Risk management of total product-development projects

- A case study of Semcon

Kandidatuppsats/Bachelor Thesis
Elin Johnston 81
Elin Ottosson 80

Handledare/Tutor
Peter Svahn

Preface and acknowledgement

This bachelor thesis in Accounting and Finance was written at the School of Economics and Commercial Law at Gothenburg University, Sweden.

This study of project risk management was made possible by the cooperation of a number of people. We want to thank our tutor Peter Svahn and the course examinator Lars-Eric Bergevärn for giving us helpful advice. We also want to thank the respondents at Semcon. A special thanks to our tutor at Semcon, Anders Löwgren, and Mats Eric Olovsson.

We would also like to thank everyone who has taken the time to read the thesis and give suggestions on improvements.

Gothenburg, 30th of May 2004

Elin JohnstonElin Ottosson
ejohnston@spray.seelinottosson@spray.se

Abstract - Bachelor Thesis in Business Administration

Title:	**Risk management in product-development projects**
	A case study of Semcon
Authors:	**Elin Johnston**
	Elin Ottosson
Tutor:	**Peter Svahn**
Date:	**01/06/2004**
Subject terms:	**Project management, project risk management, Semcon**

Background and problem: The problem of this thesis concerns the existence of project failures in companies caused by poor knowledge and poor use of project management and project risk management. There is a gap between the recommendations in the literature on how projects and the risks connected to projects should be managed and how it is actually done in practice. We have analysed how well a high-technological company, conducting work in project form, uses project management and project risk management theory in order to avoid project failures.

Semcon develops products featuring the latest technology in projects for external customers and is one of Scandinavia's leading design and competence companies. The business is conducted through external consulting activities and through taking full responsibility for product-development projects. Semcon's objective is to grow by taking on more commercial product-development projects. The high complexity of the projects places Semcon in a situation where it is important to manage the risks facing the projects. Semcon has had problems with losses and even failure in some of their product-development projects.

Purpose: The purpose of this thesis is, therefore, to analyse how Semcon works with project management and project risk management. An identification of risks was done and Semcon's risk management process was analysed.

Limitations: The empirical study will only be done on Semcon's project management and project risk management.

Method: A qualitative case-study strategy is applied since qualitative research obtains a deeper knowledge of the studied phenomenon in its context. The qualitative method is flexible to the extent that new information that appears in the initial phase of the analysis can lead to improvements in the wording of questions. We studied literature in the field of project management and project risk management and made several interviews with employees at Semcon.

Conclusion: The most relevant conclusion is that Semcon needs to develop and implement a more standardized method for project management and project risk management if they are to create growth by taking on more projects.

Handelshögskolan
VID GÖTEBORGS UNIVERSITET

TABLE OF CONTENTS

Figures

Tables

1. INTRODUCTION

This Bachelor thesis examines the problems related to project management and project risk management in product-development projects. The thesis will examine how this is done at one specific company namely Semcon. Semcon is a company that has had problems with projects not generating a profit. Semcon work with design and competence and take on total product development projects, which includes developing the product from idea to a completed solution for the customer. The fact that projects fail is an indication that the projects and the project risks are not managed in a satisfactory manner.

1.1 Problem background

Today many companies conduct a great part of their every-day work in project form. Traditionally, projects were mainly found in the construction industry and sections of the military, but the competitiveness of the markets of today with fast-changing technology encourage almost all companies to adopt project management (Burke 2003). The purpose of project management is

"to foresee or predict as many of the dangers and problems as possible and to plan, organize and control activities so that the project is completed as successfully as possible in spite of all the difficulties and risks". (Lock 1996, p. 1)

Project risk management includes identifying, controlling and limiting the impact of the risks in projects (Hamilton 1996). For a successful project, both project management and project risk management has to be managed.

1.2 Problem discussion

The problem to examine in this thesis is the phenomenon of project failures in a company working with total product-development projects for external customers. There are several situations where a project can be considered to have failed, for example, when time limits are exceeded, when costs are underestimated and when the quality is inferior. The probable cause is inadequate knowledge and poor application of project management and project risk-management. We have chosen to analyse how well a large, high-technological company, conducting work in project form, uses project risk-management theory to minimise economical risk.

According to Lock (2003) the use of project management and project risk management has turned out to be a problem for several companies. The problem seems to concern the carrying out of projects efficiently, so that restrictions on time, cost and quality are met. Carter (1994, p. 53-54) gives the following definition of the project's three parameters: **cost** as embodying *"any financial unit"*, **time** as generally represented by *"a delay in delivery or programme"*, and **quality or customer requirements** as standing for *"a lack of performance, or not meeting a specific technical constraint such as a level of reliability, etc."* There is always a trade-off between these three parameters and a change in one can affect the others (Lock 2003). Finding

the appropriate combination between the parameters is a difficult task for all project managers. The fact that all projects have an exclusive combination does not make it easier. The appropriate combination of the three parameters naturally varies due to the nature of the business. Depending on which message a company wants to send out regarding time, cost and quality, the combination will be different. If a company is extremely quality-minded they may not be as focused on keeping time limits and cost restrictions. If the company on the other hand is active on a fast-changing, competitive market they are more likely to give priority to the time aspect in order to get their products out on the market. (Burke 2003) Keeping budgets is maybe most important when working in commercial projects for external customers since a fixed price is often negotiated, and exceeding the budget could then result in a loss for the company carrying out the project. (Boyce 1995) Even though some companies find it most important to deliver high-quality products, there is always an economical aspect. The reason why many projects and work in general exceed the time limit and budget is that the company has little knowledge in predicting future risk and in managing them when they occur. In order to avoid this, the company has to know how to identify and react to these unpredictable events.

Working in product-development projects for external customers means that two projects are never identical and many different parties are involved. This leads to a high complexity, and more advanced knowledge in possible risks and success factors is needed. The increased use of working in projects has resulted in the development of various management principles to ensure the successful completion of the project. (Burke 2003) The great challenge in project-management and project-risk-management is to succeed in carrying out high-risk projects with regard to quality requirements and time- and cost restrictions. An efficient use of project-risk-management can prevent the company engaging in projects where the potential positive outcomes are overshadowed by the risks. It can also lead to better control and knowledge of how the handle the risk if and when it occurs, and not let it delay or destroy the project. There are some risks that should be avoided, since the company cannot charge anyone else for them. However, risk does not have to be negative. If the company has the competence to manage a specific risk, a risk premium can be added to the price. These risks should not be avoided but managed and charged for. This means that managing risks can be a lucrative business. As a result of this the combination of good project management and project risk management is consequently becoming more important. (Meredith & Mantel 2003)

A company's need for risk management depends on its exposure to risk. Several risks can be minimised when using accurate project management and project risk management models. Choosing risk-management models demands both information research and evaluation. In cases where an improper model is employed, problems may occur since the pertinent risks are difficult to detect and thus get little attention. (Carter et al 1994) Risk is an ambiguous word, and people might not always talk about the same thing when addressing it. Therefore, it is important that the company's attitude to risks is explicit and acknowledged by the employees. The project manager plays a great role in mediating the attitude to risk in the project. (Ottosson 1999)

The ultimate situation would be if all companies had enough general knowledge through experienced project managers to handle the risks they are exposed to. But in reality, the existence of project failures testifies the fact that that is not the case. Lack of knowledge or poor project risk management might therefore put companies in a difficult situation.

1.3 Semcon's situation

Semcon has many project assignments that involve commercial product-development for external customers such as Volvo and Astra Zeneca. Today, Semcon takes on total product-development projects, from idea to finished product. Semcon's main problem is connected with the risk that appears when working in this kind of projects. Since the products developed are different from project to project, these types of risks vary and are thus difficult to identify. It is also complicated to measure how large the impact will be on the project, in the event of a risk occurring. Semcon's ambition is to grow by committing more deeply to the project field. Today 30 % of the turnover is made from value-based projects, but Semcon's intention is to increase this number to 50 %. (Interview Financial Manager, 2004-04-30) When working in projects, an estimate is given to the potential customer, and a price is specified. It is up to the project manager and the steering group at Semcon to keep the project on time and on budget. It is difficult to invoice the customer for delays or excess time, if it is due to the fact that Semcon failed to calculate the hours needed. It is therefore of great importance that Semcon is able to predict future risks and have a plan for how to control these risks.

When working in commercial projects Semcon's two main restrictions are related to time and cost since, as mentioned above, it is difficult to invoice the customer for any extra expenses due to delays. The third, and highly important parameter is quality. Part of Semcon's success is a result of their good reputation: they are known for delivering products with high quality. The company has to take a position on which one of the three parameters in the trade-off is the most important. The outcome of a project can be improved by a more stringent control of these variables.

Semcon has experienced that some projects that ought to be profitable did not generate profit. In the year of 2003 it was estimated that the losses were 10, 5 MSEK of such projects, which is not acceptable. (Semcon annual report 2003) This is a problem and considerable amounts of money can be saved. Semcon's intention and aim is to mitigate or manage these risks in order to reduce the number of unprofitable projects.

1.4 Purpose

The purpose of this thesis is to analyse how Semcon works with project management and project risk management in product-development projects.

1.5 Limitations

The project is our basis and we therefore do not discuss management and risk management that are not connected to projects. The theory is merely applied to Semcon and its product-development projects. No other industries, companies or projects are discussed. We do not enter deeply into the function of the responsibility centres, nor do we give suggestions about future reorganisations.

In each case, there is a large number of people that could have been interviewed and loads of documents that could have been studied. We have limited our research to interviewing two

controllers, two project managers, the financial manager and the quality-service manager, since we argue that they are representative for the company. Only documents that concern Semcon's projects have been examined in depth.

1.6 Disposition

The sequence of work in this thesis can be described as follows, see figure 1.1. In the first chapter the problem is described and broken down. Semcon is presented briefly and its specific problem is discussed. A review of the literature read is followed by an empirical study of Semcon. The theoretical chapter is used as a framework in the analysis of the empirical study. When the analysis is completed, our conclusion is drawn.
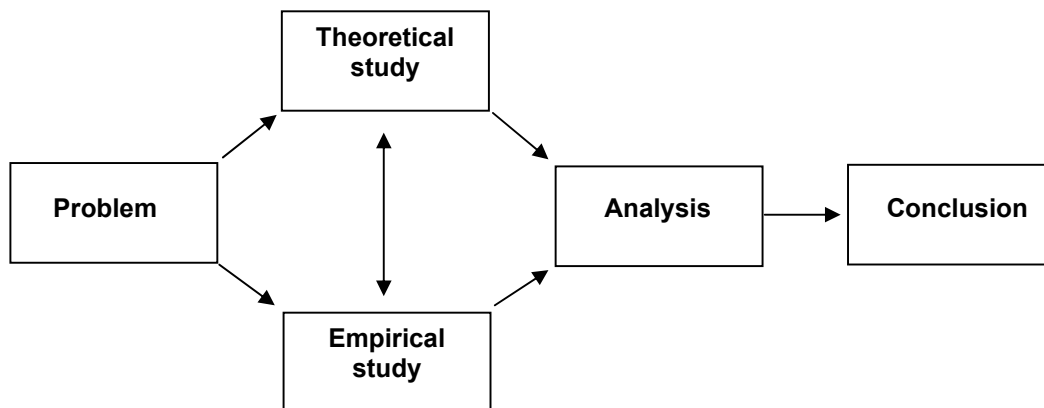

Figure 1.1 Sequence of work – our approach

2. METHODOLOGY

The purpose of this chapter is to describe the methods used in order to realise our purpose. We have chosen to do a qualitative study on one company working with product-development projects for external customers. A study of this kind makes it possible to penetrate the problem more deeply...

An accurate methodology is required if a scientific investigation is to fulfil its purpose (Holme & Solvang 1997). The methodology is the instrument that helps the researcher to achieve reasonable analyses and conclusions, and should be chosen with the purpose and the problem description in mind (Merriam 1998).

2.1 Qualitative research method

Collection and processing of information can be done in two different ways, either by using a quantitative or a qualitative method (Holme & Solvang 1997). We have chosen the qualitative method and have interviewed two controllers, two project managers, the financial manager and the quality-service manager at Semcon. The respondents were not given questionnaires and the interviews were of a conversational character. This gave us the possibility to clarify, and to ask questions that emerged naturally in the conversation. We also had the opportunity to contact the respondents again with further questions. We met some of the respondents for follow-up interviews. This method allowed us to collect all the relevant information to fulfil the purpose of this thesis. To get a deeper level of knowledge we would have needed to make an Insider Action Research, which means to be involved in a project for a longer period as an observer, team member or project manager (Björk 2003).

The main purpose of a qualitative research is to obtain a more profound knowledge of the studied phenomenon in its context. The method allows a flexible behaviour towards respondents, which reduces the number of generalisations. Other factors that reduce generalisations are the fact that different people interpret information differently, and outer circumstances can change while asking the same questions of different people. In other words, the persons involved in the work usually affect the qualitative result to some extent. The greatest strength of this research method is that it gives an exhaustive overview and knowledge of the investigated object, producing a thorough understanding of the respondent's situation. (Holme & Solvang 1997)

2.2 The Case study as a research method

The empirical study is, in this thesis a case study of Semcon. Doing a case study means examining a small number of objects, but from different perspectives (Eriksson & Wiedersheim-Paul 2001). Independent of the field under examination, a description of the subject area has to be made before hypotheses are concluded and theories formulated. Merriam (1998) argues that one of the benefits of a case study is the possibility of analysing complex contexts and the possibility of using different variables in order to understand the phenomenon that is to be studied. Furthermore, Bromley, quoted by Merriam (1998), argues that the qualitative case study by definition comes very close to the respondents through observations in their natural

environment. In this case, all interviews took place at Semcon's headquarter in Gothenburg, Sweden. This method also takes into consideration subjective factors such as thoughts and feelings (Merriam 1998), which is difficult to capture with a quantitative study.

A comparison study, where several companies are examined, would probably give a broader case study but not as deep. This thesis is of a descriptive nature, where the goal is to study different events and phenomena. The results will be presented qualitatively, where words and figures are used rather that numbers. The case study is also inductive, which means that generalisations, concepts and hypotheses come from the available information forms the frame for the study. An inductive case study also focuses on process, understanding and interpretation. (Merriam 1998)

According to Ryan, Scapens & Theobald (2002) there are three aspects in case-study research that are common sources of difficulty.

1. There is a **difficulty in limiting the area** covered.

2. **The nature of the social reality** in the case being researched. Social systems cannot be understood independently of human beings, and the researcher cannot be regarded as a neutral independent observer. There can be no such thing as an "objective" case study.

3. The **ethics** of the researcher's relationship with his/her subjects.

To deal with the first difficulty we have limited the extent of our study (see 1.5 regarding limitations). This permits a more detailed study. A case study can never be objective (as stated in the second difficulty) since the outcome is always affected by the authors. The case-study research only provides an interpretation of the social system being studied and not is an objective representation. Personally, as well as through our interaction with the respondents, we have an impact on the result of our case study, and we are aware of this fact. Before the interviews, we explained the purpose and asked if it was alright to record the interviews, as declared in the third difficulty. The respondents also reviewed the thesis before the final version was handed in.

