UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Financial Evaluation of Innovation Projects

-A case study of SCA Hygiene Products and AstraZeneca

Bachelor Thesis in Industrial and Financial Management

Spring 2013

Authors

Frida Wall Olsson 890216
Melinda Elmborg 911026

Supervisor

Ziaeddin Mansouri

2013-05-29

Abstract

Innovation plays an important role for companies' success in today's economy, but the investment decision making is complex as the future outcome of innovation is uncertain and difficult to estimate. Therefore, the firms' choice of innovation process, the appraisal techniques and risk management are highly important and those parameters are also the focus of this study. Two large Swedish companies in different industries have been investigated, SCA Hygiene Products that is a hygiene and forest products company and AstraZeneca that is a pharmaceutical company. The comparison of these two companies is interesting since both often are considered innovative.

The intent of this thesis was to gain a better insight in how to analyze the evaluation of different investing approaches to the innovation process at SCA Hygiene Products. It was also desirable that the outcomes of this investigation could constitute a suitable platform for a recommendation to SCA Hygiene Products on how to improve their work in this field.

The study is qualitative and was performed through a combination of literature studies and interviews with five employees at the two selected companies. The data used in the theory is secondary data while the data in the empirical part is primary data gathered from the interviews.

The interviews showed that SCA Hygiene Products mainly works with incremental innovation while AstraZeneca is focusing on radical innovation. Therefore it is not that surprising that SCA Hygiene Products does fewer appraisals than AstraZeneca, though what is remarkable is that they just use one technique, NPV, in their financial evaluation. Thus, this led to the recommendation that SCA should use at least a few more investment appraisal techniques than they do today. Regarding the innovation process the impression was that it is well developed, but one thing that could be applied is a scalable stage-gate® process where simple projects go through a shorter process than more complicated projects do. In addition, SCA does not do any risk calculations which therefore is another point that could be improved.

Table of Contents

1. Introduction

1.1 Background

The investment decision making in companies is crucial for innovation projects, though not simple as the future outcome of innovation is uncertain and difficult to estimate. It is the high degree of uncertainty that differs innovative projects from other projects such as investment in, for instance, equipment (Oke, Walumbwa & Myers 2012, p.277). According to Amram (2005, p.68) only 10-15% of all innovative projects are successful on the market.

Cainelli, Evangelista and Savona (2004, p. 117) state in their study that it is acknowledged that innovation is crucial for economic growth and the competitive process. Many studies have been done in the field because the innovation process in important for companies. However, most studies are based on surveys to find out about companies' attitude to innovation and their methods used for the innovation process (Radas & Bozic 2012, p. 649-669; Cainelli, Evangelista & Savona 2004, p.116-130; Jaruzelski, Loehr & Holman 2012, p.1-14). Whereas not many studies have performed a more in-depth study built on interviews at companies, this thesis therefore aims to contribute to the field by accomplish interviews with two large companies to get a closer look on the companies' method used in their innovation process, with focus on the financial evaluation.

The first company is SCA Hygiene Products that is a large global hygiene company that is producing and selling hygiene products such as paper rolls and napkins, diapers, feminine pads and liners and other hygiene solutions. SCA Hygiene Products is a part of SCA group that has 36 000 employees and has sales in about 100 countries around the world. SCA Hygiene Products' product groups are the following: incontinence care, baby diapers, consumer tissue and away from home professional hygiene solutions. Their brands are named different in different countries and markets, one large brand in Sweden is for example Libero baby diapers. Net sales for SCA group, where SCA Hygiene Products is included, accounted to SEK 85.4 billion in 2012 (SCA Annual Report 2012, p.3). SCA Hygiene Product's headquarters is based in Gothenburg, Sweden.

The authors find SCA Hygiene Products interesting since it is a global manufacturing company with comparably short lead-time for innovation projects as they are present on competitive markets where the customers often demand new innovative products. SCA's

CEO Jan Johansson states in the annual report (2012 p.3) that "Our ability to create a culture of innovation and reward out-of-the-box thinking so that we surpass costumer and consumer expectation is vital to SCA's profitability and growth", he also writes that "we are working on accelerating the innovation process". Therefore, innovation is a big part of SCA's innovation strategy.

Further, it seems that AstraZeneca is an interesting company to compare with SCA Hygiene Products because it is also a large company, but in a different industry where innovation is a key for the business and the lead-time for innovation is long. There are two types of innovation, incremental and radical. Incremental innovation is the type of innovation where an existing product is improved or maintained whereas radical innovation means that a new product is developed. Radical innovation often involves longer lead-time and more risk (Afuah 2003, p.14). AstraZeneca's business is dominated by radical innovation while SCA Hygiene Products' business is focused on incremental innovation and development of existing products. On this basis, the authors find it interesting to compare the innovation processes of the companies.

AstraZeneca is a large global biopharmaceutical company with net sales of SEK 181.8 billion in 2012 and 51 700 employees around the world. Some of their products that are of importance are for instance Crestor, a medicine that improves cholesterol levels, Nexium that is curing acid reflux and Symbicort which is treating asthmatic problems (AstraZeneca Annual Report 2012, pp. 2-3). The headquarters of AstraZeneca is based in London, United Kingdom. AstraZeneca is considered a major innovative company in the world and 2011 the company was listed as number 20 on the list of the top R&D spenders in the world (Jaruzelski, Loehr & Holman 2012, p.5).

1.2 Problem Discussion

As Amram (2005, p.68) argues, in spite of the relatively high costs and more risk that are associated with the innovation project, still different aspects of innovation plays an important role for most companies' success in today's economy. The innovation process is a flow of different phases, from the beginning with the idea stage until launch of the innovation. Figures show that only 10-15% of all innovation projects are successful on the market, a number that shows how challenging innovation is (Amram 2005, p.68). This implies that the firm's choice of innovation process is crucial. For the reason of many abandoned projects, investment decisions are both complex and critical for the firm's decision makers.

AstraZeneca is more focused on radical innovations, having an average higher risk than SCA Hygiene Products, who has a lower average risk because of the focus on incremental innovation. Because of the difference of the two company's types of innovation it is interesting to compare their innovation processes.

One important part of the innovation process is the financial evaluation, using investment appraisal techniques, which are used to calculate the future value of the innovation project. Many challenges occur when trying to calculate and forecast a future value of a project. The future value calculations can be used either to determine whether to take on a project or not or to calculate what future value a project might generate (Boquist, Milbourn & Takor 1998, p.59).

As mentioned earlier innovation projects are very risky projects, in order to lower the company's total risk, managers need to diversify corporate risk. To do so managers have to measure the risk by doing risk calculations. Without any risk calculations, it is impossible to have knowledge about the risk for a certain project and therefore impossible to diversify the corporate risk (Li & Wu 2009, p.155).

Two Swedish authors that have shown the complexity of capital budgeting are Gert Sandahl and Stefan Sjögren (2005, pp.78-81), which showed that there is a major gap between theory and practice when it comes to investment calculating and the use of NPV among the 500 largest companies in Sweden. Among other factors, as these two Swedish researchers show most companies do not adopt the discount rate after the riskiness of a project. In addition, a comparison between American, British and Swedish companies showed that the gap between theory and practice in investment calculating generally is bigger in Sweden than in the two other countries. This, in turn, creates another complexity in evaluating projects investment in general and innovation investment in particular.

Thus, different complexities which were perceived concerning the innovation investments and their evaluation approaches as well as different calculating methods that should be used during a typical innovation process constitute an interesting area for wider study.

1.3 Research Questions

During the previous chapter different problems have been discussed and difficulties related to innovation and how such projects should be calculated and evaluated. Here

the research questions are formulated in order to serve as a guide on how this research area will be implemented:

1. How is the innovation process designed in practice at SCA in comparison to AstraZeneca?
2. How are the innovation projects financially evaluated in practice at SCA in comparison to AstraZeneca?
3. How are the innovation projects risk evaluated in practice at SCA in comparison to AstraZeneca?

1.4 Purpose

The purpose of this thesis is to gain a better insight in how to analyze the evaluation of different investing approaches to the innovation process at SCA Hygiene Products from a financial point of view. In doing so, the attempt is to compare the current theoretical approaches with the practical ones associated with innovation process at AstraZeneca. Of course, it is desirable that the outcomes of this investigation together can constitute a suitable platform for a recommendation to SCA Hygiene Products on how to improve their innovation process in the future.

1.5 Limitations

This thesis is limited to only include SCA Hygiene Products and not the whole SCA group. The definition used for "innovation" in this thesis only include a product or service that is significant changed or new to the market.

2. Methodology

2.1 Research approach

This thesis is based on a qualitative research method and the authors have aimed to take a holistic approach. The reason why a qualitative method was chosen is that it is a method that allows for understanding of the reality of society whereas a quantitative method is more useful when the study is based on statistical and hypothesis testing (Eriksson & Kovalainen 2008, pp.4-5).

