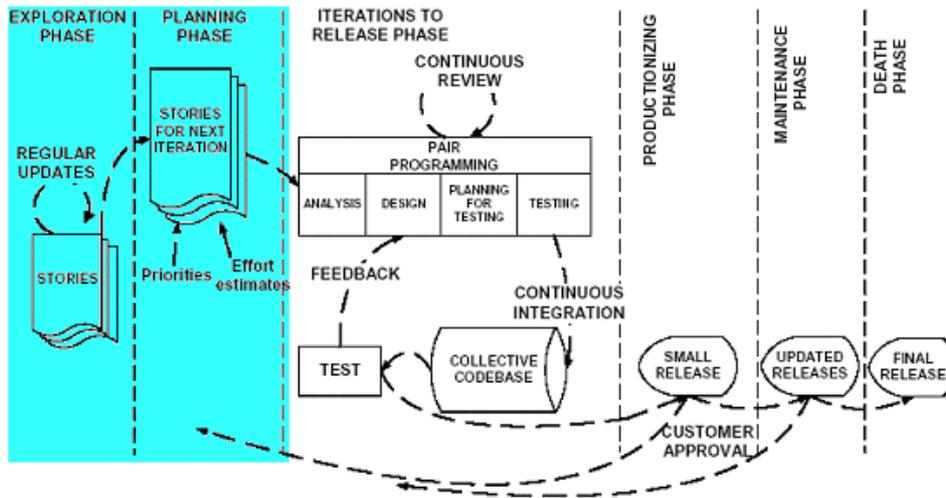
**Figure 7-1**, XP lifecycle.



This is a solution presented by XP to save time during the development and to do the documentation when everything else has been done. This practice can provide flexibility and efficiency when producing is the most important task to do. Producing and developing is also important in this company and the developers should consider this approach as a solution for their problems in information loss when the development is finished. It can also be felt as a relief to do only necessary documentation that the developers have agreed on as a final task during a project. *In this master thesis it is recommended that necessary product related documentation is handled in according to this XP approach.*

The interviewees emphasised the lack of requirements specification. The need of this is obvious through all the interviews in chapter 6. The current situation in the company is embraced with changes at all time during a development project. Agile software development through agile practices (4.3) emphasises late changes to a development project to be managed. XP (4.4) welcomes late changes in the development cycle. XP introduces user stories (4.4.1.2) to manage requirements. Figure 7-2 highlights the parts of the lifecycle that manage requirements.

Figure 7-2, XP lifecycle.



They are updated and changed during every iteration and therefore right information is passed through the development cycle. Changes are easier to manage since the requirements are changeable during the iteration and not fixed. *In this master thesis it is recommended that the company apply the user stories and iteration approach from XP to manage both early requirements and late changes in their development.*

The ideas or requirements in the company come from the marketing department, the ideas are often not correctly presented to the developers. The marketing should make the goals clear for themselves in a first place and then present them for the developers. There exist problems between the marketing and developers since they have rough time to understand each other (chapter 6). For establishing a better communication between the marketing and the developers for managing the ideas, XP provides solutions. For XP to produce user stories the customer must be participating. Since the customer for this company is an entire market, i.e. there does not exist one customer, the marketing side can take this role instead and produce user stories and participate in the development. The result could be closer interaction between the marketing and developers, leading to that they better understand each other. At the same time that the requirements are defined the communication flow between the marketing and developers will be established. Scrum provides Daily Scrum meetings (4.4.2.2) for sharing knowledge within the project group. In this way the marketing can get feedback directly from the developers to understand if the ideas can be developed within the right time frame or not. The close interaction between these parts makes it easier for the developers to understand the goals of the project and the goals of their work. *In this master thesis it is recommended that daily Scrum meetings be applied as an infrastructure to enable better communication. User stories also enable better communication through its closer interaction between the marketing and developers.*

The reason that XP's user stories was chosen instead of Scrum's backlog list is that while creating the user stories developers and marketing can discuss ideas and requirement together. The backlog list is made by several actors and includes more than pure requirements such as bug fixes, defects and technology upgrades. The relevant approach here is to make the developers and marketing work closer to understand each other better.