2.3 Data collection

Information can be collected in two different ways, either by using already existing data or collecting data yourself. Academically, these are called primary data and secondary data.

2.3.1 Primary data

Primary data is information collected by the authors themselves. The qualitative research approach uses three main tools to obtain the necessary information, namely observations, interviews, and experiments. (Eriksson & Wiedersheim-Paul 2001) The primary data in this thesis mostly consists of interviews with employees at Semcon. The questions asked in the interviews were formed as we studied the theoretical literature on the subject. Our aim was to fulfil our purpose to a great extent through interviews with employees from different departments at Semcon.

There are different ways to collect information by interviewing. Lekvall & Wahlbin (2001) describe three communication approaches: personal interviews, telephone interviews and written inquiries. In this thesis we use personal face-to-face interviews and written inquiries via e-mail. E-mails have only been used in order to clarify previous answers and to set up appointments. The advantages of personal interviews are the almost unlimited possibilities of asking questions and the low non-response rate. During the interviews, a tape recorder was used to ensure that we understood the answers correctly. This was done so that we could concentrate on the respondents' answers and ask additional questions if necessary, and also to facilitate the empirical study. A downside of using recording equipment is that the atmosphere may become too formal and the respondent may feel tense and obstructed. To decrease this risk we asked each respondent before the interview if he or she felt comfortable being recorded and explained how we were going to use the recorded material. All the respondents agreed on being recorded and did not seem to be bothered during the interviews. We also took notes regarding what was said indirectly, body language and our own thoughts during the interviews.

Our intention was to interview employees who were experienced in working in projects. We intended to talk about their project-management and project-risk-management. The first interview was with a project manager and a controller. The second interview was about the project methodologies and the third interview was with the financial manager and the quality-service manager. The last organised interview was with another controller who is involved in developing a new economic control system which is discussed further on. We asked for respondents with different positions in the organisation. The financial manager, who has also been our tutor at Semcon, picked the respondents for our interviews. The respondents were notified in advance of our purpose in order for them to be prepared. The questions asked can be found in Appendix 1. We met several of the respondents for two or more interviews that lasted approximately one hour and a half. The interviews had the character of conversations rather than an interview, and according to Ekholm and Fransson (1992), the advantage of this interview technique is that it is flexible and allows one to focus on areas that seem to be of interest. A disadvantage of using interviews can be that the interview is affected by the interviewers, which may lead to the effect that the respondents wish to give the "right" answers to the questions asked, instead of answering honestly.

The information gathered in the interviews has been used in the empirical study and the respondents' answers form the basis of the chapter. This can also be seen as Semcon's analysis of their own situation and the empirical chapter may consequently seem somewhat analytical. However, we present our analysis of Semcon's situation in the fifth, analytical chapter.

2.3.2 Secondary data

Secondary data can be defined as information gathered by others than the authors themselves (Eriksson & Wiedersheim-Paul 2001). The secondary data used in this thesis is mostly literature on project management, project risk management and commercial risk management. Literature on how to write academic papers has been used in order to write the thesis according to the accepted practice. We have also consulted working papers and academic journals. The Internet has been a source of information on papers and literature. When information is collected from the Internet, the reliability of the information always has to be questioned.

Further, we have used the annual report (2003) from Semcon. American, British as well as Swedish authors are represented in the sources used. The literature can be found at university libraries in Gothenburg: Ekonomiska Biblioteket and Chalmers Bibliotek. Is has not been difficult to find literature relating to our areas of interest.

2.4 Validity and reliability

A good case study should be characterised by high validity and high reliability (Holme & Solvang 1997).

2.4.1 Validity

The validity of a research depends on what is measured and whether it is clear in the problem statement (Kinnear & Taylor 1991). The validity can be defined as the "*measurement instruments' ability to measure what it is design to measure*"[1] (Eriksson & Wiedersheim-Paul 2001, p. 38). In this case, the validity is dependent on the relevance of the factors we examine in relation to the problem and purpose. The validity is also relevant when choosing an object to examine for the case study. There are three measures that can be used in order to ensure validity:

- Make use of several sources of information
- Establish a chain of proof
- Ensure that key-respondents review the findings of the research

(Yin 1994)

Several precautions have been taken in order to increase the validity of this thesis. One example is using personal interviews which allow the immediate correction of possible misunderstandings during the interviews and offer the chance to clarify any obscurities in the answers. The respondents were also sent a notice of our area of interest in advance, which gave them the possibility to prepare. This method decreased the risk of the respondents misunderstanding the nature of our questions. According to Yin (1994), using multiple sources of respondents is one way to enlarge the reliability and the validity of a qualitative case study. We made several interviews lasting on average one hour and a half. The number of respondents may seem few in order to obtain an accurate picture of the situation at Semcon, but the people interviewed can all be considered to have deep knowledge of their area of competence. We are convinced that the validity is elevated due to the scope of the interviews and the knowledge of the respondents. Our conviction is that the information collected is sufficient to fulfil the purpose of this thesis.

2.4.2 Reliability

Reliability is determined by how well the research is conducted and by how accurately the authors judge the gathered information. (Holme & Solvang 1997) If the same people were interviewed, the answers should be the same or at least very similar. (Svenning 2000) However, if the respondents are interviewed on another occasion, the answers might be different due to changed circumstances. The interviews with employees at Semcon are documented as a whole on tapes, but we have decided not to write them down on paper and add them to the thesis. This can be seen as a decrease

---

[1] The quote is translated by the authors of this thesis

of reliability in this thesis, but we argue that it is the content of the interviews that is important and not every single word said. The tapes are available for those interested.

When discussing reliability, the primary and secondary data should be examined and questioned. The secondary data is of high quality due to the fact that we have studied scientific literature and accepted publications, which gives a broad description of the field. The reliability of the primary data is also high depending on the reliability of the interviewers and respondents.

3. THEORETICAL FRAMEWORK

When talking about project management and project risk management, it is important to clarify and define all the concepts involved. This chapter first describes project management and the concept of risk. These two concepts are then merged in the third part of this theoretical chapter, which concerns project risk management.

3.1 Project Management

> "*Project Management is the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, quality and participant satisfaction*". (Internet 3)

Project management consists of various processes such as initiating, planning, executing, controlling and closing a project (PM bok - Project Management body of knowledge 2000). There are several different types of project. A project may run over a short or a long period, it can be simple or complex, and it can be free-standing or part of a larger project. A project may lead to changes such as new or refined methods, products, services, systems, or organisations. The essential in project management is to keep the time limits, keep the costs low and keep the use of other limited resources down, on the basis of goals and ambitions. The financial goal is of primary interest, seeing that the project is usually carried out in an organisation focusing on the shareholders and their financial interest. (Jacobowsky 1991)

3.1.1 Projects

According to PM bok (2000, p. 4) the definition of project is...

> "*…a temporary endeavour undertaken to create a unique product or service. **Temporary** means that every project has a definite end. **Unique** means that the product or service is different in some distinguishing way from all similar products or services.*"

Thus, a project is of a one-time character and has a definable beginning and end. The project is initiated to create some kind of change, for example to develop a product. The nature of many projects is complex. In order to successfully manage this complexity, input from several competences and from different departments is required. (Engwall 1999)

Project literature stresses the importance of planning and structuring the project. When handled efficiently, the many advantages of a small-scale business might be captured and taken advantage of: the objectives are, for example, quite clear, compared to in a large organisation, and it is possible for the team members to set up personal goals. This may create improved motivation and commitment among the employees and thus lead to better results. It is also easier to measure the result of a certain action in a project. Some of the disadvantages of working in a large and complex organisation, for example, monotonous tasks and lack of personal development, can be avoided. (Jacobowsky 1991)

Phases of the project

According to Kliem and Ludin (1997), every project passes through different phases, see figure 3.1. In Kliem and Ludin's model of the typical project phases, there are five phases. The first phase, called the feasibility phase, determines whether a project is a realistic option to existing operations. A decision or screening (if the project is worth taking on) is made as well as a calculation of profitability. (Jacobowsky 1991) If the decision is to go ahead with the project, the customers' expectations are defined in the formulation phase. This phase also involves developing alternative ways to meet those requirements. The actual product is created during the implementation phase and the product is introduced to the client's environment in the installation phase. In the sustaining phase the client gets direct control over the product.[2] (Kliem & Ludin 1997)
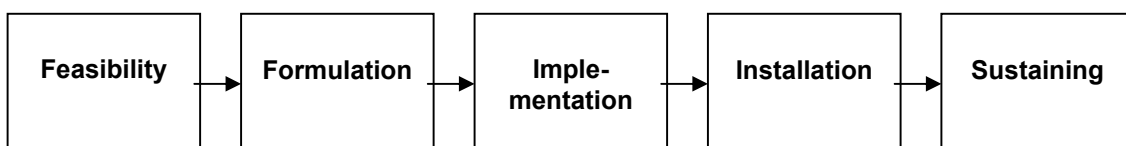
Figure 3.1 Typical phases of a project (Kliem and Ludin 1997, p. 15)

The primary objectives of the project, time, cost, and quality, must be kept in mind during all phases. A delay or a costly mistake in the beginning of the project will most likely lead to problems in the following phases since the phases depend on each other. It is difficult and also expensive to repair this kind of problem. (Kliem & Ludin 1997) The decisions made early in the project process will therefore greatly affect the project in its later phases (Engwall 1999).

The objectives of the project

The aim of the project is to meet set objectives, which usually means fulfilling the demands on quality/functionality and completion within time limits and budget. Customer satisfaction should be the objective for the project: work has to be ready on time or before, it has to be of agreed quality or better and the cost should be as no higher than planned. (Engwall 1999) If the projected cost or time frames are tight, it is more uncertain whether the project is going to reach the set goals. Naturally, employing slack time schedules will lead to lower project risk in terms of avoiding time overrun. The setting of targets is, therefore, of great importance. Clear objectives and performance criteria that reflect the requirements of all parties involved in the projects are crucial. (Chapman & Ward 1997)

---

[2] These are the explanations on how to interpret the model give by Kliem and Ludin. We interpret that the model is schematic and the size of the boxes do not illustrate their joint importance.

These three objectives and their interrelations can be illustrated in the figure 3.2 by Burke:
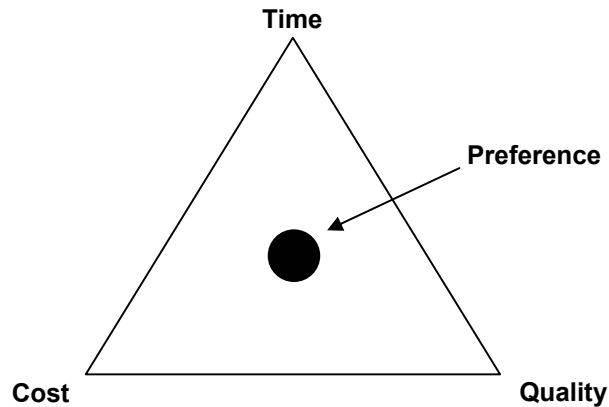
Figure 3.2 Time, Cost and Quality Triangle (trade-off) (Burke 2003, p. 22)

1. Time to completion
In order to finish the project on time, the crucial stages have to take place no later than on the planned dates. All stages in the project must therefore follow a specific schedule to adhere to timetable. A late delivery will not please the customer, and might harm the company's reputation. (Lock 1996) A project that keeps on making use of resources after its planned finishing date might also interfere with and delay other ongoing or future projects. (Lock 2003) The time aspect may be most important since there is a link between time and cost (Lock 1996); Benjamin Franklin: "*Time is money*" (Internet 1). If the time scale is exceeded, it is most likely that the budget will also be exceeded (Lock 1996).

2. Cost and budget
The project should be completed without exceeding the set budget. Failure to keep the project within budget will result in decreased profits and lower returns on capital investment or even a financial loss.

3. Quality, performance and specification
The outcome of every project must be suitable for what it was intended and fulfil the expectations of the resource owners and the stakeholders. This is especially important in product-development projects where the final product has to appeal to the customer, be reliable and safe. In addition, the product has to meet market demands and comply with the relevant legislation. (Lock 2003)

Balancing the objectives
When working on projects the balance between time, cost, and quality is crucial (Meredith & Mantel 2003). There is always a trade-off between these three parameters and a change in one will affect the others (Burke 2003). Some authors even claim that it is impossible to create a combination that optimizes all parameters since they are mutually dependant on each other (e. g. Burke 2003, Lock 2003). This implies that each project's objective inevitably has to be a compromise between the three parameters. A tightening of the project time plan, for example,

requires more resources and will probably affect the quality. During the project, the parameters can shift in importance. Generally, the technical functional aspects of the product are more important at the beginning of the project. As the project proceeds, focus shifts from function and quality to time and cost. (Engwall 1999)

The interrelation between time and cost is the most central in the triangle. The variable costs, for example man-hours, are often time-related. (Lock 2003) If the projects demands more time than planned, the budget will almost certainly be exceeded. However, there are situations where companies choose to favour one of the parameters, for example in a nuclear power plant, when performance and quality cannot fail. In other words, a quality-minded company will focus on quality and not on keeping time limits and cost restrictions. A company active on a fast-changing, competitive market will probably give priority to getting their products out on the market fast. (Burke 2003)

3.1.2 Managing projects

The one most important character when it comes to project management is the project manager. The project manager's responsibilities are numerous and fall into several different areas of competence. He or she often has multiple responsibilities towards the employer, the project, and the customer, but also a great responsibility and commitment towards the project team members. (Meredith & Mantel 2003) As a result of good project management, the project is likely to finishing within the timeframe, at the estimated cost, and with an outcome of high quality. To assure that these restrictions are met, the project manager has some important tasks. For each project, it is necessary to identify which parameter (of the ones mentioned above) that is the most important. For example, some companies may put quality and reputation first and are therefore willing to exceed their time- and cost budgets. In other cases, where there is a definite deadline, keeping the time limits may be the most important aspect. (Lock 1996)

Achieving the project's objectives and satisfying the customer should be the primary objective of the project manager. There is also a more human aspect of their work. Regardless how experienced, competent, enthusiastic, or intelligent the project manager is, he or she can not be expected to operate efficiently without adequate support and cooperation. Successful product managers have the ability to motivate people. According to Lock (1996), most participants in a project appreciate to work with a competent project manager who gives precise and achievable instructions, makes clear decisions, listens, and accepts sound advice. The project manager should delegate the different tasks properly and be enthusiastic and confident. The project manager must also feel support from senior management within the organisation, who must show a genuine interest in the project and ask questions, give constructive criticism, and offer helpful advice. When the project manager has obtained this support, he or she is can motivate the other team members. (Lock 1996)