Furthermore, the authors have chosen an inductive approach which means that the primary source of knowledge is empirical investigation (Eriksson & Kovalainen 2008, p.23). The decision to do an inductive study was taken because this study aims to

understand the practical use of the innovation process, financial evaluation and risk evaluation in companies. In order to follow the inductive approach the authors have been visiting the two companies and interviewed selected employees.

2.2 Data collection

The data of this thesis consist of both primary and secondary data. The theory chapter is based on secondary data since there are much research in the form of literature and scientific articles in this field. The information in the result chapter of the thesis is primary data and it has been collected from interviews.

To be able to achieve a study with correct and current information extensive literature studies have been done. The authors have used databases, for instance the database Business Source Premier to find scientific articles that apply to the chosen topic. Furthermore, the literature has been found by using the database of the Economical Library at Gothenburg University and also on guidance from the supervisor of this thesis. The fields that have been considered when searching for information are the following: investment decision-making, capital budgeting, investment appraisal techniques, financial evaluation, risk management and innovation management.

Regarding the information about SCA Hygiene Products and AstraZeneca, that information has been gathered from interviews with selected employees at the companies. The authors believe that the employees at the companies are the most suitable sources to use to get insight in how the selected companies work with innovation and financial evaluation of such projects. The requirements set on the interviewees are that they should have detailed knowledge of financial evaluation and the innovation process in their company, this applies to both SCA and AstraZeneca. The authors believe that the requirements have been fulfilled through the choice of interviewees.

The four employees at SCA Hygiene Products that have been chosen for interviews have been so because of their positions and their expertise in the field of this study. They all have different positions with different work tasks, but what links them together is that they work within innovation management and financial evaluation of the same. Two of the interviewees are in management teams and are decision makers. There have been two interviews at SCA Hygiene Products, with two employees at each time.

The interview at AstraZeneca was just one, with one person who also works in innovation management and financial evaluation. The reason why there will be just one interview is that the focus of this thesis is SCA Hygiene Products, and AstraZeneca is only chosen for comparison. The chosen person is a decision-maker, he is in both management teams for the two business units that he works for.

Table 2.1

Table 2.1 List of interviewees

Interviewee	Position	Company	Date	Time
Monika Enegren	Business Planner, Baby Care	SCA Hygiene Products	2013-04-23	1 h 25 minutes
Anders Elmquist	Vice President, Business Development Strategy	SCA Hygiene Products	2013-04-23	1 h 25 minutes
Lina Strand Backman	Innovation Processes Manager	SCA Hygiene Products	2013-05-03	57 minutes
Bengt Järrehult	Fellow Scientist, Innovation	SCA Hygiene Products	2013-05-03	57 minutes
Lars-Johan Cederbrant	Finance Director, CVMD iMED & PHB	AstraZeneca	2013-04-24	1 h 2 minutes

The interviews have been in depth qualitative interviews done face to face to gather relevant and comprehensive information. The interviews have taken place at the companies' offices to make the interviewees feel comfortable. In addition, the interviewers have gotten to see the offices of the companies and gotten an impression of the company's spirit and culture.

The interviews have been semi-structured and guided which means that the interview has been flexible with prepared themes and questions (Eriksson & Kovalainen 2008, p.82). The research questions are to be found in Attachment I. The questions were intended to serve as a guide for the interviews which was emphasized when they were sent to the interviewees in advance. This was done in order to achieve an interview that is open for discussions that allow the interviewees to bring up important topics and different aspects of a topic that the interviewers have not taken into consideration.

2.3 Data Analysis

The data analysis took place after the interviews and the first step was to compile the information from the recorded interviews into documents where the whole interviews where written down. The next step was to separate the useful data from the rest and use that data for writing the empirical part of this thesis. Hence, the empirical part of the thesis is only built on data from the two companies. The empirical part of the thesis has been red by the interviewees at both companies in order to control that the data is current and correct. When the authors have had questions about the data or have been in need of additional information the interviewees have assisted.

The data that concerns SCA Hygiene Products is data that all the interviewees have confirmed and therefore it is not written in chapter 4 which person that said what. This was required from SCA Hygiene Products and the authors did not see this as a problem as the information from the interviews at SCA did not differ between the interviewees. The part of the thesis that concerns AstraZeneca, chapter 5, is treated the same, the interviewee's name is not written there.

2.4 Validity and reliability

Validity and reliability are two concepts that often are used in research evaluation. Reliability can be defined as consistency of the result and the validity of the study states that it is true and certain. Validity and reliability mean, in qualitative research, that the description of the collected data is correctly handled. It is yet difficult to ensure the reliability in a qualitative study, because a qualitative study is built on impressions and the individual answers of the interviewees (Eriksson & Kovalainen 2008, p.292).

The validity of this thesis can be assured since the interviewees are all in key positions and have stated knowledge in the research field. The interviews will be done face to face in depth which makes it possible to ask further questions and avoid misunderstandings, this is also linked to validity. The interviewees have read the chapter that concern their company in order to validate that the result is correct and accurate. On this basis the authors think that the findings are true and certain and therefore this thesis fulfills the criteria of validity.

The reliability of this thesis is though less certain since the number of interviews are few. Furthermore, the authors believe that more interviews would not change the result as both companies work with a common global strategy.

3. Theory

3.1 Innovation

Michael Porter, professor in strategy at Harvard Business School, explains innovation as "a new way of doing things that is commercialized". The new way of doing things is built on new knowledge, either knowledge of technology or the markets that is what the customers demand or need. An innovation can be explained as an invention that leads to commercialization, often the new product or service in itself is called innovation. Thus, for an innovation to be created not only an invention is needed but also a commercialization of the actual product or service (Afuah 2003, p.13).

3.1.1 Types of innovation

Innovation is often divided into radical and incremental innovation. A radical innovation is an innovation that is based on new knowledge whereas incremental innovation can be defined as an innovation that originates from existing knowledge. Another way to determine whether an innovation is radical or incremental is to consider whether the innovation makes other products or services on the market still competitive or not. It is said that an innovation is radical if the other products that exists on the market not are considered competitive anymore (Afuah 2003, p.15).

When innovation is used in the context of new product development it is termed as product innovation. Rainey (2005, p.29) suggests that there are four different new-product categories that exist, to be seen in figure 3.1. The four different categories are the following: incremental improvements, incremental changes, radical improvements and radical changes.

Incremental improvements and incremental changes are both based on incremental innovation and are both market focused. The group that is called incremental improvements is also focusing on core-capabilities and the improvement that is achieved is often small and has to do with cost saving and quality and function improvement. The other group, incremental changes, often takes place when a product is changed to suit a new market or another segment of customers. The change does not have anything to do with core capabilities, it is rather about taking opportunities on the market that leads to incremental changes of existing products. Incremental changes require higher investments and also mean a higher risk than incremental improvements do.

The other two categories, radical improvements and radical changes, are based on technology and the change that occurs in these categories does not come about because of market forces. The category that is called radical improvements involves improvements to products that have to do with technological change and it is focusing on the core-capabilities of the products. Improvements that are called "new generation" often fall to this category. The fourth type is radical change and it is the type that occurs due to new radical technology that is used to create new opportunities on the market. The products that are shaped in this category can be described as "new-to-the-world" and are really outstanding compared to the products that already are out on the market (Rainey 2005, pp.29-32).

Figure 3.1

	Market focused	Technology focused
Core-capabilities focused	**Type I – incremental improvements** • Cost reductions • Revisions to solve problems • Addition of features and functionality • Quality/performance improvements	**Type III – radical improvements** • New generation • Enhanced platform • New platform • Fusion of technologies
Opportunity focused	**Type II – incremental changes** • Repositioning of existing product • Derivative for existing market • Derivative for new market • New product line	**Type IV – radical changes** • New-to-the-world • Improved technology platforms • Radical technologies • Disruptive technologies

Figure 3.1 Rainey's types of innovation (Rainey 2005, pp.29-32)

3.1.2 The innovation process

3.1.2.1 The New Product Development

The part of innovation that means that a new product is developed can be illustrated in a process that David Rainey calls New Product Development process, shortened NPD, and illustrated in figure 3.2. The executive management establishes the strategy of innovation and the innovation process serves to be an instrument for the employees to achieve what the strategy states. This process if often standardized in many firms and it exists to facilitate and simplify the development of a new product. It is used as a roadmap and a tool for the participants to get a better understanding of how to execute the new product development (Rainey 2005, pp.10-11).