### 7.1.2 Planning recommendations

The problems addressed in the interviews (chapter 6) concerning planning relates all to how the projects are planed, maintained and managed. There are clear needs to improve the planning structure in the company. The interviewees clearly define that there should be project plans, project goals, project definitions, resource planning and follow-ups. It is also important that the plans can be flexible and changeable if changes appear in the project. It should not be forgotten the needs of flexibility in the project for the company since they are steered up by the market. The planning approach in Scrum provides definition of the project team, tools and other resources, risk assessment and controlling issues, training needs and verification management approval. The planning part is set in the beginning of the process since pre much of the project will build upon the first planning draft. The planning part of the process can be changed as the needs change and new functionality (requirements) occurs. The change of the planning is a must if the process should be flexible and changeable to satisfy the market needs. *In this master thesis it is recommended* that the company apply the planning approach from Scrum.

XP differs from Scrum through defining the planning in roles and in practices. The tracker role in XP is a person with the responsibility of monitoring and giving feedback concerning the process. He traces the estimates made by the team and gives feedback on how accurate they are in order to improve future estimations. He also traces the progress of each iteration and evaluates whether the goal is reachable within the given resources and time constraints or if any changes are needed in the process. It is a follow-up procedure to address progresses, future estimations and if project goals are reached. The practice part in XP is the planning game, it contains estimations done by the customer and developers for scope and timing of releases. *In this master thesis it is recommended* that the tracker role is applied, and also iterated among the project members in the company. In this way the members are forced to learn more about their new project process. It favours the project group when everyone is aware of the practices presented by the tracker role since members get to know the results of estimations done, how to do better estimation, goal evaluation and how to give feedback.

### 7.1.3 Process and Structure recommendations

XP and Scrum are two agile methods presented in this paper (chapter 4). They both emphasises flexibility and late changes in the development cycle. According to the interviews in chapter 6 the current work procedure are struggling to be flexible for managing changes. The process and structure presented by Scrum and XP can be the right options for the company to adopt process structure. XP provides six phases and Scrum provides three phases for establishing a fast and efficient process. It is not required by XP or Scrum to be used as an entity, it is possible to choose parts of the process and implement them. Humphrey (1997) does also mention that it is easier to implement small parts then to implement everything at the same time. By the recommendation in this chapter, the company should use parts of XP and Scrum to improve their current situation. The parts are: XP User Stories, Daily Scrum meetings, Scrum Planning Part, XP Tracker Roll, XP Planning game and necessary product related documentation in XP Death Phase. *In this master thesis it is recommended* that the company should apply the parts suited for product development and management.

Problems related to process and structure defined in chapter 6 addresses lack of process use, lack of structure and no defined or followed processes. These problems are identified by the interviewees (6.1) from the company. There are clear needs of

processes and structures and also needs of flexibility and efficiency. This paper uses XP and Scrum as processes that can be used as a way for the company to establish processes that will satisfy the needs of quick time-to-market, flexibility and efficiency. The different definitions of process (3.1) should be reviewed when establishing processes.

Once the processes are established and fitted to the needs of the company the improvement must start. The process improvement does not come without changes; these changes will affect the development and management habits. The interviewees have pointed out that they are open to these kinds of changes and will not resist to them if the benefits are clear. Process improvement is important as it can change the process according to the needs of the organisation. Process improvement (chapter 3) provides maturity steps for the process and must be treated as a never ending project that keeps improving. The steps for providing process improvement according to the lifecycle presented in chapter 3 are: Assess current practices; plan improvement actions; create, pilot & implement process; and finally evaluate result. And the topics presented from the process improvement framework in chapter 3 are: Software process infrastructure, Software process improvement roadmap, Software process assessment method and Software process improvement plan. It is important that the company review the steps of process improvement lifecycle and framework before starting process improvement.

#### 7.1.4 Summary of the recommendations

The recommendations below are gathered from the previous recommendation sections.

- *In this master thesis it is recommended* that the company reduce the documentation to an appropriate level. Study agile principles and values to understand them and to apply them in the organisation so that they can be flexible, efficient and on time-to market.
- *In this master thesis it is recommended* that necessary product related documentation is handled in according to XP Death Phase.
- *In this master thesis it is recommended* that the company apply the user stories and iteration approach from XP to manage both early requirements and late changes in their development.
- *In this master thesis it is recommended* that daily Scrum meetings be applied as an infrastructure to enable better communication. User stories also enable better communication through its closer interaction between the marketing and developers.
- *In this master thesis it is recommended* that the company apply the planning approach from Scrum.
- *In this master thesis it is recommended* that the tracker role in XP is applied, and also iterated among the project members in the company.