Project-management Tools
The project-management process has to commence before any resources are committed to the project and must continue throughout and only finishes when the project is completed. (Lock 1996) As highlighted above, the project manager has many responsibilities and things to keep in mind in order to lead a project in an optimal manner. This has lead to the development of

different project-management tools. Such tools can be used to ensure that the project will not exceed the time and cost budgets and the manager is less likely to forget vital parts in the project. A couple of tools and methods for project management are presented below:

Checklists are widely used to ensure that nothing important is forgotten (Lock 1996). It is a reasonably simple way of focusing attention on the right aspects (Chapman & Ward 1997). Different types of checklists may be used for different types of project, but it is always advantageous to have one. A complete checklist should include all possible aspects that may have an influence on the project and its costs, such as technical, commercial, statutory, environmental, and social. (Lock 1996)

In a project, it is necessary to include and plan when strategic decisions should be made. A helpful tool could be a *project methodology* which allows the project manager to plan the different steps of the project. The use of milestones and milestone analysis is a system to facilitate the time of the decision making, and can be a part of a project methodology. (Carter 1994) The milestone analysis is a simple method that can be used to compare the actual costs and time spent on a project with the cost and time that was planned to use (Lock 1996). Using milestones means employing a step-by-step process which must be followed in order to move on to the next stage (Carter 1994). The first step in milestone analysis is to define the milestones. This is done by identifying certain key activities, which are situated at points between significant phases of the project. A milestone is achieved when the pertinent milestone activity is finished (Lock 1996). When reaching a milestone the project manager and team can check how well they have followed the schedule and compare the actual outcome with the expected. The milestone analysis can hence be a tool for the project manager to control the risks involved in the project. (Carter 1994)

Another method that can be used in managing projects is *identification of success factors*. This means finding the factors that made previous projects successful and employing the same factors. (Engwall 1999) There is nothing new about learning from experience, but too frequently companies fail to learn lessons from old projects. (Boyce 1995) According to Kimbler and Ferrell (1997), there are a certain number success factors to consider in a project, for example, choosing a project theme or task description. Moreover, it is crucial to define the objectives of the project so that all parties involved have a clear view of the goals and the same expectations of the result. Once the project is initiated, maintaining focus becomes important. The team must stay motivated and committed. Another important success factor is how the project manager and the team are equipped to deal with potential problems which may arise when new tasks or modifications are added to the original project plan. (Kimbler & Ferrell 1997) Furthermore, every phase of the project should be pervaded by sound economic thinking and acting. (Jacobowsky 1991) Hence, it is vital to identify the success factors in each project in order to transfer and take advantages of them in coming projects.

3.2 Project Risk Management

"It is probable that the improbable will happen." Aristotle 384-322 BC

(Internet 2 and Hamilton 1996, p. 88)
This Aristotle quote illustrates the importance of being prepared to manage the unexpected. According to Carter (1994), to manage something means to control it. The first rule of risk management is to start working with the risks as early as possible. (Carter 1994) The purpose of risk management is to reduce future damage and loss, to minimize the total cost of risk and identify, control, and limit the impact of the risks. (Hamilton 1996)[3] Risk management is the key to better understanding of the project by the different parties involved. Through communication and risk assessment, a common view of the project can be created, when everyone involved is aware of the risks that the project faces. Through careful mapping of the risks, "grey" areas can be avoided, and these grey-areas are often a subject of conflict. (Grey 1995) Hence, the result of risk management can, if handled properly, be a happy company, satisfied customers, and shareholders. (Boyce 1995)

Depending on the business in which the company is active on, organisations have different needs for risk management. The degree of innovation and complexity in their activities and projects determines the need for managing risks in each specific project. (Carter 1994)
This is illustrated in figure 3.3.

---

[3] This is also stressed by Chapman, 1997
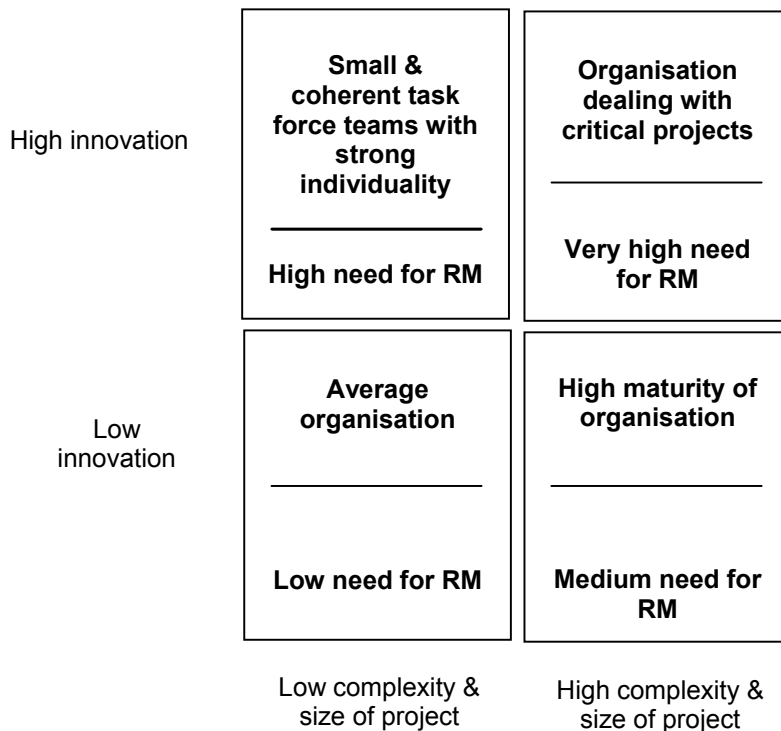
Figure 3.3 The need for Risk Management (RM) from 'the Montreal Group' (Carter 1994, p. 64)

3.2.1 Risk in projects

Risk is a confusing topic, and people from different environments are likely to refer to different things when describing risk. According to Kliem and Ludin (1997, p. 3)

> "*risk is the occurrence of an event that has consequences for, or impacts on, projects*"

The common view of risk generally focuses on the negative aspects of risk (Carter 1994). However, there is a close relation between risk, uncertainty, and opportunity (Burke 2003). As a matter of fact, there is only one word for risk and chance in Chinese which is indicates that risk can turn out to be an opportunity or a threat. (Hamilton 1996) According to the article *There's no such thing as a risk-free project*, risk in itself is neither good nor bad. Therefore, a risk does not necessarily have to be a threat or a problem in companies where good project risk management is developed. (Burke 2003) In fact, a company can get a competitive advantage from well managed risks since they can be priced.

When working on projects, risk can and will arise at different stages (Kliem & Ludin 1997). Often, the uncertainty associated with projects is greatest in the very beginning of the project (Chapman & Ward 1997). If no action is taken on a risk that appears in the initial phases of a project, the total impact of the risk on the project will be greater and it will be particularly costly

to attend to it later on since it will consequently affect the whole sequence of work. (Kliem & Ludin 1997)

According to Boyce (1995), all risks have a source. The table of the sources of risks below indicates that all projects are exposed to risk of both internal and external character (where in-house would be internal risks and the rest external risks). The table shows the sources of risk and gives examples of possible risks of each source.

Table 3.1 (Boyce 1995, p. 28)

Sources	Examples
Customer	geographically remote poor credit standing
Subcontractors/ Suppliers	different priorities technical competence
Third parties	regulatory bodies patent infringement
In-house	'risk naive' organisation under-resourcing

The grouping between internal and external sources of risk can also be illustrated in a risk map (figure 3.4) which shows how the degree of control is dictated by the source of the risk.
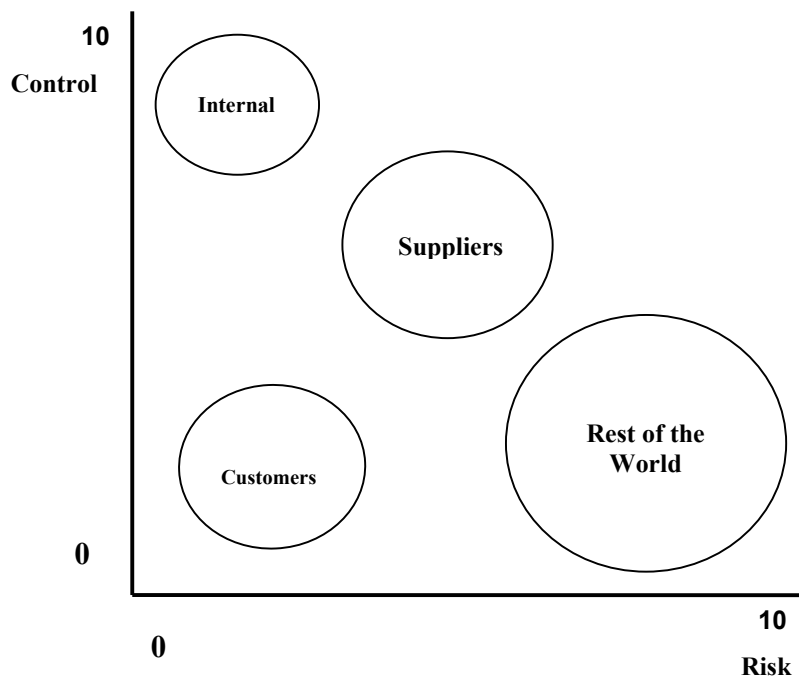

Figure 3.4 Risk map (Boyce 1995, p. 38)

The scale 0-10 on the control axis indicates the ability to control the risk, where 0 means no possibility of control and 10 indicates the possibility of total control. The same scale is applied on the risk axis, where 0 indicates no project risk and 10 major risks. If the risks are internal, it is relatively easy to exercise control. The risks connected to the customer, supplier and the rest of the world, on the other hand, are larger and much more difficult to control.[4] (Boyce 1995)

To control a risk successfully, knowledge about its existence and nature is necessary (Hamilton 1996). The risk map gives an overall indication of where the company should concentrate its attention. The internal risks can often be fully controlled and should therefore be attended to. Risk connected to the supplier can turn out to be quite large, but can be controlled with rather simple means, such as good relations and thoroughly detailed estimates. To control risk linked to customers is harder, but the risk can be mitigated through, for example, watertight contracts. Even though the "rest of the world" constitutes a large risk and the consequences can have disastrous effects on the project, they are very difficult to counteract and eliminate. Therefore, not too much energy should be concentrated on avoiding this risk. Instead, the company should focus on the controllable risks and ensure to mitigate or avoid these. With regards to external risks, the company should have a back-up plan to handle risks that are more difficult to control. (Boyce 1995) The different risks that can derive in a project are described below.

3.2.1.1 Internal risks

Project manager
The role of the project manager is vital to the entire project. But even so, the project manager sometimes actually constitutes a risk since he or she might make poor decisions. These may be the result of pressure from senior management or peers and may signify a lack of confidence. The project manager has to be able to exercise independent judgement. In complex projects there is also a risk of misinterpreting facts and data and the project manager must then make decisions based on limited information. The project manager has a difficult task and can sometimes feel that they lack "command and control" over team members. There seems to be tendency that the project manager waits too long before he or she asks for help, and the problem is then much more difficult to solve. (Kliem & Ludin 1997)

Another internal risk, concerning the project manager, is the unwillingness to learn from experience as well as from others outside the project. There exist tendencies that a project manager wants to do things his or her way and do not learn from others. It is important to set aside personal pride and to learn from the experience of others to avoid making the same mistakes. (Boyce 1995)

Project teams and its individuals
According to Burke (2003), the most common reason why a project team fails to accomplish the task, is low mental ability. Low ability means that the team is not able to take advantage of opportunities, that they are not good at problem solving and that they are unable to change with times. (Burke 2003) The composition of the project team involves gathering the human resources needed. If the "best" human resources are not available, there is a risk that the selected team may

---

[4] Boyce does not explain the different sizes of the risk bubbles.

not have the competence to finish the project within set timeframes. The project manager must to make sure that the team meets the project requirements and creates the best project team possible. (PM bok 2000)

Another common reason for project failure is lack of motivation and commitment among the team members. The project manger should encourage the team members to inspire and motivate each other to achieve the objectives of the project. (Burke 2003) If motivation lacks, there is a great risk that the project will not precede as planned. When motivational factors such as achievement, recognition, and advancement are present, they encourage high levels of motivation. (Kliem & Ludin 1997) Reward and recognition systems can motivate the team to keep, for example, time and cost limits. It is also important to work with team performance to create and keep motivation in a team. This can be done through team-building activities. The activities can vary from a five-minute agenda item in a regular meeting to an extended, off-site, professionally facilitated experience where the purpose is to improve interpersonal relationships. (PM bok 2000)

3.2.1.2 External risks

Customers
There are various risks that involve the customers. One is the customer's ability to pay for the project. This can be a problem if the project runs on for a long time, and the customer turns out to have liquidity problems when it is time to pay. Furthermore, a customer can, in certain cases, cancel a project at short notice. This result in a risk where the company is not always guaranteed full cost coverage for their work. (Boyce 1995)

Offers and Contracts
The company's offers and contracts can cause problems if they are not thought through properly. There are several aspects that are worth considering when putting together an offer or a contract. Three of them are the main objectives of a project: time, cost and quality. Time frames, price and the quality of the product developed have to be clearly written down so that no confusion can possibly arise. The cost of the project also has to be clearly broken down and there has to be clear agreement on what is to be delivered. The offer should also include how the prices are set, when payments are due and how additions or modifications are to be handled and priced. (Boyce 1995)

Stakeholders
Stakeholders are individuals and organisations that are actively involved in the project, or whose interest may be positively or negatively affected as a result of project execution or project completion. These stakeholders can turn out to be a risk as they may exert influence over the project and its results. (PM bok 2000) However, as Grey (1995) relates, everyone involved in a project will want slightly different things from it. The project team must therefore identify the different stakeholders and determine their requirements (PM bok 2000). The project manager has to decide which stakeholders they are most concerned with and whose views matter the most. This step is rarely given enough attention and is often overlooked, even though is it highly important to ensure that the point of view and expectations of the stakeholders and the supplier are the same. (Grey 1995)

Suppliers

There are various risks linked to the supplier. Some examples are that the goods can be "unfit" after delivery. The supplier can also go out of business and thus be unable to deliver. To avoid these risks the company should (Boyce 1995, p. 149):

- specify delivery dates in the order
- emphasise the importance of delivery on time by including "time is of the essence of the contract" in the order
- require progress reports/forecast from the supplier
- consider including liquidated damages
- remind the supplier from time to time of the importance of timely delivery
- include a termination for default clause

Risks concerning the rest of the world

Risks concerning the rest of the world can be, for example, global factors and changing markets, which lead to a lower demand of the company's products or services. Also stiffening global competition, shorter product-life cycles and natural disasters might be a threat to the project. These risks can have a tremendous impact on the project, but are difficult and maybe even impossible to control. The company must be aware of these risks and have plans or extra buffers to tackle them when they occur. (Boyce 1995)

3.2.2 Managing Risks in Projects

Project risk management is defined by the PM bok in Burke (2003, p. 253) as

"*...the systematic process of identifying, analyzing and responding to project risk...* [throughout the project life-cycle]".