Figure 3.2

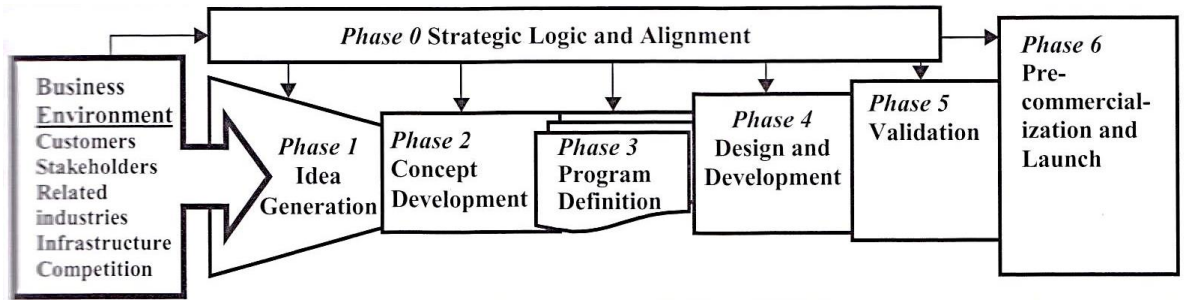

Figure 3.2 The NPD process (Rainey 2005, pp.10-11)

The NPD process is based on many considerations, but briefly it is there to allocate resources in the most efficient way across the organization, manage risk and uncertainty, create cross-functional teams in the organization, endorse internal audit and be an instrument for constant new product development (Rainey 2005, pp.10-11).

The NPD process consists of seven phases, actually six phases numbered from one to six and one initial phase that is called "phase 0". Every phase require a set of activities and a review that should be carried out in that phase before moving to the next milestone of the process. It is important that each phase is identified and well demonstrated in the process map that the organization is using (Rainey 2005, pp.10-11). The importance of review in the NPD process is stressed. The review can be done after each phase or continuously, ideally it is done in both ways. It is done by management and it serves to evaluate the process and to examine the objectives and outcomes of the process (Rainey 2005, p.105-106).

The phase before the first one in the NPD process is phase 0 and it is called the strategic level. This stage is about formulating strategies regarding innovation and new product development. It is strategic management that has the responsibility here and they are in charge of both the strategies but also the resource allocation. The strategy sets out the direction for the whole organization and therefore this step of the NPD process is essential as it affects what the outcomes in the next stages will be (Rainey 2005, p.106).

The next step in the process is idea generation which is the starting point of the NPD process. New product development would not exist without new ideas and proposals on improvement and change coming up. Phase 1 is about identifying all ideas and put them in a context to evaluate whether or not it is an idea that can and should be realized into

a product, or a change of an existing product, or not. In this phase it is important to consider both the strategically goals of the firm when it comes to new product development but also what the market demand and what stakeholders of the firm are expecting (Rainey 2005, pp.149-151).

When a certain idea, or ideas, is chosen and management has decided to go further in the process it goes to the next phase which is the concept development phase. The idea is conceptualized into a concept that can be evaluated and analyzed. It contains information about the design of the product, the use and the intended market segment (Rainey 2005, pp.189-194). It is also in this phase that the first cost estimation is done, the most common way to estimate the cost of the new product is to calculate the target cost which is given by subtracting gross margin from the market price of the product. (Rainey 2005, p.199). In this phase the major screening of the product takes place, that means that the product is tested and evaluated from different aspects to determine whether this product idea should be invested in or not. The scope of the screening tends to vary depending on what type of product it is and also what organization it is. Some common areas to screen is the financial aspect, the strategic fit of the product, the market potential of the product, risk, production capability and resource and technical aspect (Rainey 2005, pp.209-211).

The third phase is the NPD program definition where the program of a specific product is to be defined. This stage clears out which activities are involved in the new product development and also which people that should take part in the process. It is also important to establish who is responsible for what and when. The NPD program plan should include further detailed plans in the following fields: organization, product and market, marketing, production and financial. Those plans are based on the screening that is done in the phase before, but with additional information and less uncertainty. The financial evaluation that is done in this phase often includes techniques such as: NPV, IRR, payback period, ROI etcetera (Rainey 2005, pp.226-228).

Phase four is design and development and it is all about the product and how it should be designed to attract the chosen segment. It is also based on financial metrics, mostly to see that the financial goals of the product still are realistic. Briefly it is a further development of the earlier phase, but with one major difference, the product is now designed and optimized for the market (Rainey 2005, pp.471-473). Validation is the following stage, phase five, where the product is tested on the market to see what

strengths and weaknesses the potential customers can see with this product. The design and development of the product, phase 4, is getting evaluated in this phase and it is a crucial part of the NPD as both improvements and avoidance of future customer complaints can be obtained (Rainey 2005, pp.516-517).

The last phase of this NPD process is phase 6 that is called pre-commercialization and launch. The pre-commercialization can be viewed as the rehearsal before the launch. The last changes are made in this phase and management makes sure that the "gameplan", as Rainey calls it, is all ready for the launch and commercialization of the product. The final part of the NPD process is the actual commercialization of the product. It may seem like the NPD process stops here, and in one way it does, but it is important to do reviews even after the launch for obtaining continual improvement of the organization and the product portfolio (Rainey 2005, pp.549-565).

3.1.2.2 The stage-gate® system

Dr. Robert Cooper is a well-recognized expert in innovation management today and funder of the product innovation process called stage-gate® that was introduced in the middle of the 1980's. Cooper's stage-gate® process contains five stages and five gates as shown in figure 3.3. The five stages represent the different phases in product innovation, from the idea generation to the final step which is the launch of the product. The idea is that every stage is followed by a gate where the gatekeepers, the decision makers in the firm, meet to decide whether they should keep going with the project or not, and what resources that are needed (Cooper 2009, p.47).

To be able to use the stage gate process as an efficient tool it is necessary to identify who the gatekeepers actually are, it is not enough just to define them as decision makers as that often results in too many gatekeepers. The gatekeepers can be defined as the ones in management that own the resources that are needed to take the project to the next level. Sometimes many people actually are gatekeepers, then the group of gatekeepers need to be synchronized and take the decision together (Cooper 2009, p.49).

Figure 3.3

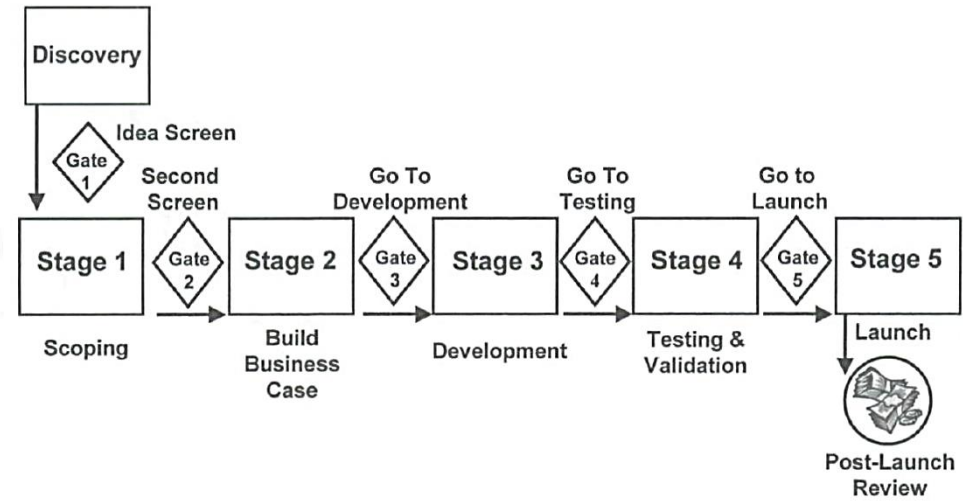

Figure 3.3 Cooper's stage-gate® process (Cooper 2009, p.47)

Many large firms have implemented a process that is more or less similar to the stage-gate®, but modified to suit that particular firm. The evolution in innovation management has gone further since the time when the stage-gate® process was launched, and therefore Robert Cooper himself advocates a few points to take into consideration when using the stage-gate® process.

One thing to consider that Cooper points out is that the stage-gate® process is a funnel, not a tunnel. The difference may seem small, but it is essential to remember that the funnel has five gates and not one, meaning that the decision whether or not to keep on with the project should be taken after every single gate and not only after the first one. Cooper experiences that many firms today end up with too many projects in the end of the funnel, both good and bad ones. It is therefore important to keep the "go/kill" thought in every gate and allow management to dare to kill projects if they can be considered not to measure up (Cooper 2009, p.48).

Another problem with the stage-gate® process it that much paperwork needs to be submitted to the gatekeepers before the decision can be made. One rule to keep in mind regarding what documents that are needed is that they should be necessary for the decision that is going to be taken. The company Johnson & Johnson is using the term "lean gates" in their stage-gate® process and this usage has resulted in that they reduced the amount of paperwork for every decision. Earlier a normal decision in a stage gate process could require up to 90 pages of decision support, while the maximum pages

is set to four today. Furthermore, the company stresses that management needs to learn all the basics before the meetings so that they arrive to the meeting ready to take a decision (Cooper 2009, p.49).

Cooper has observed that larger firms often use a couple of variants of the stage gate process in order to optimize the process according to the specific project. If the project is a NPD which normally involves a high risk and many resources it is appropriate to go through all the phases of the stage gate process. However, if the project involves medium or low risk a shorter and simpler process could be used in order to save time and work effort, as seen in figure 3.4. Cooper calls this a "scalable" stage-gate® process and believes that this trend will continue and improve the efficiency of the stage-gate® process as a useful tool in new product development and other types of innovation (Cooper 2009, p.54).