In this master thesis XP and Scrum have been described in chapter 4 with their process phases, roles and practices. The reason that only some of these parts have been used in this thesis is that they fit the problem areas in chapter 6. The used parts will work as a starting point for the company to later on be able to apply and implement more parts of XP and Scrum as needed.

## **8 FURTHER RESEARCH**

During the researches in this master thesis several areas were identified to be interesting for further study. Since there has not been enough time and possibilities to include these areas, some of them will be discussed briefly here.

The interviews in this master thesis could have been done with more people in the company to establish a wider basis for the problem areas. Other problems and issues could have also been identified if more interviewees were available to the research. It had been very interesting to reach the managers of the company for discussing the problems in the company. The interesting questions that could be used are: Are they aware of the problems discussed in this master thesis? If they are aware of them how have they planned to solve them? How do they think that the problems affect the company? What are the managers' perspectives?

The discussion could result in valuable information of how the managers reflect and act against the problems in the company.

The informal organisational structure has not been discussed in this master thesis. An idea to understand the problems better is to identify how the informal structure in this company works. To identify the informality in the company, observations can be applied. It takes time and resources to apply observations and this has not been possible to carry out since it is outside the scope and timeframe of this master thesis.

A research could be carried out to see how the recommendations were used and the results of them. It would be about how the company applied the recommendations and how they were affected by them. The research should also include if other parts of the recommended processes were applied and how the developers and marketing feel about the new changes. The result of this research would then present if it was successful or not with the recommendations.

## 9 REFERENCES

- Aaen, I.; Arent J.; Mathiassen, L.; Ngwenyama O. (2001):** ‘A conceptual MAP of software process improvement’, *Scandinavian journal of information systems*, 13, p. 123-146.
- Abrahamsson, P.; Salo, O.; Ronkainen, J. (2002):** ‘Agile software development methods review and analysis’, *VTT Electronics, Espoo*. 107 p.
- Ambler, S.W. (2001):** ‘Agile modeling’, available from Internet <<http://www.agilemodeling.com>> (April 2003)
- Beck, K. (1999):** ‘Embracing change with extreme programming’, *IEEE Computer*, 32(10), p. 70-77.
- Beck, K.; Beedle, M.; Bennekum, van A.; Cockburn, A.; Cunningham, W.; Fowler, M.; Grenning, J.; Highsmith, J.; Hunt, A.; Jeffries, R.; Kern, J.; Marick, B.; Martin, C.R.; Mellor, S.; Schwaber, K.; Sutherland, J.; Thomas, D. (2001):** ‘Agile Manifesto’, available from Internet <<http://agilemanifesto.org>> (April 2003)
- Beecham, S.; Hall, T.; Rainer, A. (2003):** ‘Software Process improvement Problems in Twelve Software Companies: An Empirical Analysis’, *Empirical Software Engineering*, 8(1), p.7-42.
- Cockburn, A.; Highsmith, J. (2001):** ‘Agile software development, the people factor’. *IEEE Journal paper*, 34(11), p. 131-133.
- Dawson, C. W. (2000):** *The essence of computing projects - A student's guide*. Pearson Education Limited, Harlow, Essex, England. ISBN: 0-13-021972-X.
- Humphrey, W. S. (1989):** *Managing the software process*. Addison-Wesley, United States. ISBN: 0-201-18095-2
- Humphrey, W. S. (1997):** *Managing Technical People - Innovation, Teamwork, and the Software Process*. Addison-Wesley, Massachusetts, United States. ISBN: 0-201-54597-7
- IEEE Std 610.12-1990**, ‘IEEE standard glossary of software engineering terminology’. IEEE Standard.
- Karlsson, J. (2002):** ‘Marknadsdriven produktledning –Från kundbehov och krav till lönsamma produkter’, available from Internet <<http://www.focalpoint.se/>> (February 2003).
- Karlsson, L; Dahlstedt Å. G.; Natt och Dag, J.; Regnell, B.; Persson, A. (2002):** ‘Challenges in Market-Driven Requirements Engineering - an Industrial Interview Study, -Workshop’, *Software Engineering Research Group*, available from Internet <[http://serg.telecom.lth.se/research/publications/docs/karlsson\\_refsq2002.pdf](http://serg.telecom.lth.se/research/publications/docs/karlsson_refsq2002.pdf)> (February 2003).
- Kitchenham, B.; Pickard, L.; Pfleeger, S. L. (1995):** ‘Case Studies for Method and Tool Evaluation’. *IEEE Software*, 12(4), p. 52-62.