Project risk management constitutes an extremely important part of project management, but is still not seen as a separate activity (Carter 1994). It includes the four important steps risk identification, risk analysis, risk control and risk reporting. (Kliem & Ludin 1997)

According to Burke (2003), it is the responsibility of the managing director to manage risk within the company. Nevertheless, risk responsibility is often delegated throughout the organisation. (Burke 2003) In some companies, the work is delegated to a risk manager, who handles and works on all the risks facing the company. The risk manager must have a bird's-eye view of all the risks within the company. His or her main task is to do continuously follow-ups of everyday activities, and the risk manager must spend much time walking around the different divisions, in order to keep updated on changes in the company's risk environment. It is therefore important that coordination between different areas and departments exists, so that risk knowledge from one area can be transformed and used in another. (Hamilton 1996) Today, the project manager is often expected to cover a wide area of competence including finance, technology, environment, procurement, politics and organisation. The project manager rarely is endowed with all the multi-functional skills needed for the project, and often lacks time. (Kippenberger 2000). To solve this problem, a risk manager can take part and act as a risk calculator and an expert concerning the company's risk. The risk manager can also work with

activities that aim to increase protection in order to decrease risk. In addition, he or she can be responsible for risk training within the company and act as a counsellor in all questions concerning risks. (Hamilton 1996)

To get the best out of risk management, it should become more a part of the company's culture and less of an administrative task. (Kippenberger 2000) The company's management style highly affects the way people within the organisation view and handle risk (Kliem & Ludin 1997). Management style has to be open and supportive if individuals are to accept this responsibility. They must feel that they can discuss problems without fear of being accused. This is firmly embedded in the culture and can only happen if there is a mature understanding of the value of project risk management from the very top to the bottom of an organisation. (Kippenberger 2000) The organisation's atmosphere has great influence on how project managers observe and distinguish risks. Risks are more often accepted in a stolid and hierarchical organisation whilst risk aversion dominates in less hierarchical organisations with fluid atmospheres. (Kliem & Ludin 1997)

All projects involve risks, which are both technical and commercial in character, adding up to a total risk, see figure 3.5. Even though the appraisal of technical risks in projects is very important, it is just as important to consider the commercial risks. The figure shows that even a company with functional technical risk management can never achieve successful total risk management without considering the commercial aspects of risk. (Boyce 1995)

Technical Risk Management	Commercial Risk Management	Total Risk Management
It worked	We got paid	Happy company
We finished it	We didn't get sued	Happy customer
Cost within budget	We made profit	Happy shareholders
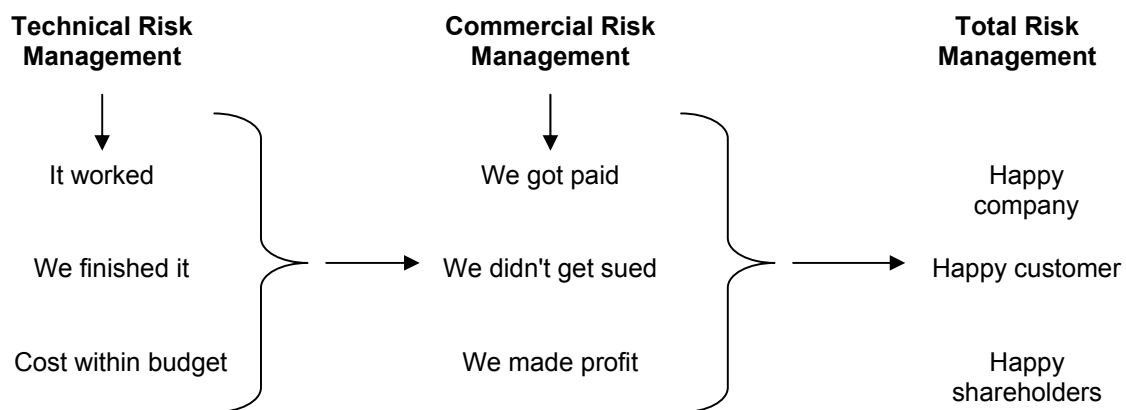
Figure 3.5 Technical, commercial, and total risk management (Boyce 1995, p. 29)

There are several different ways to describe the work sequence of risk management during the lifetime of a project. The main difference lies in how many phases the risk management process is divided into. We will describe a few authors' different viewpoints on the phases of risk management and try to combine these in four, perspicuous phases. A project manager must, to be able to perform risk management, appreciate what unforeseeable events may happen. To show this process the Deming Wheel can be applied, see figure 3.6. It can be explained as follows. Project managers must **plan** to carry out risk identification and to identify as many risks as possible. They have to **do** this by performing a risk analysis, which appraises the possibilities

and the impacts of a risk. They must **check** by performing a risk control and manage the impact of risk. Ultimately, they have to **act** by monitoring their established controls. (Kliem & Ludin 1997)
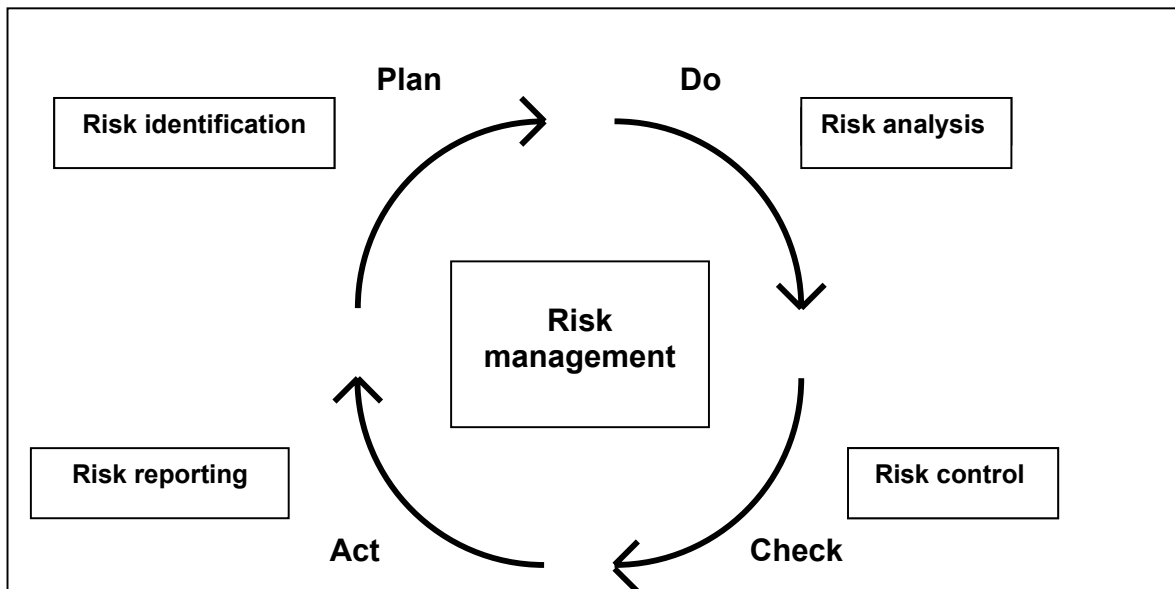
Figure 3.6 A continuous-loop risk management using the Deming Wheel (Kliem & Ludin 1997, p. 9)[5]

Risk identification
The first rule of risk management is to start working on identifying the risks as early as possible (Lock 1996). The process of risk identification usually encounters various problems and, according to Kerzner (1998) it is considered to be more a skill than knowledge. This is due to the fact that there are no exact rules on how risk identification should be done. Further, the perception of danger increases through previous experiences and the use of new technologies (Ansell & Wharton 1995).

There are several different methods for identifying risk. According to Boyce (1995), the three best techniques for identifying risks are:
1) Brainstorming
2) Interviewing
3) Drawing on existing risk database.

These techniques provide a wide search range for risks since the three methods differ in nature (Boyce 1995). Kliem and Ludin (1997) also highlight the importance of getting an outside opinion. An external consultant can see things that the project group would never notice. (Kliem & Ludin 1997)
A risk may be described as any event or constraint that prevents the achievement of the project's goals. For that reason it is important that the definition of the project's goals is well thought

---

[5] This figure is originally created by W Edwards Deming (Deming 1994, p. 132)

through and clear. (Burke 2003) It takes much effort to identify and rank the processes of a project and its major goals and risks (Kliem & Ludin 1997). Once the goals are defined, the factors of risk and uncertainty that can prevent reaching these goals must be identified. Risk identification should be a continuous process and is likely to be the most difficult part of the risk-management process, but also the most important.

Risk analysis

Risk analysis is used to estimate risk (Vose 1996). It includes listing, classifying and quantifying risks (Boyce 1995). A classification of the risks puts them in perspective and the project manager can decide whether the event is a showstopper or if it is recoverable (Kippenberger 2000). A quantitative analysis of the risk describes, as detailed as the analyst wishes, the level of uncertainty that the project faces. It also enables the analyst to compare different risks at an aggregated level, taking both probability and impact into account. Hopefully, this will lead to a more realistic attitude towards the task. (Grey 1995)

The risk analysis is done through a quantification of the probability that the risk will occur. It also indicates what impact or consequence of the risk. (Burke 2003) In the article *There's no such thing as a risk-free project* (2000), it is stressed that the likeliness of an event happening is culturally bound. This means that if, for example, the organisation is of the sort where people are pulled off projects and assigned to other tasks frequently, it must be taken into account in the judgement of probability. (Kippenberger 2000) The purpose of quantifying risks is to generate a statistical result of possible outcomes of the analysed objective (Vose 1996).

Impact/probability grids can be found in several of the used project management books (e. g. Burke 2003, Boyce 1995) and illustrates the probability of the risk occurring and the impact it would have on the project, see figure 3.7 (Carter 1994). In Carter's (1994) figure there are three levels of probability that the risk will occur and three levels of impact the risk will have on the project. A combination of the different levels of impact and probability characterises the risk as minor, significant, critical or unacceptable. Minor risk does not cause considerable troubles and represents a relatively small financial sum. Significant risk illustrates a situation where the occurring problems are operational, but have no connection to the budget. Critical risk consists of exposure to risks which can damage achieving the project's aims. Critical risk can also bring about considerable material and human damage and signify a major financial exposure. (Carter 1994) In simple terms, a risk potentially affects cost, time, or performance or a combination of these parameters. According to Carter (1994), the impact of a risk should be measured according to any or all of the three parameters. After having identified and considered both the impact and probability of each specific risk, the grid helps to point out where attention most needs to be directed (Boyce 1995).

	Low probability	Medium probability	High probability
High impact	Critical	Unacceptable	Unacceptable
Medium impact	Significant	Critical	Unacceptable
Low impact	Minor	Significant	Critical

Figure 3.7 Classes versus qualified risk impact and probability (Carter 1994, p. 55)

There are, of course, difficulties in ensuring that probability and impact are correctly evaluated (Carter 1994). The question even arises to whether it is possible to create prediction accurately (Boyce 1995). An effective method for quantifying risks can be developed or the risks can be roughly estimated through an awareness of the level of uncertainty. Using an effective method is clearly preferable but is not always cost-effective. For example, a complicated method is not needed when it is only necessary to find out that a risk exists and that it needs to be met, and not exactly which impact the risk will have or even the probability of its occurring. Approximate evaluation can thus be appropriate in certain situations, provided that the uncertainty in the information is handled carefully. (Carter 1994)

Risk control
Risk control is also an important part of risk management, since it puts the risk-management plan into practice (Burke 2003). It involves searching for and classifying responses for each identified and quantified risk (Chapman & Ward 1997). Risk control entails developing options and determining actions that will reduce threats to the project's objectives (PM bok 2000). It also involves reporting the status of the risks and effectiveness of the mitigation strategies to higher management (Carter 1994). In other words, risk control includes managing the impact of risk. In risk control a response plan should be developed. The plan delineates different methods of addressing adverse risk and enhances opportunities before they happen. (Kliem & Ludin 1997) It is often obvious how one could respond to a risk once its sources are identified. Nevertheless, it is not always the easiest response that is the most appropriate from the point of view of risk-efficiency; it may be worth identifying and considering other responses. (Chapman & Ward 1997) Different authors present the risk responses in their own way, and we have chosen to focus on what Lock (2003), Burke (2003) and Chapman & Ward (1997) have written to give a broad range of risk responses (see bullets below). There are a variety of responses, such as, avoid the risk, eliminate the risk, prevent or mitigate the risk, accept the risk, share the risk or limit the risk. These responses should be developed during the planning phase of the project. The different responses do not exclude each other, and the risk response plan may well be a combination.

- *Avoid the risk* means finding ways to eliminate the risk completely. In certain situations, this could mean not taking on the project at all.
- *Take precautions to prevent or mitigate the impact of risk*. This is a very important part of risk management, and includes reduction of a risk's probability and impact. This can be done through technical tests that ensure the functionality of for example a product.
- *Accept the risk*. If the company does not take any measures to influence the risk, they choose to accept it. An acceptable risk could be a risk that the project team cannot do anything about, for example that it rains on a big testing day. It might delay the project, but this type of risk has to be included in the time and cost calculations in the beginning of the project.
- *Share the risk* means finding partners that can undertake some of the risk, and the impact of any failure can be shared among the partners.
- *Limit the risk* can, for example, be done with the help of time and budget limits throughout the project.
- *Transfer the risk*. Some risks can be transferred to another party, through for example insurance.

Reporting and Reviewing in risk management

Risk management is to be seen as a continuous process with follow-ups of the options and measures against risks (Kerzner 1998). This last step involves the process of keeping track of the identified risks, monitoring residual risks and identifying new risks, ensuring the execution of risk plans, and evaluating their effectiveness of reducing risk (PM bok 2000). Frequent reviews and reassessments within the project lead to a gradually higher precision of the project. This in turn leads to risk reducing throughout the entire project, since a small problem in the initial phase might grow large later on in the project. This revision must also focus on the financial aspects of the project, and not only on the technical ones. (Jacobowsky 1991)

The project manager should in this phase be ready to report the results. This can be done through a formal presentation or as a document. The aim is to monitor the company's established controls and to check if there is a need to bring them up to date or improve them in any way. (Kleim & Ludin 1997) A careful review must be done in order to identify the success factors and the factors that appeared to create a problem. This must be done in order to help future projects and to avoid making the same mistakes twice. (Jacobowsky 1991)

3.3 Concluding comments

Regarding the increased use of projects in the daily work, project management and project risk management are of current interest. Despite that the authors studied in this thesis describe and name methods differently, there are conformities found in both project management and project risk management. The theory and figures of project management and project risk management described above should constitute the essential information needed to make an empirical study on Semcon.