Figure 3.4

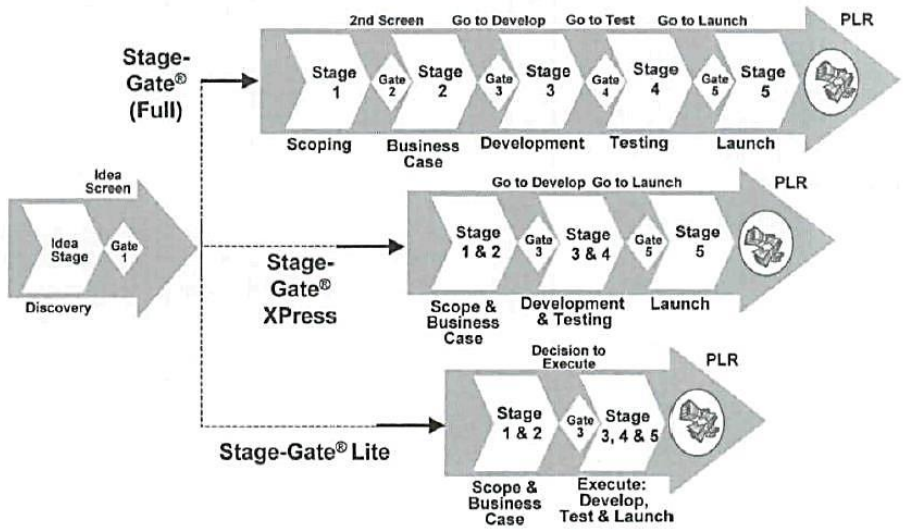

Figure 3.4 Cooper's scalable stage-gate® process (Cooper 2009, p.54)

Critics to the stage-gate® process claim that the process hamper the innovation and brake the creativity of the employees. They argue that the specific gates and all the administration makes it difficult to achieve radical innovation as that requires a large portion of out-of-the-box thinking. In addition, the stage-gate® thinking includes that the uncertainty is less the further you get in the process and the critics states that it affects the innovation negatively. According to Hutchins and Muller (2012, pp.30.35) breakthrough opportunities often arise due to disruptive discoveries and surprises that were totally unexpected, an approach that clearly differ from the one of the stage-gate®

process. Furthermore the authors states that the decision of "Go/Kill" a project is too binary, according to them an innovation project is not that linear and easy to judge. Hutchins and Muller (2012) have set up some guidelines to follow in order to work efficiently with the stage-gate® process. First and foremost it is important to be open minded and focused on opportunities when working with innovation, the project plan should be designed after the opportunity and one should allow for changes throughout the whole stage-gate® process. The final advice that the authors give corporations working with this process is that it is not only hard work that leads to successful commercialization of a project, other important parameters are that management allows for flexibility, exploration and fun in their project teams (Hutchins and Muller 2012, p.30-35).

3.2 Investment Appraisal Techniques

In the theoretical textbooks all companies are expected to have a common objective. The objective is to maximize the owners' wealth, which means the shareholders wealth (Arnold 2010, p.7). To maximize the shareholders' wealth, investments need to be done to hopefully raise the firm's income. How to know if an investment will maximize the shareholders wealth? If considering different investments, which one should be chosen? For example, should the company invest in developing a new product or invest in developing existing products? For these questions financial investment appraisal techniques has been developed to make the managers able to calculate what will maximize the shareholders' wealth (Arnold 2010, p.34). Appraisal techniques are often also named capital budgeting techniques.

There are many different ways to appraise the cash flows of an investment. The main purpose of the appraisal techniques is to maximizing shareholders' wealth, this purpose may be described more in detailed by four different criteria:

- All cash flows during the project's life have to be taken into account.
- The cash flows have to be discounted according to the corresponding opportunity cost of capital.
- The decision maker should be able to choose one project that maximizes shareholders' wealth from a set of mutually exclusive projects.
- The value-additivity principle, which states that the decision maker should be able to deliberate one project autonomously from the others. (Copeland, Weston, Shastri, pp.24-26)

3.2.1 Payback Period

The payback period method is a very straight-forward way of evaluating projects. The payback period is the time it takes for a project to have the initial capital investment covered by the forecasted cash flows. The decision rule says that if the forecasted future cash flows at least equal the initial investment it should be accepted.

The payback period method's most significant advantage is its simplicity and easiness which makes decision analysts more comfortable to use it and it is easier to communicate in the firm (Arnold 2010, pp. 72-76). The drawbacks of the payback period are many, it is possible to compare the technique of the payback period with the four criteria from section 3.2. The payback period method violates two of the criteria; it does not consider all cash flows, only those until the forecasted cash flows equal the initial investment and the method does not discount the cash flows (Copeland, Weston, Shastri 2010, pp.24-26).

3.2.2 Net Present Value

The net present value is based on the idea of the time value of money, which indicates that money loses value over time. The time value of money is caused by several assumptions. First of all, individuals prefer to consume today than save for later, individuals need a financial incentive to start saving. Inflation is a reason for the time value of money, because inflation means that a money unit loses its purchasing power over time. The last reason is that saving money for later consumption always contains a risk, the higher the risk for the saving, the higher return the investor demands. The time value of money creates a discount rate, which is the opportunity cost of invested capital for the investor.

The discount rate is used to calculate the present value of a future cash flow by the following formula:

$$Present\ Value\ of\ Cash\ Flow = \frac{Future\ value\ of\ Cash\ Flow}{(1+r)^n}$$

Where: r = the chosen discount rate
n = the time, usually years

A project often has several forecasted cash flows that may be going on for many years. To use the present value calculation for projects it requires adding all cash flows to get a

sum for all cash flows adjusted by the discount rate, this sum is called the net present value (NPV). The NPV formula is very similar to the one for the present value:

$$NPV = CF_0 + \frac{CF_1}{1+r} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n}$$

Where: CF_0 = the cash flow at the time zero, t_0
CF_1 = the cash flow at time one, t_1, usually one year after t_0
CF_n = the cash flow at time n, t_n, n years after t_0
r = the chosen discount rate
n = the time, usually years

The decision rule for the NPV states that if the sum of all the discounted cash flows is positive, the project should be accepted (Arnold 2010, pp.36-49).

In companies, the discount rate to be used for calculating the NPV is supposed to be the company's cost of capital. The company's cost of capital is calculated by using the formula called weighted average cost of capital (WACC), which both includes the cost of debt and the cost of equity, what return the shareholders require:

$$WACC = \frac{D}{D+E} * r_D + \frac{E}{D+E} * r_E$$

Where: D = the firm's debt, according to the balance sheet
E = the firm's equity, according to the balance sheet
r_D = the interest rate of the firm's debt
r_E = the shareholders required return

(Arnold 2010, pp.239-240)

The NPV method is the only investment appraisal technique not violating any of the earlier mentioned criteria, because all cash flows are considered, the cash flows are discounted, it makes it simple to compare projects and it also satisfies the value-additivity principle (Copeland, Weston & Shastri, pp.24-26).

In practice the NPV method may be complicated to use, especially the question about which cash flows to include. The essential is of course to include all incremental costs, but there are many more costs that are hard to pin down a specific project, such as

overhead costs. According to many textbooks, opportunity costs should be included in the NPV analysis but it is difficult to estimate them. Since the NPV is based on cash flows, expenses such as depreciation should not be accounted as that is not a cash flow. The NPV calculation requires many assumptions and is therefore very subjective (Arnold 2010, pp.91-95).

According to the two authors Berkovitch and Israel (2004, p.241), the NPV method is not an effective way in a typical company with top management and divisional managers. They argue that top management wants to maximize the shareholders' wealth while the manager's objective is to maximize his own utility. The top management then creates incentive mechanisms for the division manager, which may encourage the division manager to manipulate the selection process. The NPV may for that reason create an agency problem.

3.2.3 Internal Rate of Return

The internal rate of return (IRR) technique is similar to the NPV calculation, it also takes into account the time value of money. Figure 3.5 shows the close connection between the NPV and the IRR. Instead of calculating the value created for the shareholders at a special discount rate the IRR method calculates the rate of return on investment as if NPV would be zero, according to the following formula:

$$0 = CF_0 + \frac{CF_1}{1 + IRR} + \frac{CF_2}{(1 + IRR)^2} + \cdots + \frac{CF_n}{(1 + IRR)^n}$$

Where: CF_0 = the cash flow at the time zero, t_0
CF_1 = the cash flow at time one, t_1, usually one year after t_0
CF_n = the cash flow at time n, t_n, n years after t_0
n = the time, usually years
IRR = the internal rate of return, to be calculated

The decision rule states that if the IRR is higher than the firm's chosen discount rate or rate of return, the project should be accepted. The following graph shows how the NPV changes with different discount rates and where the IRR is. Figure 3.5 shows the connection between the NPV and the IRR. (Arnold 2010, pp.50-57)

The drawbacks with the IRR method is that it does not discount at the opportunity cost of capital and the IRR calculation may also give us multiple rates of return if the series

of forecasted cash flows changes sign one time or more (Copeland, Weston & Shastri, pp.24-26).