- Kotonya, G.; Sommerville I. (2002):** *Requirements Engineering - processes and techniques*. John Wiley & Sons, England. ISBN: 0-471-97208-8
- Kutschera, P.; Schäfer, S. (2002):** 'Applying agile methods in rapidly changing environments', available from Internet <<http://www.agilealliance.org>> (April 2003)
- Kvale, S. (1997):** *Den kvalitativa forskningsintervjun*. Studentlitteratur, Lund, Sweden. ISBN: 91-4400185-1
- Lantz, A. (1993):** *Intervjumetodik*. Studentlitteratur, Lund, Sweden. ISBN: 91-44-38131-X
- Lappo, D. (2002):** 'Quick Guide to extreme programming (XP) For Managers', available from Internet < <http://www.smr.co.uk/guides/XPForManagers.html>> (April 2003)
- Paulk, M.; Curtis, B.; Chrissis, M.; Weber, C. (1993):** 'Capability maturity model for software (version1.1)', available from Internet <<http://www.sei.cmu.edu/pub/documents/93.reports/pdf/tr24.93.pdf>> (February 2003).
- Reifer, D.J. (2002):** 'How good are agile methods?', *IEEE Software*, 19(4), p.16-18.
- Riddell, S. (1998):** 'Implementing process improvement in software development', *Electrical and Computer Engineering*, 2, p.505-508.
- Schwaber, K.; Beedle, M. (2002):** *Agile software development with Scrum*. Upper Saddle River, New Jersey, Prentice Hall. ISBN:0-13-067634-9
- Trost, J. (1997):** *Kvalitativa Intervjuer*, Andra upplagan. Studentlitteratur, Lund, Sweden. ISBN: 91-44-00374-9.
- Trost, J. (2001):** *Enkätboken*, Andra upplagan. Studentlitteratur, Lund, Sweden. ISBN: 91-44-01816-9.
- Varkoi, T. (2002):**' Management of continuous software process improvement', *Engineering Management Conference*, 1, p. 334-337.
- Wells, D. (1999):** 'Extreme Programming: A gentle introduction', available from internet <<http://www.extremeprogramming.org/>> (April 2003)
- Wieggers, Karl E. (1999a):** 'Process improvement that works', Software Development, available from Internet <<http://www.processimpact.com>> (February 2003).
- Wieggers, Karl E. (1999b):** 'Why is Process Improvement So Hard?', Software Development, available from Internet <<http://www.processimpact.com>> (February 2003).
- Wieggers, Karl E. (1999c):** 'Software process improvement: Ten Traps to Avoid', Software Development, available from Internet <<http://www.processimpact.com>> (February 2003).
- Zahran, S. (1998):** *Software Process Improvement*. Addison Wesley, Great Britain. ISBN: 0-201-17782-X

## 10 APPENDIX A

### 10.1 Questions

The questions were used to start conversations about the topic.

#### **Processes and Process Improvement**

- Do you believe that the company have processes that you follow?
- What do you consider about your knowledge in process improvement?
- Has the company been good at informing about processes?

#### **Ideas and Communication**

- How do you think the ideas are handled from the marketing side? What do you think is required?
- What do you think is the problem in the communication between the developers and the marketing side? What are the solutions?
- Have the problems been discussed in the company?

#### **Documentation**

- How well are the ideas documented and by whom?
- Are there any standards or templates for documenting?
- How do you in the company handle the documentations?

#### **Quality and Structure**

- Do you think that the problems have some kind of connections to development quality, product quality and efficiency of work?
- Do you believe that there are positive effects by introducing processes and models to the company?

#### **Changes**

- What do you feel about changes that come along new processes and models?
- How would you react to the changes, welcome them or resist against them?

#### **Project management**

- How big are the projects in the company?
- Are there people that are involved in simultaneous projects?
- How do you feel about the current way of managing the projects?
- How well are the projects planed?

#### **Influences from marketing department**

- Do you think that the marketing side has a big influence when it comes to prioritising the projects?
- Can the marketing side change the prioritisations and how do you feel about that?

### 10.2 Explanations

**Marketing, marketing department, marketing staff and marketing side** are words that have been used freely in the thesis. They are intended to mean the same area of work and that is marketing.