4. EMPIRICAL STUDY

The empirical study follows the same outline as the theoretical chapter. It begins with a company presentation and continues with a description of how Semcon works in projects and with project-risk management. The theories from the third chapter are used as a framework for this chapter. All information in this chapter is gathered from interviews with employees at Semcon or collected from their Intranet, except for the models already presented in the theory chapter. We have also used information from the 2003 annual report. The fact that information and knowledge at Semcon are used to form the empirical study might contribute to some analytical paragraphs and figures in this chapter.

4.1 Company presentation

Semcon is one of Scandinavia's leading design and development companies in product development. Semcon's consultants help companies to develop products faster, with improved design, and featuring the latest technology. Semcon's two main business areas are technical consulting and project assignments for external customers. The industrial consultancy market has deteriorated in recent years because of the recent economical recession. Semcon's business offer is based on in-depth knowledge of product development and related areas. Today, Semcon takes full responsibility for total project-development projects, from idea to finished product, and will in the future focus their activities on securing larger and more complex total product-development assignments. Semcon is gradually moving from invoicing technical consulting for hours, via total responsibility for projects to partnerships with customers. This is due to the fact that the demand for detailed system knowledge, for project management, and for companies that take complete responsibility for projects, including risk, is growing steadily. Semcon has currently a strong market position as a technology and development partner for leading industrial businesses in the Nordic region. The customer base is broad, but there is a concentration on Vehicle, Telecom, Medical & LifeScience and Industry sectors. By offering partnerships and complete solutions in form of managing and performing large and complex projects, growth is expected, primarily in the Vehicle and Medical & LifeScience sectors. (Semcon annual report 2003) Semcon has started to focus on project activity and today, 30 % of the turnover is produced by value-based product development projects. The Semcon group's objective is to increase the project part to 50 %. (Interview with Financial Manager, 2004-04-13)

Semcon regards its developed products to be of high-quality as few of them get complaints in combination with returning customers is a sign of Semcon's good reputation. However, as Semcon acts in a competitive environment, it is important that they give the best offers to the customers seen in different perspectives as cost, time, and performance. Their position is shown in figure 4.1.
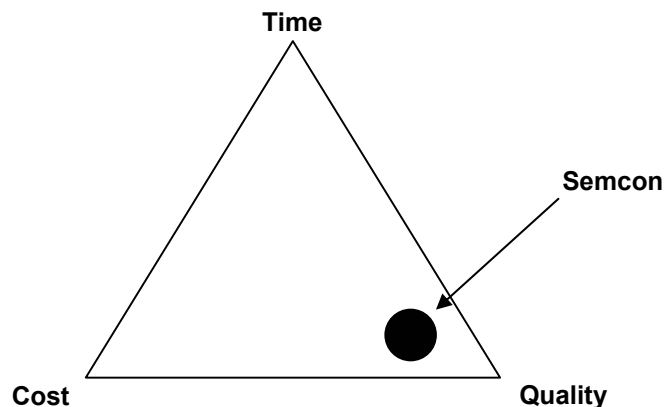
Figure 4.1 Semcon's position in the Time, Cost and Quality Triangle (trade-off) (Burke 2003, p. 22) according to the respondents.

Thus, in the trade-off between time, cost and quality, quality is clearly the most important parameter to Semcon. (Interview with project manager, 2004-04-26) Eagerness to obtain perfect quality sometimes leads to exceeding the time limits and therefore also the budget. This has been the case for several product-development projects in recent years, where it has been difficult for the project manager to calculate the exact hours needed to complete the project.

4.2 Managing projects at Semcon

Project management process at Semcon is initiated when a customer makes a request and finishes when the results of the project are handed over to the customer. Project management is primary carried out by the project manager and he or she is, when needed, supported by a steering group, controllers and a quality service manager.

Semcon's project managers have responsibilities regarding both technical and economical aspects. The project manager is usually only involved in one large project at a time. He or she makes the first calculation of how many hours the project will need and how much it will cost. After the hours are calculated, the project manager contacts the different departments from where a certain competences are required and makes sure that the project group has all the competence required for the project. An internal pricing model is used at Semcon and the project manager has to negotiate with the department managers for the price of the consultants. The formed project teams work in an open-landscape area for specific projects. In large projects when it is practically difficult to gather the team, the different disciplines are seated together. In most projects the project manager has his or her own office, close to the project team. The project teams are seated isolated from so that they are not disturbed by the every-day activities at Semcon. An important factor in a successful project is that the individuals in the group work well together, since one of the largest risks facing a project are the risk of lack of motivation within the team. One of the project manager's most important tasks is therefore to keep motivation high and ensure that the best suited human resources are at the right place at the right

time. A non-functioning team can negatively affect the motivation and commitment. If the project manager is able to establish a stable level of motivation, the probability of attaining a successful project is high. The ability to motivate the team members throughout projects is one of Semcon's success factors, although it is difficult to accomplish. According to the respondents the non-prestigious atmosphere at Semcon encourages the team spirit and raises the motivation.

The project manager is also responsible for calculating the risk premium that is added to every project. In an offer Semcon states the responsibility of certain risks. These risks are charged for and a risk premium is added to the price. This premium is 10% on hours needed and 15% on materials needed in all product development projects. (Interview with project manager 2004-04-26) Once the project is launched, the project manager has to make sure that the project runs as planned, which involves doing continuous risk analyses and finding strategies to react to the risks. When the project is finished, the project manager should create a white book where the sequence of work, the success factors, the risks, the problems and other useful information about the project are described. The purpose of the white book is to document all the events that occurred during the project. These documents can be very useful when starting up new projects. The white books are also used at the project-manager meetings, held twice a year, to share both positive and negative experiences among Semcon's project managers. (Interview with project manager, 2004-04-26)

As mentioned above, the project manager can get assistance from controllers concerning financial questions. There are three controllers working at Semcon and the major part of their work consists of general economic tasks; controlling the projects is only a sideline. The controllers are only involved in projects of a certain size and that involve a certain amount of money. The smaller projects hardly get any attention. The responsible controller contacts the project manager and checks up on progress. If everything is fine, the controller calls back the following week. If there appears to be a problem the controller and the project manager set up a meeting to address the problem. (Interview with controller, 2004-04-26)

4.2.1 Semcon's project control models

Today, Semcon has two different project-control models called PROPS and SMASH. These models describe the implementation of a project and identify the different persons involved. They also describe the time aspect and the use of deadlines. Each project can be entered into these models and be followed up. Before Semcon started using PROPS, SMASH used to be the only project-control model. SMASH was developed by Semcon, but does not completely cover the need of a project model. Today Semcon mainly uses PROPS and therefore this project methodology will be examined in this thesis. PROPS is an internationally acknowledged project methodology developed by the telecom company Ericsson, but does not always fit Semcon's projects because of its all-embracing character. Further, it does not employ the use of milestones, which suits the way Semcon works with follow ups. (Interviews with project manager and quality-service manager, 2004-04-30)

PROPS's project flow is illustrated with the shape of the letter U, where the process starts at the upper left and finishes at the upper right. As the project progresses there are different decision points called tollgates. The tollgates are means for the project manager to control the project

process and make sure that everything develops as planned. There are five tollgates, that all have predefined definitions and purposes. To be able to move on to the next phase in the projects, specific decision point has to be passed. (Semcon's intranet, 2004-05-04)

Today, not all project managers use the systems SMASH and PROPS. Semcon's ambition is though to get all the project managers to employ only one system, so that all projects can be followed up in the same way. The work of synchronising these two project methodologies into one system is under construction. The new system will be more customer oriented and more brought into line with what Semcon needs. (Interview with project manager 2004-04-26)

To improve the financial control of projects, Semcon is also constructing a new economical control system. The importance of controlling the economical issues of a project has become evident, as projects have repeatedly exceeded their budgets. The new system is composed of questions about the project. The questions are sent to the project manager by the controller responsible for the project. The project manager takes a stand on the different questions and enrols the project in the system. The controller compiles the answers and turns them into parameters such as percentage of completion of the project, costs compared to budget and invoiced of the total sum. It is this way easier to analyse the current situation of the project. The aim of this system is to make it easier to identify warning signals early and thus highlight problems before they are out of control. (Interview with controller, 2004-05-06)

4.2.2 Project phases at Semcon

The purpose of this section is to present Semcon's method when working in projects. This can be compared to the different project phases presented in the theoretical part of the thesis. The information about Semcon's project phases was collected through interviews and the project methodology PROPS, which outlines the project process. Semcon's process is divided into four phases.

1. *The pre-study phase*

This is the preparatory phase before the project is formally started. During this phase the business opportunity for the expected outcome of the project is considered. The phase begins when a potential customer makes an inquiry about a product they wish to develop. All relevant commercial, technical, and organisational aspects are then considered and addressed. The purpose of this phase is to ensure that a business idea is technically and commercially feasible and that it will fulfil the expressed and unexpressed requirements of the customer. The resources and the competence needed for the project should be identified during this phase. It also includes the preparation of a budget and a time schedule for the following phase.

2. *The feasibility study phase*

During this phase the scope of the project is defined, the project's objectives are formulated, the project organisation is formed and risks and opportunities are assessed. A quality system for the project is defined to ensure that the project outcome and performance will be aligned with the organisation's and the customer's quality demands. Project plans are developed during this phase. They should be detailed enough to establish realistic time and cost limits for the project and ensure proper control. Both internal and external resources needed in the project are

identified. This is also when the first customer meeting takes place and the project is discussed on a basic level. The meeting structure is planned and decided. The contact structure clarifies how communication is going to be conducted throughout the project.

3. *The execution phase*

During this phase the project organisation is fully established. The project management in this phase does the following:

- start up the project and build the project team with people from different departments within the company,
- confirm and review the project's budget, time schedule, and other plans,
- actively coach, integrate, and control the different parts of the project and steer it towards its goal,
- hand over the project outcome to the customer,
- gradually phase out human resources and project assets when these are no longer needed in the project.

4. *The conclusion phase*

This phase is initiated either as a result of a tollgate-five decision to start project conclusion or as result of a decision to terminate the project. Although most project members have already left the project during the execution phase, they should be allowed to spend time to contribute to the handover of experience in the conclusion phase. The project management in this phase should:

- ensure that the organisation is given the full opportunity to learn from experience,
- hand over competence developed in the project,
- document experiences in a final report and transfer the lessons learned,
- formally close the project, which incorporates taking care of all outstanding issues and closing all processes.
  (Semcon intranet, 2004-05-05)

These steps can be compared to Kliem and Ludin's model, see 3.1, in the theoretical part of the thesis. The following model, figure 4.2, illustrates the phases of the projects at Semcon.

| Prestudy | → | Feasibility | → | Execution | → | Conclusion |
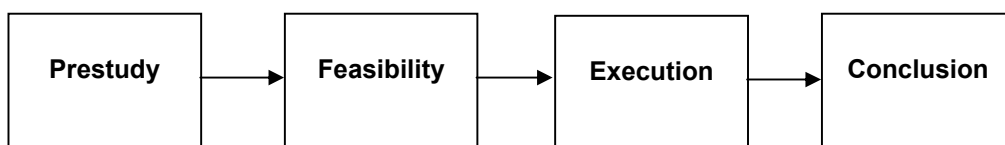
Figure 4.2 The project phases at Semcon (Semcon intranet 2004-04-29)

4.3 Managing project risks at Semcon

Semcon is a company that works with innovative activities, since new solutions and products are created. The projects are often complex, and consist of several parts. With this information, we can place Semcon in the square "organisation dealing with critical projects" and with "very high need for risk management" in Carter's map, the "need for risk management", see figure 4.3.

	Low complexity & size of project	High complexity & size of project
High innovation	**Small & coherent task force teams with strong individuality** ──────── **High need for RM**	**Organisation dealing with critical projects** **SEMCON** **Very high need for RM**
Low innovation	**Average organisation** ──────── **Low need for RM**	**High maturity of organisation** ──────── **Medium need for RM**

Figure 4.3 Semcon's need for Risk Management (RM) in Carter's modified figure (Carter 1994, p. 64)

Since Semcon is active in this type of environment they have a high exposure to risk. The relative size of the risk must determine what attention risk management should pay the project. In Semcon's case, the need for risk management is very high. The first rule of risk management is to start working with the risks as early as possible. (Carter 1994) In Semcon's case, this means taking time to do a car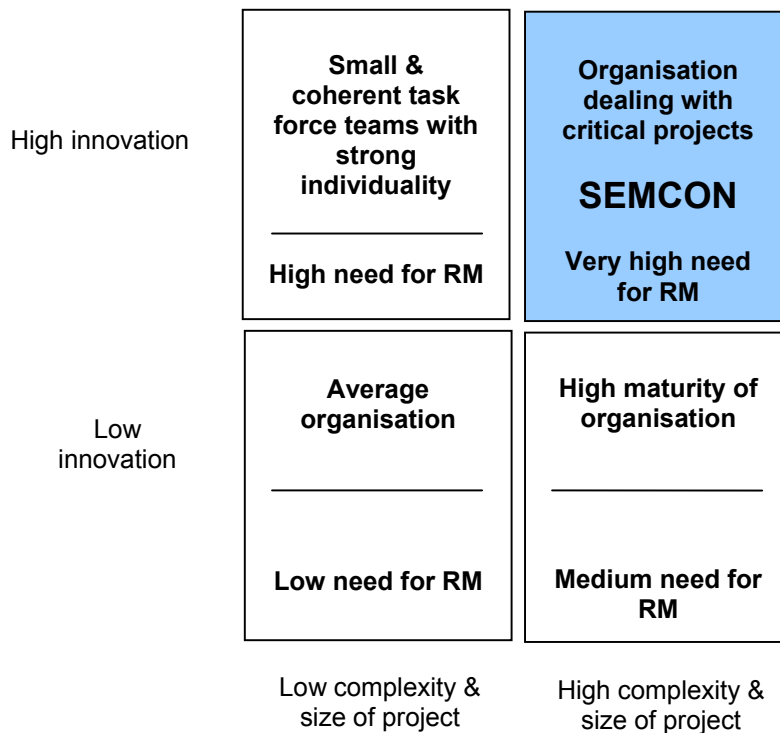eful risk identification and analysis as early as possible in the process of the project. According to Boyce (1995), a risk can be either of technical or financial character. Companies are faced with both technical and commercial risks and to attain total risk management, both technical and commercial risks have to be managed. This relation can be seen in figure 3.5.