Figure 3.5

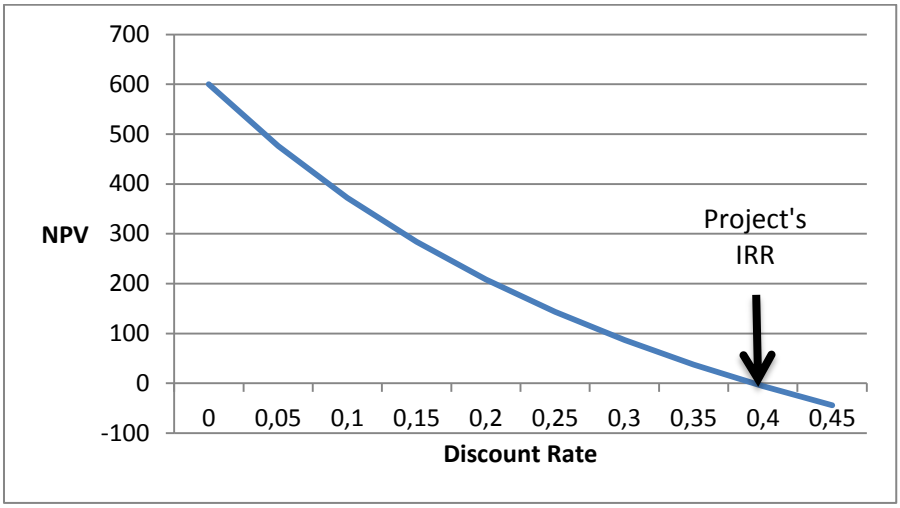

Figure 3.5 Graph of NPV for a project when different discount rates are used (Arnold 2010, pp.50-57)

3.2.4 Real Options

Real options analysis is used as an extension of the NPV calculation. Often projects are not an all-or-nothing decision as the NPV calculation states, especially innovation projects are often abandoned before the product reaches launch. The real option analysis contains the value of the opportunity to expand or abandon the project during its life when the circumstances might change. Real options give the firm future managerial flexibility. Real options can be calculated by following formula:

$$Real\ Option\ NPV = Crude\ NPV + NPV\ of\ expansion\ option + NPV\ of\ abandon\ option + NPV\ of\ other\ option\ possibilities$$

The real option analysis is characterized by welcoming uncertainty and risk, the uncertainty is even creating extra value. Real options also comes with many drawbacks, the way of welcoming risk may also turn the real options analysis to overoptimism. It is difficult to measure uncertainty and risk which turns the analysis to very subjective and also very complex. The complexity makes managers incapable to take part in the process in an informed way without training (Arnold 2010, pp.129-135).

Myers was 1984 (pp.134-135) the first one to state that the traditional NPV method is not helpful when valuing projects in companies with significant growth opportunities and says that "The value of R&D is almost all option value".

Hence it follows that the real options method has been current among academics during three decades theory has not met practice yet according to Alexander Triantis (2005, pp.8-16). Triantis states that the real options method is not widely used by practitioners because it tends to reflect perfection and not economic reality, managers are assumed to be totally rational and loyal to the firm's shareholders, which rarely is the case. The second reason is that practitioners think the method is complicated to use and even more difficult to explain, this leads up to that decision analysts are not comfortable using it.

3.2.5 Appraisal Techniques in Practice

A number of studies have been done, investigating what investment appraisal techniques companies are actually using. The studies have shown that there are many companies using the appraisal techniques in practice and the amount of companies using them has been increasing over time as seen in the table 3.1 and in figure 3.6.

The data for the years 1975-1992 are based on studies done by Richard H Pike. In a study written by Pike (1988, pp. 341-351), 100 of the 208 largest companies in terms of market capitalization in UK answered surveys covering the years 1975, 1980 and 1986. In another study written by Pike (1996, pp. 79-92), surveys were sent again in 1992 to the same companies as in the study concluded in 1988. The last study, done by Alkaraan & Northcott (2006, pp. 149-173), is based on 83 companies with a turnover of at least £100m, 1 000 employees and assets of £50m.

Table 3.1

Table 3.1 Investment appraisal techniques used in large companies in UK (Pike 1988, pp.341-351, Pike 1996, pp.79-92 & Alkaraan & Northcott 2006, pp.149-173)

	1975 %	**1980** %	**1986** %	**1992** %	**2002** %
Payback Period	73	81	92	94	96
Net Present Value	32	39	68	74	99
Internal Rate of Return	44	57	75	81	89

Figure 3.6

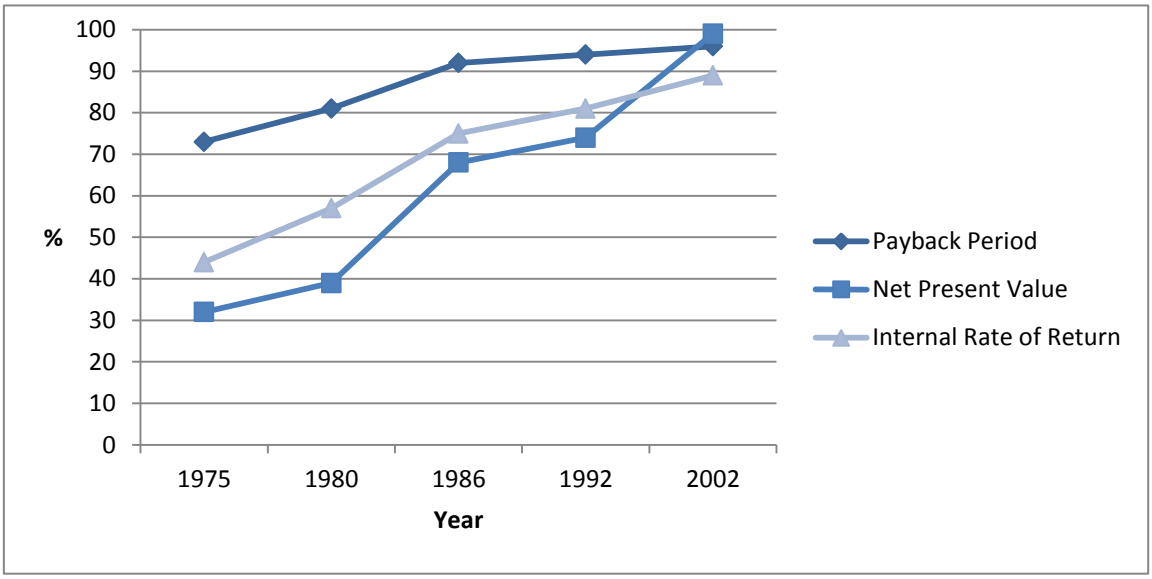

Figure 3.6 A graph showing the data from table 3.4. (Pike 1988, pp.341-351, Pike 1996, pp.79-92 & Alkaraan & Northcott 2006, pp.149-173)

As showed in the table and graph, four decades ago the payback period was the most common appraisal technique and NPV and IRR was not yet widely used. The use of all appraisal techniques has increased over time but NPV is the appraisal technique whose popularity has had the largest increase in the existing studies. In these studies, but also in many other studies, it is showed that decision makers use numerous kinds of methods to analyze investment projects. The appraisal techniques are used more as complementary then competitors, for the decision maker to create a more certain analysis (Arnold 2010, pp.72-73).

Another research team, concentrating on listed companies with headquarters in one of the Nordic countries did surveys during 2007-2008 with 157 respondents. In the survey the CFO was asked about what investment appraisal techniques the company is using. The result showed that capital budgeting methods are much less common in Nordic companies compared to other countries, for example the United States and United Kingdom. According to the study 64,9% are using NPV primary or secondary to evaluate investments and 61,9% are using the payback period primary or secondary. (Brunzell, Liljeblom, Vaihekoski 2013, pp.85-110)

3.3 Finance Performance Measurements Used by Investment Decision Makers

3.3.1 Return on Investment

The return on investment (ROI) key ratio is a relatively old way to evaluate already done investment decisions to find out how much the company has got in return for their investments for a specific time period. ROI is computed with the following formula:

$$ROI = \frac{Net\ Income}{Capital\ Investment}$$

This means that the return on investments measures the how much income the investors' investments are generating. The ROI is because of its simplicity very widely spread in firms (Adler 1999, pp.82-83).

3.4 Risk

Risk means that different outcomes are possible and especially in the innovation field, where the risk is often high many different outcomes are possible. The probabilities of outcomes may be an objective probability, which are established mathematically or historically, or a subjective probability, obtained by personal judgment (Arnold 2010, pp.111-114).