4.3.1 The risks at Semcon

Although 80 % of the risks at Semcon are financial, almost all risk analysis concerns technical risks; this is, according to the respondents, despite the fact that most technicalities are solved. (Interview with project manager, 2004-04-26) Semcon's risks can be divided into four main groups. Various risks were discussed during our interviews. The 2003 annual report also identified the main risks. We have chosen to group the risks on the basis of their source using Boyce's four risk source groups:

Sources	Examples
In-house	*non-optimal allocation of employees*
	lack of motivation and commitment
	trade-off between quality and time
	lack of control
Customer	*liquidity problems*
	powerful stakeholders
	cancellation of project
	indistinct offers
Subcontractors/	*inability to deliver*
Suppliers	*inability to deliver on time*
Third parties	*stiffening global competition*
	shorter product-life cycles
	hindering regulatory bodies
	natural disasters

The risks can also be classified as internal, customers, suppliers and the rest of the world, see 4.4. This figure, inspired by Boyce (1995), illustrates Semcon's risks; how big a risk they are to the project and to what extent they are controlled today. The size of the "bubbles" does not represent the size of the actual risk. The risks shown in the figure 4.4 will be described below.
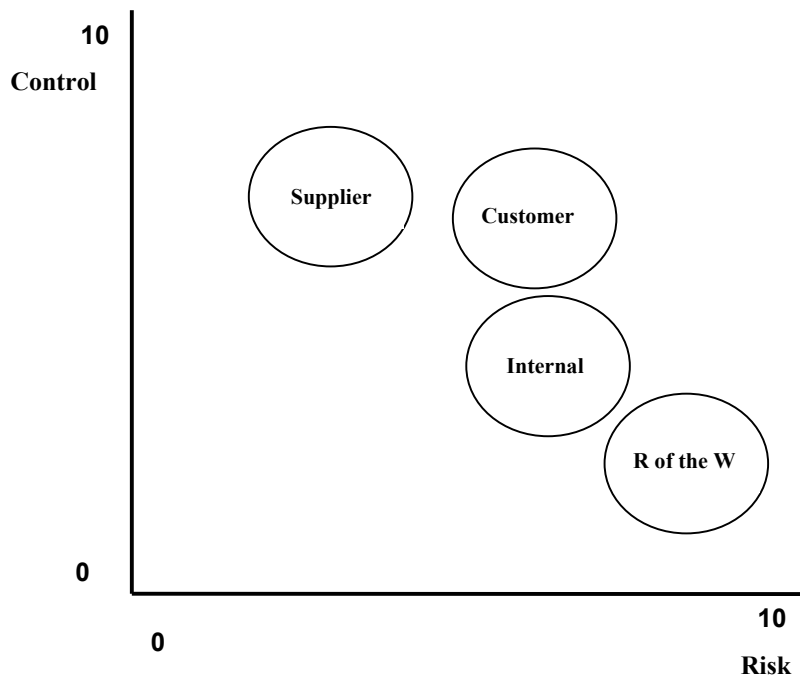

Figure 4.4 Semcon's risk map (Boyce 1995, p. 38)

4.3.1.1 Semcon's internal risks and risk response

Employees

One of the greatest risks in a know-how intensive company is that employees have to leave for some reason, or that the right employees are not recruited. The project manager is as mentioned responsible for keeping motivation and commitment high. In the beginning of most projects, a kick-off is arranged with the purpose of creating a team-spirit. An important task for the project manager is to find the right competence for his or her project. If this is done the motivation is not damaged by lack of competence.

Competence

The allocation of human resources appears to be a problem at Semcon. When initiating a project, the project manager contacts the different departments with an inquiry for people with special competences. Sometimes, the most appropriate competence for the specific project is already engaged in another project or working for external customers. The project manager then has to settle with a less competent team. Since internal pricing is used, the department managers of each area sell their employees' services to the highest-paying customer. This may lead to a situation where the project manager cannot get the competence needed within the company, and may have to engage consultants from other companies to help out. As a result, motivation may drop and the hours calculated for the project are no longer trustworthy. This leads to higher risk of delays and thus profit loss. (Interview with Financial Manager 2004-04-30)

The trade-off between quality and time

Delivering high-quality products or solutions is somewhat of a trademark for Semcon. There is a risk tough, that Semcon's quality focus might undermine the importance of keeping the project within the budget. Delivering high qualitative products is important for the company, but this can also be a risk as the projects might not be profitable. There is an internal system for quality checks that the respondents consider to be well functioning, and the products delivered by Semcon are of high quality. As already mentioned, a new economic control system has emerged.

Lack of control

At Semcon the general feeling is that senior management does not ask the project managers enough tough questions of a financial character. Usually, due to the technical competence within the company, quality is not a large risk and therefore does not need to be addressed by senior management. Cost and time, on the other hand, need more attention. The lack of tough questions can lead to that projects are out of control long before attention is drawn to the problems. The new economic control system will hopefully reduce this risk.

4.3.1.2 Semcon's external risks and risk response

Customer

Customer relation is the most important factor in a consultancy company's success. Due to innovative solutions provided by the consultants, customers return. A good relationship with the customer is formed by initiative, openness, competence, involvement, and reliability. However, there are various risks involved in customer relations. The project may run on for a long time, and the customer may turn out to have liquidity problems when it is time to pay. Another risk concerns the cancellation of projects, when customers cancel a project at short notice.

Consequently, Semcon is not always guaranteed full cost coverage for the work done, especially for those consultants who cannot immediately be transferred to another project. Another risk connected with the customer is the identification of key individuals among the stakeholders. When initiating a project Semcon has to try to identify if there is a determined, powerful stakeholder on the customer's side involved in the project. Quite often this is a person who attends the first project meeting and then is too busy to follow the process and the progress of the project. He or she returns when the developed product is completed and complains about details such as design. Most project managers mitigate the risks connected to the customers by doing careful financial checkups of the customers, writing specified offers and contracts. By invoicing at the beginning and continuously during the project, the risk of completing a project and not getting paid can be avoided. Also, the project manager gets help from the steering group to identify the stakeholders that might cause trouble in the later phase of the projects.

Offer and contracts
Not all project managers take the time to create proper offers. Poorly formulated offers and contracts may turn out to be a risk for Semcon. Every so often the customers want to make additions or modifications to the product under development. Semcon usually accepts these changes since they want to be service-minded and help the customer. At the same time they realise that the cost and time frames cannot be held, given this additional work.
When making an offer, price is an important aspect. A fixed rate is often used in the offer since it is an easy way to close a deal and obtain a contract. The number of fix rate projects is also increasing which makes this risk of current interest. However, in doing this Semcon exposes itself to the risk that the project cannot be finished within the budget. Furthermore, it is difficult to estimate the time required in a project, which may have a finishing date years ahead. This leads to an uncertainty concerning the costs of the project and thus the profit.

There is a great risk that the person estimating the hours is inexperienced or too optimistic in his or her calculations. In order to mitigate the risk involved, Semcon has a template specifying how to put an offer together and what should be included, for examples how additions and modifications should be handled. Some project managers use the template zealously and others shape the offer in their own way. Another risk that may arise at the negotiation stage is, for example, if Semcon's representative wants to please the customer and takes on a project on terms and conditions where Semcon cannot make a profit. Consequently, such behaviour may lead to price dumping, whereby Semcon gives an offer with a price that is lower than the estimated cost for the project. This sometimes occurs in an economical downturn and is done to keep employees occupied and the customers loyal to the company. Today, there are no specific countermeasures against these risks, but some new models are under construction.

Supplier's inability to deliver the ordered products or inability to deliver on time
Sometimes the supplier is unable to deliver the ordered goods, or the delivered goods are not of required quality. The supplier can also be unable to deliver on time due to an overestimation of their capability or capacity. This may cause a delay in the project, while some employees sit idle waiting for a new delivery, causing a project being stopped at Semcon. This in turn can effect the motivation in the team. A project stop is the most critical situation in a project and often leads to a drop in motivation and commitment. Semcon tries to mitigate these two risks with the help of

thorough check-ups of the suppliers and their competence, financial situation, and credibility. Well-written contracts protect the company from economical loss in situations where the supplier cannot deliver the products.

Global factors and changing markets
There are a number of external factors that can affect the customers' use of consultants and the demand for the services that Semcon offers. Stiffening global competition and shorter product life cycles are examples of these factors. Furthermore, an economical recession affects all business activities. Risks that are more difficult to control are, for example, natural disasters. Another uncontrollable risk that has affected the business climate all around the world in recent years is terrorist attacks. As shown before, these risks are difficult or impossible to control.

Regulatory bodies
All companies are in some ways affected by regulatory bodies and legislations. For example, when building a pharmaceutical factory, Semcon has to consider relevant laws and regulations. In case they do not, the regulatory bodies can interfere with activities and impose fines on Semcon. To avoid such penalties, Semcon works to keep updated on changes in legislation both in Sweden and abroad.

4.3.2 The steps of project risk management at Semcon
The risk management process at Semcon is formed in accordance with figure 3.6 (A continuous loop risk management using the Deming Wheel).[6]

Identifying project risks at Semcon
As a profit-oriented company; economic loss is unacceptable. There may be several reasons why a project shows negative figures, and therefore it is important that the company surveys all the risks connected to the specific project. The most common reason why a project oversteps its budget is that it exceeds the time limit. This can be due to various factors that are all equally important to identify, as missing out on one single risk can have tremendous effects on the outcome of the project. At Semcon, it is the responsibility of the project manager to identify the risks. He or she has a checklist of risks and needs to determine the probability of each risk. Obviously, this task becomes easier the more experienced the project manager is. The checklist is used in order to help identifying the risks. The information on the checklist has most probably been collected from previous projects and an objective database has thus been used.

Unfortunately, the checklist or variations of it, is not always used when identifying risks at Semcon. When using the checklist, the project manager has to use brainstorming to come up with all possible risks. The project manager also has the possibility of contacting other project managers who have been working in similar projects. Even though this is how it is supposed to be done, the respondents mentioned that there is a tendency that the project manager wants to carry through the project in his or her own way. If for example the project manager has to be replaced during a project, the new project manager often wants to change the process and do things his or her way. If this happens it could lead to the same mistakes being made twice.

---

[6] This sequence of work in risk management has been stressed by several authors among others Carter (1994), Burke (2003) and Boyce (1995)

Risk analysis at Semcon

Semcon employs a risk analysis model according to the Risk Priority Number-model (RPN) that can be found on Semcon's Intranet. The model quantifies the risks and ranks them according to how they severe they seem. The project manager defines predictable events and situations that will, in case they occur, affect the project and its result negatively. The project manager then evaluates the probability of the events occurring. He or she uses the following scale.

1 = Improbable
2 = Low probability of problems
3 = Certain probability of problems
4 = High probability of problems
5 = Very high probability of problems

The project manager then looks into the consequences of the event, if it happens. The following scale is used.

1 = Insignificant consequences for the project
2 = Only negligible consequences for the project
3 = Certain consequences for the project
4 = Severe consequences for the project
5 = Disastrous consequences for the project

To obtain the risk priority number, the evaluated number for both probability and impact are multiplied. This results in figure 4.5, which is inspired by *Classes versus qualified risk impact*

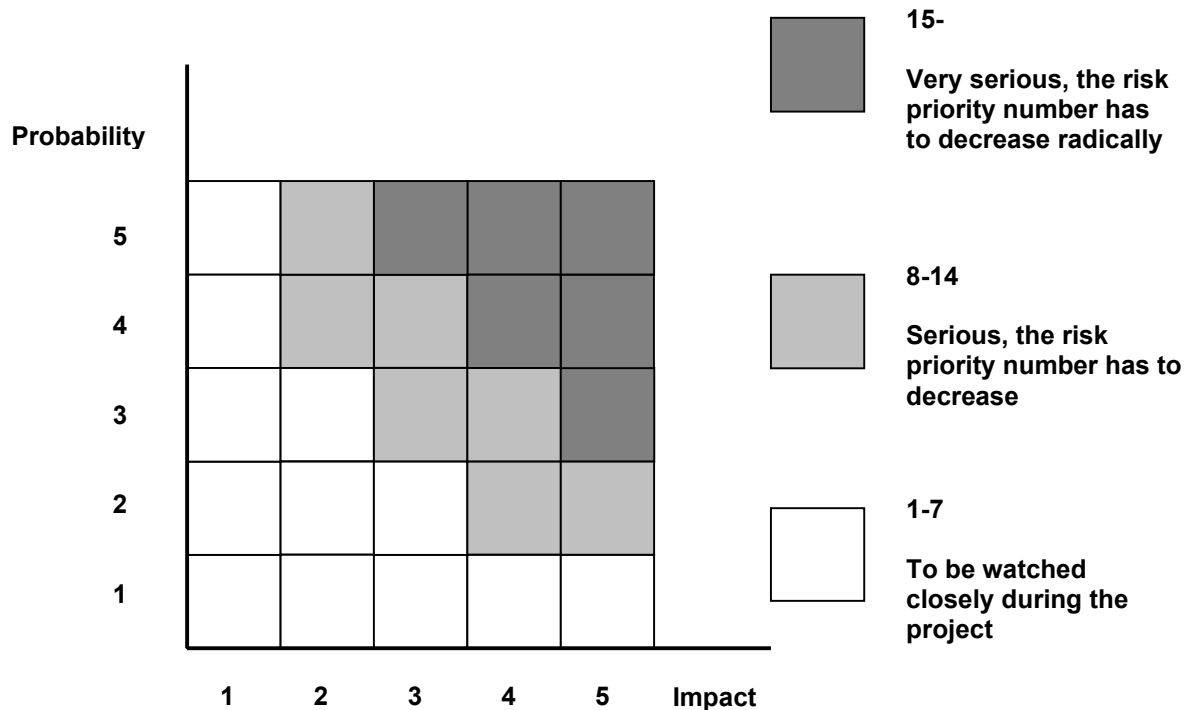*and probability* (figure 3.7, Carter 1994, p. 55).

Figure 4.5 Probability/impact matrix created on the basis of Semcon's Risk Priority Number model

It is very important that risk analysis is carried out before the offer is given to the customer. If this is done correctly, Semcon can declare in the contract that they are not responsible for the impact that a certain risk might have. If Semcon wishes to include this risk in the contract, they can use the fact that they take responsibility as an argument for setting a higher risk premium and thus a higher price. This is due to the fact that if an identified risk is of severe character and impossible to eliminate, the price given in the offer should reflect this risk. A risk premium, that includes all identified risks, is calculated by the project manager and added to the price in the offer. If the risk is considered to be extremely severe, Semcon can refrain from leaving an offer.

After the quantification is done, the project manager should look into the countermeasure list that follows the RPN calculation. This list highlights questions that the project manager needs to answer. Some of the questions are for example; How can we reduce the potential risks? How can we reduce the probability of it occurring? How can we reduce the impact the risks have on the project?

Risk control at Semcon
The most important part of risk control is deciding which means are appropriate to counteract the risks. This is accomplished by looking into how to reduce the possibility of the risks occurring and the impact that they will have on the project. At Semcon, again this is the responsibility of the project manager. He or she decides what to do about the identified risks and involves the

individuals needed in developing responses. Every project manager at Semcon has various ways of handling risk, but no standardised plan of how to work with risks exits. Semcon's countermeasures are presented in 4.3 (Managing project risks at Semcon).

Risk reporting at Semcon

Risk reporting is an important part of project risk management, yet it is often ignored or even forgotten. There is often an eagerness to move on to the next project and reporting an evaluating might not seem like the most important tasks then. It is the project manager's responsibility to compile a white book on the project. The white book explains the sequence of work and reports the project manager's opinions and views on occurred events and on solutions used. All white books are available on the intranet for other project managers. The purpose of the white books is to help project managers when initiating new projects. They can find useful information about projects of similar character and get guidelines on how to avoid problems that are specific for a certain type of project. Information about project managers and which kinds of project they have been involved with can also be found. Semcon organises project-manager meetings for all their project managers twice a year. Usually, one part of the meeting is of educational character, with lectures or workshops. The other part gives the project managers the opportunity to share both positive and negative experiences and to get advice regarding future projects.

4.4 Comments regarding the empirical study

This chapter has highlighted Semcon's situation and the respondents' observations of the company. The respondents at Semcon have created the link between the theoretical study and this chapter. With this information in mind, we can move on the analysis where Semcon's way of handling projects and their risks will be analysed.

5. ANALYSIS

In this chapter we analyse how well Semcon manages its projects and its project risks in relation to theory. The chapter follows the outline of project management and project risk management that can be found in the theoretical framework. The fact that several authors (e. g. Burke 2003, Lock 2003) have used the same way of defining project risk management gives the analysis more reliability. This analysis will then form the background for the following conclusion chapter.

5.1 Analysis of the project management at Semcon

The project manager is the single most important person in a project and should control all aspects of the project. Among other things, the project manager is responsible for the offer, the composition of the project team, its competence and motivation, and the risks connected to the specific project. Lack of motivation is one of the risks mentioned most frequently in the interviews. Motivation is rooted internally and should in theory not be difficult to influence. The problem with motivation at Semcon might indicate that the project manager does not have enough time to inspire, motivate and keep the team together. If he or she had more time, the risk could be reduced. The composition of the project team affects motivation and commitment to a great extent. In groups with well-functioning collaboration and communication, the team members feel inspired and motivate each other. Consequently, it is crucial that Semcon finds and educates project managers with the ability to find skilled people, put together a well-functioning team and motivate the project members throughout the project.

Semcon has clearly defined methods for working with project management. The two project methodologies, PROPS and SMASH, are functional tools in product-development project management when implemented correctly. However, there may be a problem in that the methodologies. During the interviews we have noticed that SMASH and PROPS are not used by all project managers. This could be because the methodologies contain too much information. Each web page contains a tremendous amount of information, which makes it difficult to determine which pieces of information are more important than others. The texts on the web pages are repetitive, and it can be unclear how they should be implemented. Further, some of the information is irrelevant since the methodologies do not fit Semcon's project activities perfectly. A new system, which is partly a combination of PROPS and SMASH, is under construction. This new project methodology is put together especially for Semcon and will eliminate the previous problems where the methodologies did not completely fit the company's activities. Unfortunately, we have not yet seen enough of the new system to comment on it.

Additionally, project managers have highlighted the problem of dealing with individuals in teams, particularly when there is one individual who creates an unpleasant atmosphere or does not have the competence needed. If an individual does not fit in the team and the problem cannot be solved within the group, he or she should be removed. Otherwise, there is a risk that the unpleasant atmosphere or lack of competence may affect the project team negatively and a drop in motivation ensues. At Semcon, this is not always done. It is untenable to have a non-functional individual in the team if the project is to be kept within timeframes and budget, and at the same time, reach the required quality standard.

Lack of motivation often arises when there is a shortage of competence in the project team as a whole or individually. The shortage can be due to the fact that the right competence sometimes is difficult to find, since employees at Semcon work externally as well as internally and an internal pricing model is used. The department manager is therefore likely to offer the resources to the highest-paying customer, external or internal. This means that even though the project manager has identified exactly who he or she needs to carry through a project successfully, it is not certain that the person required is available. In some cases, the project manager then has to settle for a less competent team than planned or even employ external consultants. This affects the three objectives of the project, quality, time, and cost, since the available employees might not have as much experience in the specific task as the proposed individual. With less skilled or suited people it is difficult to calculate how much time the project will need. This will most probably lead to an overrun of time, which in turn costs money, and thus budget is exceeded. In this kind of situation Semcon seems to avoid letting the shortage of certain competences jeopardise the quality of the product and thus their reputation. Instead the task will be solved in the best way from the point of view of quality, which might negatively affect the remaining parameters of cost and time. The problem regarding getting the most appropriate competence for a specific project is aggravated by the fact that bonuses for the different department managers are based on each department's turnover, which is due to the fact that consultancy used to be Semcon's only business activity. This problem can only be solved if Semcon reconsiders its organisation and makes appropriate changes in the organisational structures.

5.2 Analysis of the project risk management at Semcon

If Semcon is to grow through committing more in project activity, they need to stake more into project risk management.

5.2.1 Analysing Semcon's need for project risk management

Semcon is in control of its technical risks, but does not seem to have full control of its commercial risks. This means that total risk management cannot be achieved without improving commercial risk management (see figure 3.5). As showed in figure 4.3 Semcon deals with critical projects and needs therefore to use advanced risk management. Despite this, Semcon does not seem to organise and control the work using project risk management. Another reason why project risk management is important is that it offers Semcon the possibility to take advantage of the risks. Once Semcon is sure of its risk management, the risks can be priced or excluded from Semcon's responsibility in the contract. In other words, risks should always not be regarded negatively or with aversion. By choosing to take on controllable risks, Semcon can argue for a higher risk premium that is added to the price. If Semcon calculates the risk to be non-controllable, they can exclude that particular risk from the offer and contract.

5.2.2 Analysing the steps of project risk management at Semcon

Today, many of the project managers seem to handle risks in their own way. Although it is positive that the senior management place confidence in their project managers, it is also important that Semcon has an outspoken and acknowledged method to handle risk in projects. Today, it seems to be up to the project manager to interpret what is to be done. A homogeneous

method will facilitate the process and it will also be easier to see what has already been taken care of and what is left to do.

Analysing Semcon's risk identification

The first and most crucial step in developing effective project risk management is successful risk identification. Without accurate identification, the company cannot analyse the risks and therefore has no means of controlling them. The fact that the work is done early on the project process facilitates the rest of the work a lot. This was mentioned frequently in the interviews.

The respondents at Semcon stressed that it is important to invest a lot of energy in the pre-study phase, in order to avoid problems that may be more difficult to solve later on. Most project managers seem to identify the risks early on, but there are no exact instructions on how and when that should be done. Sometimes a project is initiated under quite a lot of pressure, and there might not be enough time to examine and evaluate the risks thoroughly. Once again, the project manager might have too little time to fulfil his or her tasks. However, there is a clear tendency that not enough attention is given to all the risks. Technical risks are more concentrated on than commercial risks. This might be explained by the fact that all the project managers at Semcon are engineers for whom technical interests usually come before commercial.

To help the work of risk identification, the project manager has a checklist. When done by the book, the checklist is a powerful tool that covers most of the probable risks facing a project. But Semcon's list has been added to for many years, which has made it very extensive (it consists of almost 200 risks). It is not obvious which risks in the list that is the most important. We find it hard to see how the list can be used efficiently. Some risks mentioned do not even appear to be risks, for example, geographical places for education and must be very difficult to evaluate, such as the project manager's competence since it is the project manager who uses the checklist in his or her identification. This may lead to a situation where the checklist defeats its own purpose, and as mentioned in theory, can have an intimidating effect and is therefore not likely to be used. Semcon needs a well constructed checklist that only concentrates on a few important risk areas. If the project manager considers one of the risks important, he or she should be able to click on the risk area and all risks connected to the area will appear. The project manager can then take a stand on all relevant risks. However, if the risk area does not seem relevant, the project manager does not have to enter deeply into it.

Brainstorming and interviewing are two effective means for collecting information from more experienced project managers at Semcon. Unfortunately, this does not seem to be as used as it should be. The attitude towards learning from experience and old mistakes has to change to attain more efficient risk identification. Semcon's problem during this first step of project risk management seems to be that it is solely up to every project manager to handle risk identification. Few others seem to be involved and this can lead to poor risk identification and future problems. Stricter instructions on how to proceed with risk identification are needed to ensure a more uniform sequence of work.

Analysing Semcon's risk analysis

The theoretical chapter stresses that the quantification of risks is necessary in order to spot the probability and impact of risks and decide what attention each risk should receive. The identified risks should now be quantified. Since the checklist is extensive it may be very difficult for the project manager to estimate the probability of occurrence and the impact on the project of every single risk. Again, the problem with some risks not being true risks arises; how are they to be quantified?

Semcon has well-developed informative texts specifying how the risk analysis is to be done using the parameters of probability and impact. Even here, there seems to be a problem with usage; some project manages believe they have a better way of doing it. However, when used, it does not give enough advice on what to do about the risks that receive a high RPN (risk priority number) after multiplying probability and impact. Risks with high RPN are considered to be very serious and according to the documents, have to be decreased radically. There is a short list of measures on what to do when serious risks occur. However, we do not consider the list sufficient since the measures do not tell how to act, but asking "eye-opening" questions. This is of course helpful, but we think that the list of measures needs to be more concrete to serve its purpose. For example, if the risk for example concerns economical issues, the immediate (although obvious) advice, ought to be to contact the controller and set up a meeting to discuss which countermeasures to use.

The risk analysis document also contains a "to-do" list with ten steps. The points are well thought through, and if all projects managers would employ and follow them, it would be easier to manage many of the risks. Unfortunately, there seems to exist an unwillingness to do this at Semcon. Project managers want to deal with the project their way and seem to think that their plan is superior and will lead to a successful project. It must be made clear how important it is to use other project managers' experiences. This was mentioned as a problem especially in cases where a project manager is pulled off a project and replaced by another. However, one reason for this unwillingness might be that project managers do not know how other project managers have handled things, since there are no explicit instructions on how to proceed in projects. They might therefore feel uncomfortable and insecure when taking over a project as they are not completely aware of what exactly has been done. Further, they do not want to be responsible for problems that arise later on in the project, due to the fact that the problems were not attended to when they first arose.

The problem for Semcon's project risk management at this stage seems to be that there is no complete straightforward method for quantifying risk. Good documentation is available, but the problem seems to be that it is not used. A better system for how to quantify risks has to be created. This system should contain a shorter list describing risks, and should hopefully be a better basis for decisions.

Analysing Semcon's risk control

Risk control involves searching for and classifying responses to each identified source of risk. (Chapman & Ward 1997) This is where Semcon's greatest shortcoming in project risk management arises. As illustrated in the risk map in the theory chapter (figure 3.4), the risks can be divided into four groups, internal, customer, supplier, and rest of the world. The ability to control the risk depends on which group a risk is placed. For Semcon, it is important to control all four different groups of risk. The internal risks are, according to the risk map, the easiest risks to control. Strikingly enough, this is where Semcon's control is inferior. The project risk management concerning the other groups seems to work better and more efficiently. Concerning the external risks linked to the three groups, standardised documents are used to avoid misunderstandings. For example, both customers and suppliers are carefully financially examined before any contracts are signed.

Semcon takes measures against several of these risks, but some seem to be left unattended. In the following part Semcon's measures against the risks that were mentioned in the empirical study are analysed.

Internal risks

One risk mentioned frequently is lack of motivation and commitment among project team members. At Semcon the conditions required to keep the employees motivated exists. The employees at Semcon have a high level of education. The headquarter is a beautiful, purpose-designed office building, and the premises are bright and inviting. The company recreation area, with gym, pool and sauna, is situated on the bottom floor and can be used at any time. To summarize, the environment at Semcon is very pleasant and the company seems to put a lot of work into the employees' well-being.

Consequently, Semcon has all the prerequisites necessary to maintain a satisfactory level of both motivation and commitment. However, things affecting motivation can still happen. One such event mentioned in the interviews is when the team members do not function on a social level. This may be due to one or several individuals, and such individuals must be removed if the situation does not improve. Of course, this is a difficult situation and project managers are sometimes unwilling to act in such circumstances. They may not want to deal with the conflict and remove the individual from the project. Unfortunately, these situations cannot be ignored in an organisation where time- and cost-limited projects constitute a large part of the activities. Senior management in the company has to make sure that the project managers feel confident enough to act instantly when such problems occur. Sometimes, a decision from the company's senior management is required; the project manager then feels support in his or her decision. A climate where it is fully acceptable to restructure a project team has to be created to avoid this problem. It is also important to ensure that this individual knows that he or she is wanted and needed in the organisation, but perhaps not in this specific project.

As mentioned, another reason for drops in motivation is when a project team lacks certain competence. Tasks that should be easy to solve take far too much time and the pressure on the team increases. The problem, which is about getting the appropriate competence, is due to the fact that employees at Semcon work internally as well as externally. An internal pricing model is used and each department manager runs his or her department as if it were a small company.

This is difficult to change as department's turnover, coming from external as well as internal projects, forms the base for bonuses.

Another internal risk is lack of financial control. Several projects fail to keep their time limits and cost restrictions due to this. This might be due to that all project managers at Semcon are engineers, who sometimes have too little economical thinking. One can argue that the overseeing of product-development projects is insufficient. Today, the controllers are mostly used when a problem arises, or when a specific problem of financial character has to be solved. Often the controller is contacted too late to be able to help solve the problem and keep the project within time and cost restrictions. Since the controllers are not active in the projects, they may have a poor understanding of the company's project activities. This would reduce the possibility of their advising their non-economist colleagues. A solution to this could be to let a controller be involved actively from the very beginning. Currently, the project manager has free hands; few tough questions are asked and interim reports are not given to senior managers or controllers, only final reports when the project is completed. However, a new economic control system has been taken into use. We see this as an excellent initiative. The new system should solve some of the controlling problems. Using it, the project manager must answer questions concerning the economical aspects of the project regularly. The system gives the controller an early warning if something that is not proceeding as planned or if the economical guidelines are not being attended to properly. With the new system the controllers will get more involved in the projects and there will hopefully be fewer project failures.

External risks
One external risk concerns the customer's ability to pay. Semcon controls the customer risks through careful check ups of their financial situation and takes many precautions to mitigate these risks. The new controlling system will probably lead to an even better control of this problem. Warning signs will appear early if for example the project is not at all invoiced while more than half of the work is already done. This problem is thus solved through earlier interference of the controllers, either personally or through the economical control system. We regard Semcon to be fully aware of financial customer risks and have the means for managing them, for example templates for offers, but the problem is that they are not properly used by all project managers.

There is one more risk linked to the customer that is far more difficult to control. It regards the powerful and influential stakeholder that does not give his or her opinions until the completion phase of the project. Semcon's aim is to identify these stakeholders as early on as possible to avoid their demanding last-minute changes. This is, however, up to every project manger and there are no rules on how this should be done. Some project managers or other Semcon employees, depending on experience and psychological awareness, have the ability to spot this stakeholder after only a few minutes in the first meeting. Once this is done, the project manager can focus on keeping this person updated on the project to avoid sudden interference at the last moment.