3.4.1 Discount Rate

Adjusting risk by discount rate means using different discount rates for different levels of risk when calculating the project's net present value. The method is very popular among companies and is based on the fact that investors require higher return for taking a higher risk. The firm may use different risk premiums for different judgments of risk level and then adjusts the discount rate. The method is simple, resulting in a more comfortable decision analyst but an evident drawback is that the method is very sensitive for personal judgment (Arnold 2010, p.114).

3.4.2 Sensitivity Analysis

The traditional NPV method is static and therefore a sensitivity analysis can be used to give the decision maker a better view of the project. The sensitivity analysis is calculated by calculating the NPV of the project when crucial variables change. The analysis may be thought of as a "what if" analysis, for example what if the price will be 10 % higher? Or 10 % lower? It is mostly an objective analysis which also makes it a drawback, because there is no room for personal judgment (Arnold 2010, pp.114-120).

3.4.3 Scenario and Probability Analysis

A scenario analysis is used because the sensitivity analysis only changes one variable while the scenario analysis changes many variables. The change of many variables creates a new scenario which gives a new NPV, it is very common to create worst case and best case scenarios for the project to find out the NPV for different outcomes.

A probability analysis is including the probability of the outcomes in the different scenarios. When knowing the different probabilities for the different scenarios it is possible to calculate an expected net present value, eNPV.

The expected net present value turns out to be lower than the initial NPV. This new eNPV creates a more enlighten view of the project and its risk for the decision maker. The complications with the probability analysis are that the probabilities are only informed guesses, often just personal judgments, it is also a complicated tool which turns it into a poor communication tool in a company (Arnold 2010, pp.120-123).

Chapter 3 has aimed to establish the theoretical framework based on the research questions of this thesis. The first part of this chapter defined innovation and introduced two different innovation processes that are used widely in today's corporate world. The most common investment appraisal techniques were explained and established in order to give the reader an insight in what tools that the companies use for project evaluation. Finally, risk was defined and some useful techniques to quantify risk were raised.

4. SCA Hygiene Products

4.1 Innovation Process

4.1.1 Types of innovation

The four different innovation types that SCA Hygiene Products have identified are the following: breakthrough, new generation, upgrade and cost save. It is important how to term the different innovations, a vocabulary that all the employees accept and can relate to is desired. SCA Hygiene Products is working with a tool that they call "Consumer Technology Matrix" which they use in order to make the portfolio balance between the four innovations visible.

Figure 4.1

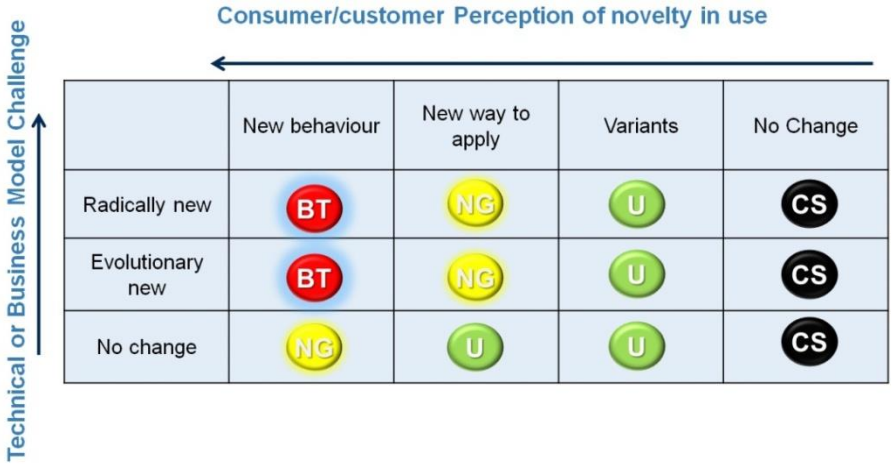

Figure 4.1 SCA Hygiene Products' Consumer Technology Matrix

A Breakthrough is defined as a product that creates a new behavior on the market and to SCA Hygiene Products it means a technical or business model challenge that is radically or evolutionary new. This can be seen as an effectiveness measure to stay competitive.

A New Generation innovation means that a new similar type of product is further developed from an already existing product, for example when one of their brands Libero launched a diaper called "Pants". This is a pull up pant diaper which is different from traditional diapers that are sealed with tape. New Generation types of innovation are used for attracting new customers and to gain market shares.

An Upgrading type of innovation means to make a smaller change to an existing product. It is a minor change or a launch of a special collection. An example is Libero "Dance Collection" which consisted of specially designed diapers, launched in 2011. Upgrades do not generate large gains of market shares, they are rather there to keep the existing market shares.

Cost Saves are made to save money for the company. To qualify for a Cost Save project there should be no impact to the consumer. Often this means a change in the production in some way. Cost Saves are efficiency measures necessary to stay competitive over time.

Breakthroughs are normally quite few, while the majority of all projects are upgrades. Upgrade projects have higher probability to reach launch than breakthroughs. The distribution of the four innovation types does look different depending on product

category and corresponding innovation strategy. It is important for SCA Hygiene Products to consider how they allocate their resources in projects for each category since the different categories are following different strategies and goals.

The time for an innovation project varies a lot, depending on the type of innovation involved in the project. An upgrade might just take a year or less to implement while a breakthrough can take up to 10 years to realize.

4.1.2 The Phases of the Process

The model that SCA Hygiene Products is using for their innovation process is called innovation funnel and it is applied globally in the organization. It was implemented globally in the organization in 2012. A large amount of ideas is considered and evaluated but learnings made from abandoned projects and other ideas are prioritized. Yet just a portion of the initial ideas will be launched in the markets.

The company encourages creativity and continues scrutiny brainstorming, that is done to abandoned projects and instead allocating resources to bigger and better ideas. The purpose of the funnel is to give a view of all current projects and what phases they are in, to stay on strategy and on time. Ideas go through the funnel with five decision points.

The first stage, called Early Concepting, is about insights, ideas based on new research, technology or opinions from consumers and so on. Market research I s also performed to some extent to see how the consumers respond to the idea and which markets that could be suitable for the future product. This is followed by a decision where management decides whether or not to go into the next phase which is called Feasibility.

The idea is transformed into a concept and then taken in to the feasibility phase. In this stage the project team tries add further value (both to the costumer and to the company) to the project, constantly checking the potential costs, sales and investments needed fo the future product. This is also the phase were most of the projects are turned down, the reason can vary but it might be because of the difficulty of realization or that the costs are too high. The feasibility phase ends with a decision of go or no go with the new product. Further insights made, affecting the probability of success will also give the innovation teams an idea if this is a good concept to pursue.

The next phase is called the Development phase and involves further development of the concept into a product. More detailed financial evaluation of the value of the product is done and also marketing planning. If the decision after development is that the company wants to continue with the product, a capital expenditure request for investment is done. The subsequent phase is called the Capability phase and is about getting the product ready for launch. The final phase is the Launch of the product, i.e. when the product reaches the market and is available for sale. The decision that follows this phase is a decision to include the product in the continuous production and to close the innovation project.

Figure 4.2

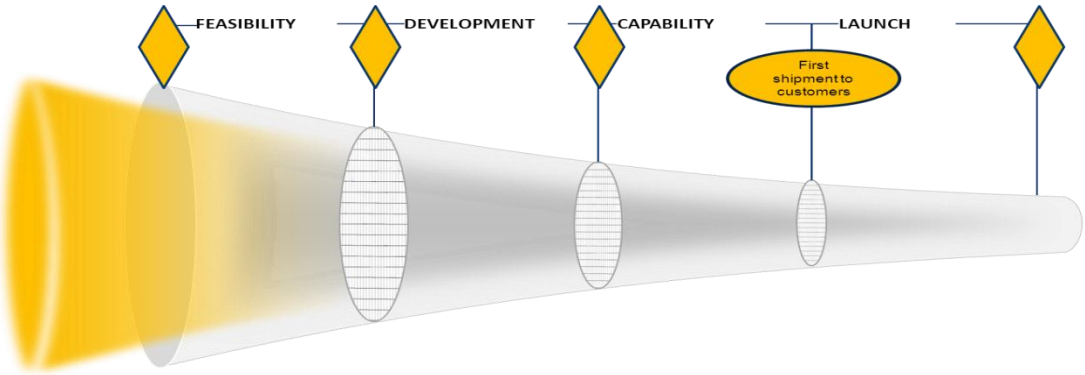

Figure 4.2 SCA Hygiene Products' Innovation Funnel

SCA Hygiene Products have developed the models from own experience but also from theory. In July 2012 SCA group acquired the paper company Georgia Pacific's European business which also has influenced the way of working. In addition, SCA Hygiene Products has been inspired by how other firms in the industry are working with innovation. The trend that the interviewees have observed regarding innovation is that the environment outside the company is taken into consideration to a higher extent than before.