Offers can turn out to be risk-filled if they are not clearly written and specified. Each offer has to specify every aspect of the project in order to prevent unpleasant surprises such as additions or modifications. However, this can be difficult to do in advance. Semcon has a template for offers

that all project managers have access to. The template is an excellent way of avoiding problems due to uncertainties between Semcon and the customer. Some departments put a lot of work into offers and according to the respondents these departments seldom have offer-related problems. The problem is that not all project managers use this extensive type of offer. If a standardised offering system could be used for every project, some of the potential problems with the customer would be avoided. Before the offer is handed to the customer it should be read carefully by several different individuals in the company in order to find any unclear points.

Suppliers can be a risk for Semcon. If the supplier, after confirming that they have the capability, cannot deliver the ordered products or can not deliver them on time, the whole project may stand still for a period. To mitigate this risk, Semcon performs careful checks-ups of all their suppliers. We consider this measure to be sufficient to avoid this type of risk.

There are also various external risks that are connected to the rest of the world and that are very difficult to control. In Semcon's case such risks concern factors that affect the customers' demand for consultancy services. Such risks are almost impossible to control, but we consider Semcon's efforts to stay competitive and its stake in technological development sufficient. Semcon handles risks connected to regulatory bodies, such as rules and laws, in the best possible way. Following the law in different countries is important, since heavy fines may be the result of not doing so. Through having experts in each sector, Vehicle, Telecom, Medical & LifeScience and Industry sectors, this risk can be avoided to the extent possible.

Analysing Semcon's risk reporting
The purpose of risk reporting is to spread information and experience about already completed projects. As mentioned in the empirical study, Semcon does this through compiling white books, a project managers' database where information can be found, and by arranging project-manager meetings twice a year where experiences are shared. These are all good ways of finding and spreading knowledge and experience within the organisation. According to the respondents a non-prestigious atmosphere exists at Semcon, and this means that it is alright to admit to not having all answers and this open attitude can prevent the same mistake being made again. Unfortunately, the means for finding information are not always used; perhaps due to lack of time or interest. If this had been used efficiently, many problems in projects could be avoided.

For example, when a project manager for some reason has to be replaced during a project, the new project manager wants to do things his or her way. This means that some of the knowledge from the "old" project manager is lost. Not all project managers are interested of learning from other. This attitude has to change. They might feel that it is too time-demanding to search for old similar projects and find the name and telephone number of project managers experienced in the appropriate field. The solution may be found in the new project methodology that is currently under development. When logging in with a project the first time certain pieces of information such as task, product, number of people involved etc. are probably filled in. When this is done the system gathers the information and searches for old projects that can useful for the project manager to look at. The project manager then does not have to invest too much time getting useful information about similar projects. This way, the shortage of time cannot be used as an excuse for not using the project managers' database and contacting experienced project managers.

5.3 Analysing the risk culture at Semcon

The majority of the employees at Semcon are technicians, which explains the strong focus on quality. However, as Semcon is gradually moving towards a more project-centred business, they also have to widen their focus to include more of the two other parameters, time and cost. As mentioned before, there is a strong interrelation between time and cost, and this needs to be recognised among the project team members. Using all necessary channels of information Semcon has to spread risk thinking and risk awareness throughout the organisation.

The attitude towards project risk management at Semcon appears to be positive. According to the respondents, some employees are aware of the fact that they need to become a more risk-focused organisation. This awareness is positive, since introducing something new in a negatively disposed organisation is difficult. Semcon's open-minded and relatively young organisation has all the conditions to accept a new way of thinking concerning risk.

5.4 Concluding analysis

After having examined project management and project risk management in theory and in practice, we have found that there is a relation between project management and project risk management. If project management in a company is carried out by the book, few risks arise, and project risk management does not have to be as central. If the project management is, on the other hand, inferior many risks will occur. As a result of this much effort has to be put into managing these risks. In other words, there are two possibilities of handling risk in project. However, a well-developed project management does not exclude the event of risk occurring. This means that a highly developed use of project management does not suggest that project risk management can be neglected or vice versa.

6. CONCLUSIONS AND SUGGESTIONS

This chapter will present our conclusions, based on the analysis. Conclusions regarding the purpose will be presented. Further, we will suggest ways of improving project management and project risk management at Semcon.

The purpose of this thesis was to analyse how Semcon works with project management and project risk management. To fulfil the purpose we mapped out the general risks in product-development projects and analysed how Semcon acts to manage these risks. The following conclusions can be drawn.

6.1 Conclusions

Semcon has expressed a wish to grow through committing more deeply in project activities, and if this is to be a safe option, the project management and project risk management cannot be neglected in any way and has to be carried out more professionally.

- • The project methodologies that are used today are too extensive and must become more user friendly. Our conclusion is, however, that Semcon has taken notice of this since a new project methodology that meets their specific requirements is under construction. A standardised way on how to handle every part (such as making offers, calculating hours, team building) of project management has to be formed by Semcon's senior management and used in all projects. They should try to ensure the use of systems, methods, and recommendations by informing staff that employment of these can facilitate the work of project management.

- • We have also reached the conclusion that the organisation is pervaded by a belief in technical quality and there is sometimes a shortage of economical thinking. There does not seem to be enough economical involvement in the product-development projects. It would be a good idea to involve a controller earlier in each project; maybe just to set up an economical plan for the project that can facilitate the controllers' future follow-ups. Hopefully, the new controlling system will partly solve this problem, since it will force the project managers to consider and report financial data to the controllers.

- • If Semcon is to move towards working more in projects, they have to shift from the old organisation with departments and internal pricing models to a more project-oriented organisation. Today, the project manager sometimes does not get the required competence for the project, since the different departments' consultants also work externally. The fact that Semcon's bonus system is based on this departments' total turnover, including internally invoiced hours, makes the problem even more difficult to solve. There is no incentive for the department managers to favour internal inquires. There are no countermeasures against this risk as long as the company is organised this way and the bonus systems are based on each department's turnover.

- Semcon does not have a homogeneous method for handling risks or project risk management, nor do they have adequate documentation that describes how project risk management should be conducted. This is despite the fact that Semcon, according to our analysis, is a company dealing with critical projects that face several different risks. The risk management steps seem to be done with a certain routine, and Semcon relies on its project managers' experience and knowledge in project risk management. The fact the project risk management is not given enough attention in combination with insufficient economical thinking, might in certain cases lead to non-profitable projects and project failures which is exactly what Semcon wants to avoid. To summarize, there is no outspoken policy on how to handle risks. Semcon has to invest more in project risk management, for example, through employing a so-called risk manager. This risk manager is an expert in risk, who can calculate project time and cost as well as work with the risks involved. The risk manager would assist in handling risks, but parts of the active work with risk would still be delegated to all employees. With this in mind, the project manager can focus on the project task and the team. Our conclusion is that Semcon's documentation on project risk management is not sufficient for a company working with such risk-filled projects and that Semcon needs to consult a risk manager.

- Our suggestion to Semcon is not to avoid all risks, but to avoid those risks that do not generate any income, for example, lack of motivation. The risks that, on the one hand, can generate income should not be avoided but should be controlled and added to the risk premium and thus the price. But if this is to be a safe option, project risk management has to be under control. Otherwise, all risks should be avoided.

To summarize, if a standardised method for working with project risk management is adopted by Semcon, we see no problem in growing by taking on larger and more complex projects. Semcon does not lack the ability to handle risk management; the risk management has just not been properly initiated. If project risk management was used properly, we see no reason to why future projects would fail to keep time restrictions and budgets and still be off high quality.

6.2 Suggestions for further research

Here, we will give suggestions for further research on the subject. This thesis has examined project management and project risk management. Along the way, we have discovered interesting angles that can be studied, both within Semcon and in the business in general. As this is not considered in this thesis, it is still left to investigate.

- Since the empirical study has been of a qualitative nature, a suggestion for further research could be to see if the results in this thesis are true in other companies.

- A follow-up on this thesis could also be of interest. Will Semcon grow by taking on more projects? If yes, how are they handling risk management in the new projects?

- An interesting issue to study further might be how Semcon can re-organise so that the departments are not measured on their profit. It is not optimal for a company that wants to grow by taking on more projects to have bonuses for the managers that are based on the

result for each department. This could lead to the situation where the managers for the departments get bonuses, while the projects are showing negative figures. This means that the bonuses are paid with money that is not externally invoiced and is therefore no real revenue for Semcon.

BIBLIOGRAPHY

Literature

Ansell, J. and Wharton, F., *Risk: Analysis, Assessment and Management*, Wiley & Sons, Chichester, 1995

Björk, E., *A contribution to Insider Active Research*, PhD Thesis, Otto-von-Guericke Universität, Magdeburg, Germany, 2003

Björk, L. and Räisänen, C., *Academic Writing: A University Writing Course*, Studentlitteratur, Lund, 1996

Boyce, T., *Commercial Risk Management; How to identify, mitigate and avoid the principal risks in any project*, Thorogood Ltd, London, 1995

Burke, R., *Product Management*, Biddles Ltd, Guildford, 2003

Carter, B., Hanock, T., Morin, J-M. and Robins N., *Introducing Riskman Methodology - The European Project Risk Management Methodology*, NCC Blackwell Ltd, Oxford, 1994

The Certified Quality Manager Handbook, American Society for Quality (ASQ), Quality Press, Milwaukee, 1999

Chapman, C., Ward, S., *Project Risk Management- Processes, Techniques and Insights* John Wiley & Sons Ltd, West Sussex, 1997

Deming, Edwards W., *The New Economics – for Industry, Government, Education*, Massachusetts Institute of Technology Center for Advanced Engineering Study, Cambridge (USA), 1994

Ekholm, M., and Fransson, A., *Praktisk Intervjuteknik*, Norstedts Förlag, Stockholm, 1992

Engwall, M., *Jakten på det effektiva projektet – andra upplagan*, Nerenius & Santérus Förlag AB, Stockholm, 1999

Eriksson, L. T. and Wiedersheim-Paul, F., *Att utreda forska och rapportera*, Liber Ekonomi, Malmö, 2001

Grey, S., *Risk Assessment for Project Management*, John Wiley & Sons, Chichester, 1995

A Guide to the Project Management Body of Knowledge, Project Management Institute, Newtown Square, 2000

Hamilton, G., *Risk Management 2000*, Studentlitteratur, Lund, 1996

Holme, I. and Solvang, B., *Forskningsmetodik – om kvalitativa och kvantitativa metoder*, Studentlitteratur, Lund, 1997

Jabobowsky, B., *Projektekonomi i verkligheten*, Konsultförlaget AB, Uppsala, 1991

Kerzner, H., *In Search of Excellence in Project Management*, Van Nostrand Reinhold, New York, 1998

Kimbler, D.L. and Ferrell, W.G., *TQM based project planning*, London, 1997

Kinnear, T. and Taylor, J., *Market research: an applied approach*, 1991

Kliem, R.L. and Ludin, I.S., *Reducing Project Risk*, Gower Publishing Limited, Hampshire, 1997

Larsson, A., *Ekonomisk styrning och organisatorisk passion: Ett interaktivt perspektiv*, Linköping Universitet, Linköping, 1997

Lekvall, P. and Wahlbin, C., *Information för marknadsföringsbeslut*, IHM, Göteborg, 2001

Lock, D., *The essentials of Project Management* Gower Publishing Limited, Hampshire, 1996

Lock, D., *Project Management – eighth edition*, Gower Publishing Limited, Hampshire, 2003

Lundahl, U. and Skärvad, P-H., *Utredningsmetodik för samhällsvetare och ekonomer*, Studentlitteratur, Lund, 1982

Meredith, J. R. and Mantel, S.J. JR., *Project Management: A Managerial Approach*, John Wiley & Sons, New York, 2003

Merriam, S B., *Fallstudien som forskningsmetod*, Studentlitteratur, Lund, 1998

Ottosson, S., *Dynamisk Projektverksamhet*, Tervix Förlag, Floda, 1999

Ryan, B., Scapens, R. W. and Theobald, M., *Research method and methodology in finance and accounting*, Thomson, London, 2002

Svenning, C., *Metodboken,* Lorentz Förlag, Eslöv, 2000

Vose, D, *Quantitative risk analysis : a guide to Monte Carlo simulation modelling*, Wiley & Sons, Chichester, 1996

Yin, R. K., *Case study research: design and methods*, Thousand Oaks., CA Sage Cop, 1994

Internet

Internet 1
Famous Quotes
http://quotations.about.com/cs/moretypes/a/bls_famous.htm
2004-05-16

Internet 2
Norwegian University of Science and Technology (NTNU)
http://www.risikoforsk.no/rus.htm
Publikasjoner
Theory Formations related to the "Risk Society" by Jan Hovden, NTNU – NoFS XV 2003,
Karlstad, Sweden 13th to 15th June 2003
2004-05-16

Internet 3
Project Management Institute
http://www.pmi.org/info/pp_pmbok2k_conf.asp
2004-04-23

Articles

Hörte, S-Å., *Hur kan man ge struktur åt rapporter och uppsatser?*, Luleå tekniska universitet, 1999

Kippenberger, T., *There is no such thing as a risk-free project*, The Antidote, Volume 5, 2000
Found in the database Emerald

Palmquist, A., Sundström, M., *Att skriva rapporter*, Högskolan i Borås, Utgåva 2, 2003

Appendix 1 - Interview guide

The interviews were more of conversational nature. The following questions were not used as a questionnaire, but to get the discussion started. Additional questions may have been asked, but are not included in this interview guide.

Conversational interviews
First interview 2004-04-26
Mats Eric Olovsson, Project Manager, Manager Industrial IT
Desirée Benjaminsson, Controller

- How is work in projects conducted at Semcon?

- Does Semcon have a standardized method of working in projects?

- What are the responsibilities of the project manager?

- Why do projects fail?

- Which parameter of time, cost, and quality is the most important when working in projects at Semcon?

- How is the financial control carried out? What role does the controller have in the projects?

- How are the projects priced? Who calculates the price?

- Why is project risk management a problem for Semcon?

- Which risks are product-development projects faced with?

- Are there factors crucial for success? How are success factors identified?

- How are these risks identified?

- How are the risks analysed, controlled, and reported?

- Which risk is the most crucial to control? Which risk affects the project most?

- Who is responsible for risk management?

- How is risk management carried out? Is there a risk manager? Are there any models for risk management?

Second Interview 2004-04-30
Mats Eric Olovsson, Project Manager, Manager Industrial IT

- Which project methodologies does Semcon employ?

Third Interview 2004-04-30
Anders Löwgren, Financial Manager
Lars Idmyr, Quality-Service Manager

- Who is responsible for project risk management?

- Which risks are the product-development projects faced with?

- Are there factors that are crucial for project success? How are the success factors identified?

- How is internal pricing handled?

- In what way is project risk management a problem for Semcon?

Fourth interview 2004-04-27
Sture Smith, Project Manager

- Clarifying questions to the answers in the first interview (with Mats Eric Olovsson and Desirée Benjaminsson) regarding risk attitude at Semcon.

Fifth interview 2004-05-05
Christian Wersten, Controller

- How will the new economic control system work?