4.3 Financial Evaluation

To understand the financial evaluation that SCA Hygiene Products are practicing it is important to keep the innovation funnel and its phases in mind. In the first funnel phase, Feasibility, the project team tries to roughly estimate the sales revenue that will be generated when the product is being launched. This is difficult and therefore it is important to have the market analyses done as a basis for the calculations. In this stage no costs are considered at all because of the difficulty to estimate them. Thus, a kind of

NPV is calculated with the sales revenue as only cash flow. The intention is to understand if there is an opportunity and how big it could be. Time spent on a project is defined and time doesn't allow for deep analysis. SCA wants to have a look at many ideas and then through the funnel select the ones that have the best fit and expected financial outcome.

In the Development phase, more calculations are done. The cost of goods sold is calculated by taking the production cost including depreciation and covering all production costs, also the distribution cost is included. The distribution cost consists of freight to customer, delivery cost from other SCA factories and warehousing costs, also advertising and promotion costs, A&P, are used in the calculation. A central cost is standardized consisting of costs for R&D, sales and administration. In addition, the CAPEX (Capital Expenditure) investment is estimated in this phase. From these figures a NPV is calculated. In this phase the NPV plays an important role, and it happens that projects are turned down because of an insufficient NPV.

The following phase, Capability, comprises of the same calculations as the Development phase. The difference is though, that the figures are now more reliable and reliable. In this phase the CAPEX investment and marketing costs are set and not only as estimates. The conclusion is that the nearer launch, the more rigorous and correct are the calculations. The calculations that SCA Hygiene Products do are used in the innovation teams for discussion and evaluation. For top management the financial evaluation is of high importance too, it serves as a decision base. Though, it is important not only to look at financial measures such as NPV.

The NPV calculations of all current projects in the innovation funnel are summed up, what SCA Hygiene Products calls the funnel value, to a total figure. This is done to get a view of all the projects and to confirm that the strategy of the portfolio is being followed and that the value support the strategy. All the NPVs are serving as decision support in each decision point, where the decision is either to continue or abandon the project.

4.4 Risk

The employees that have been interviewed all believe that the company constantly sets risk on the agenda. Primarily, they define risk as something that occurs that differs from the plan. In order to increase the probability of successful launches, SCA Hygiene Products invest in different types of projects with various levels of risk. In theory one

successful breakthrough per year might be enough to keep the market share and generate profit, but it is way too risky to just invest in one breakthrough project.

SCA Hygiene Products try to spread the risk and keep many projects running at the same time. Risk management is linked to product portfolio management and the strategy of the same is based on what top management requires and the guidelines are set by the CEO.

SCA Hygiene Products has chosen to use one average discount rate that is set globally for all projects when calculating NPV. When an application for CAPEX is done, it includes a NPV calculation but for this NPV a regional discount rate is used. For instance, Europe has one discount rate and South America another.

5. AstraZeneca

5.1 Innovation Process

5.1.1 Types of innovation

AstraZeneca divide their innovation in incremental and radical innovation. Back in history AstraZeneca was a rather active fast follower which means that they to some extent focused on incremental innovation and developed existing products from their own product portfolio but also from improving competitors' products. One example of a development of an already existing AstraZeneca product is the acid reflux drug Losec that was further developed into Nexium. Since AstraZeneca named Pascal Soriot as their new CEO the focus has shifted more towards radical innovation with focus to really differentiate AstraZeneca's medicines in the pharmaceutical industry. Different business units work with different types of innovation, radical innovation is the main focus of AstraZeneca R&D in Mölndal where the interviewee works.

5.1.2 The Phases of the Process

The innovation process that AstraZeneca has implemented globally in the organization is called "Drug Product Operating Model" and it was updated to today's version in 2010. The innovation process model is illustrated in figure 5.1.

The first phase of the process is target selection, TS, where the scientists are trying to find small molecules or antibodies that might have a biological effect relevant to the

disease. There are couples of phases after the TS phase that are serving as extensions to the TS phase. What happens in these phases is, shortly, that AstraZeneca applies for patents for the molecule or antibody and also do initial safety testing. After these phases a key decision called candidate selection investment decision, CSID, is done to decide on exactly what chemical compound or antibody to work further with.

Figure 5.1

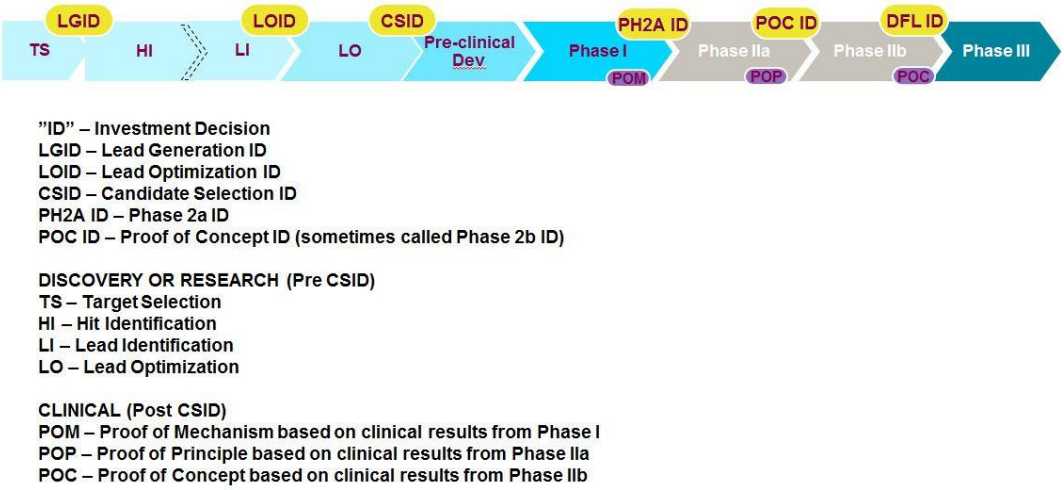

Figure 5.1 AstraZeneca's Drug Product Operating Model

After CSID the process turn from research on molecules and antibodies to development of a specific compound to clinical development. The phase after CSID is called pre-clinical development, where they apply for approval of their clinical tests and do Good Laboratory Practice Toxicology studies, GLP-tox studies. The clinical tests of the medicine start in phase 1 on healthy volunteers. During phase IIa and IIb clinical tests are done on patients to ensure the effect, additional safety and the dose decision range for the registration studies in phase III. The studies done during phase III, which are done on a large group of patients, serves as the base for the product claim and for their application for permission from authorities to manufacture and sell their products.

5.3 Financial Evaluation

Financial evaluation is not the most important thing in investment decision making for AstraZeneca, what matters the most for them is the science and what effect a medicine might have. Nevertheless, the science strategy follows disease opportunity profiles deemed to deliver differentiated medicines with benefit for both AstaZeneca and the society. After science is considered the financial evaluation and risk thinking gets important. The importance of the financial evaluation increases the further in the

process. There are four variables that AstraZeneca always keep in mind when making investment decisions, these are: commercial value, costs, risk and time. These are important to keep in mind when evaluating projects and it is a dynamic between the four parameters.

When AstraZeneca is considering all the projects and what they will generate in the future for the whole company, two tools are used for analysis. The first model that is used is return on investment, ROI, to answer the question if AstraZeneca will make money over time, in an assumed steady state portfolio volume. That is modeled by disease area. ROI is applied in a steady state which means that the analysis is applied to a system that has variables that are unchanging over time. They use ROI hypothetically to see the point estimate return a specified number of candidate drugs will generate.

The second tool that AstraZeneca uses is a simulation model that is stochastic which better reflect the binary element that either a project progress to the next stage or not. It is based on "Monte Carlo modeling" and is used to calculate the probability of certain outcomes. For instance the model can conclude that, in the future, in 65-70% of the cases AstraZeneca will earn money.

When looking at a specific project the NPV is calculated before every decision point in the innovation process. In the NPV calculation they assume that the project will succeed. Neither sunk costs for specific projects nor the cost of failures of other projects are being considered in these calculations. In addition, IRR and a discounted payback period are also done for specific projects. Another measure, that is not equally frequent in innovation investment decision, is "bang for buck" which simply can be defined as how many units of money is returned for every unit invested. Furthermore, they compute an undiscounted measure that is called maximum cash exposure that is total cash outflows which arise until the project starts to generate a net positive cash flow.

AstraZeneca is also working with external projects where the chemical compound already is patented by another companies and acquired by AstraZeneca. These projects are analyzed as internal projects but milestones, up fronts and royalties are also cash flows being considered.

Regarding the discount rate AstraZeneca is using their weighted average cost of capital, WACC,that has been set to 10% globally because of the high risk that is involved in their business. Since the interest rates have been low during the last couple of years, they also

do calculations on a WACC of 8% and 9% mainly when they do sensitivity analyses. When AstraZeneca calculates NPV and IRR they use the length of the patent to determine the lifetime of the project.

5.4 Risk

There is a high risk in the biopharmaceutical industry since it involves long lead-times and advanced research and technology. All tests that are needed for the medicines to be permitted by authorities are highly expensive in difference to other industries were clinical tests are not done. AstraZeneca is considering risk in their daily work as a consequence of this. In every phase the project is risk assessed by a standardized risk model that is applied on the project. The risk assessment results in a "standard risk estimation" that can be used to enlighten the decision maker about the risk of the project.

Moreover, AstraZeneca do sensitivity analyses and scenario analyses to risk assess a project depending on what phase the project is in, though it is common that these analyses are done in connection with the CSID. Before the DFLID a more rigorous scenario analysis is done, in the form of an outcome tree where possible scenarios are mapped. When doing this outcome tree all possible outcomes are given an estimated probability that they will occur and an eNPV is obtained.

6. Analysis

In this chapter the research questions will be answered, divided into two sections. Section 6.1 will answer questions 1-3 regarding SCA Hygiene Product's routines compared to studied theory. Section 6.2 will answer questions 1-3 regarding SCA Hygiene Product's routines compared with Astra Zeneca's routines.

6.1 Comparison SCA Hygiene Products and Theory

6.1.1 Innovation and innovation process

SCA Hygiene Products has defined the types of innovation that they work with themselves which goes beyond the usual definitions of radical and incremental innovation. Their types of innovation are similar to the four different innovations that Rainey has identified. When studying the innovation process of SCA it is obvious that it is inspired by Cooper's Stage-Gate process. It is not a New Product Development Process, NPD, since it has clear decision points or "decision diamonds" in the model, which is a

clear difference between Stage-Gate and NPD. Though, SCA's innovation process model is not scalable since just one version of the process is developed.

6.1.2 Financial evaluation

What is definitely consistent with theory is that SCA keeps the shareholder wealth maximization in mind when making investment decisions. Similarly, the computations of NPV are done according to the principles of the literature studied for this thesis. Though the financial evaluation is quite brief since no other measures are used for analysis. In obedience to researches done in this field, the majority of large companies, in the size of SCA Hygiene Products, use several investment appraisal techniques as a compliment to NPV. This is done in order to enlighten the decision maker of the financial situation of a project and how it will affect the firm's financial situation. One explanation to why SCA is not using numerous methods for financial evaluation may be that it is a Swedish company and according to the earlier mentioned study in section 3.2.5, capital budgeting techniques in Nordic companies are not as widely used as in UK and the US where most studies have been done.

One thing that definitely is notable compared to the theory of NPV, is that SCA Hygiene Products is including depreciation in the calculation of cost of goods sold which is then included in the NPV. According to the theory, that is not how it should be done since depreciation is not a cash flow and the NPV calculation should only include cash flows.

SCA Hygiene Products is not using real options in their innovation project evaluation at all, which they should according to the article by Myers (1984 pp.134-135), where he states that the real option method is the only way to value R&D. On the other hand, SCA Hygiene Products might not use real options due to that the method is complex and seems to reflect perfection and not economic reality.

6.1.3 Risk

When studying SCA Hygiene Products' attitude to risk, indications are that they are welcoming risk in the beginning of their innovation funnel. That is done to encourage creativity and not miss out on innovation in order to obtain the desired product portfolio. On the other hand, they are restrained with what projects that actually pass through the whole process and reach launch. What is noteworthy is that they do not state that any risk is quantified by doing any specific risk calculations, such as sensitivity analysis or probability analysis.

6.2 Comparison SCA and AstraZeneca

6.2.1 Innovation and innovation process

SCA Hygiene Products and AstraZeneca are two companies that differ in many aspects, they are operating in different industries and markets, but one thing that they have in common is that they are large listed and global firms. When comparing their innovation processes the differences become even clearer. AstraZeneca's process is long and complicated, and they even change project team during the process. On the contrary, SCA Hygiene Products is working with a process that involves just one project team through all stages and the time horizon for their projects is generally much shorter. AstraZeneca's process contains more decision points than the one of SCA Hygiene Products since it has more phases. Another aspect is to look how the processes are modeled, SCA Hygiene Products' process is illustrated as a funnel whereas the one of AstraZeneca is more similar to a uniform chain. In this case it is difficult for one to learn from another, the processes serve different purposes and are therefore complex to evaluate further.

6.2.2 Financial evaluation

What the both firms have in common is that they do NPV calculations with a globally set discount rate, but that is where the similarities end when considering the investment appraisal techniques used by the firms. AstraZeneca is applying remarkably more financial measures than SCA Hygiene Products does, such as payback period and IRR. The measurements are seen as compliments to each other, for comparison and to several financial inputs to the decision makers. Moreover, AstraZeneca is using financial performance measurements as ROI and the binary model in the "Monte Carlo Model" to predict the future for the whole firm and its product portfolio. This is something that SCA Hygiene Products has not adopted, they do not use historical data to predict the future of their product portfolio. AstraZeneca has a well-developed and systematic way of financially evaluating their individual projects as well as the product portfolio while SCA Hygiene Products relies on NPV in their financial evaluation.

Given, the comparison of the financial evaluation of SCA Hygiene Products and AstraZeneca, it is quite predictable that AstraZeneca is more rigorous in their financial approach. That is because their business involves higher risk, a more expensive innovation process, more advanced science and longer lead-time. Another reason for the difference in rigorousness may be the location for their headquarters, SCA Hygiene

Products is using less methods because companies with the headquarters based in Sweden traditionallu use less calculations, whereas AstraZeneca's headquarter is based in UK where firms traditionally use more rigorous calculations (Alkaraan & Northcott 2006, pp. 149-173, Brunzell, Liljeblom, Vaihekoski 2013, pp.85-110).

6.2.3 Risk

The risk approach is not similar in AstraZeneca and SCA Hygiene Products, an evidence of that is the difference in their innovation process model. SCA Hygiene Products has a clear funnel where they encourage ideas whatever potential in the beginning of their model, while AstraZeneca tries to avoid the ideas in the beginning of their innovation process model that they might be abandoned later. This states that SCA is welcoming risk to a higher extent than AstraZeneca. Despite SCA Hygiene Products' positive risk approach they do not do any specific risk calculations at all, which is rather surprising, but the reason might be that SCA Hygiene Products' is in a lower risk level business than AstraZeneca. AstraZeneca is quantifying risks by using several methods, which is understandable since their business is defined as a risky one.

7. Conclusion

The innovation process of SCA Hygiene Products is well established and designed in a satisfying manner for their business. One thing that they could apply, in order to adjust the model to their types of innovation, is to implement a scalable stage-gate® process which would be a more suitable process for their business. Advantages of that are that the company would save both time and resources for shorter innovation projects such as cost saves and upgrades which includes lower risk.

When the financial evaluation that SCA Hygiene Products practices is compared with both theory and the one of AstraZeneca the conclusion is that their financial evaluation is insufficient. NPV is probably enough for simpler projects like cost saves and upgrades. When it comes to riskier projects such as breakthrough and new generation complimentary investment appraisal techniques should be used to achieve a rigorous financial analysis. Two measures that are recommendable are payback period and internal rate of return, IRR, which AstraZeneca and many other large companies apply. This should be done because the NPV only shows one dimension of the financial situation, what cash flow the firm will receive from the project, and not any indicator

about the length of the project and what the investment is in relationship with the project's positive cash flow which the payback period respectively the IRR shows.

As SCA Hygiene Products has a positive approach to risk and are taking several risks in their innovation projects, they consequently should quantify the risk. A way of doing this is to use the discount rate in the NPV calculation to adjust the risk according to the projects' level of risk. This is a very simple method which is easy to use which makes the decision analyst more comfortable and it is easier to communicate in the firm, yet a quite subjective one. To complete the discount rate method a sensitivity analysis should be done for all risky projects, which is an objective method but also easy and fast to use to not waste the company's resources. The result of the risk calculations would give the decision maker more rigorous information about what risk the project exposes the company's finance for.

All these recommendations are built on the idea of shareholders' wealth maximization, the authors think these actions would increase the company's profit which leads to increasing shareholders' wealth.

This thesis has contributed to this field of study since it is a qualitative study built on interviews and has examined the relationship between SCA Hygiene Products' and AstraZeneca's types of innovation, innovation process, financial evaluation and risk management.

One field that the authors find interesting for further research is how firms choose what investment appraisal techniques to use in their businesses based on qualitative research. Aspects that are interesting to consider are, among others, the following: type of industry, organizational culture, size of the firm, level of innovation in the firm etcetera. In addition, more research could be done on what key success factors there are for obtaining a high degree of innovation in a firm. In the context of this the authors red about the fairly new term "open innovation", which also is an interesting field for further studies.

References

Adler, R. (1999) *Management accounting: making it world class.* Oxford: Butterworth-Heinemann. pp.82-83

Afuah, A. (2003). *Innovation management.* Oxford: Oxford University Press. pp.13-15

Alkaraan, F., Northcott, D. (2006) *Strategic capital investment decision-making: A role for emergent analysis tools?* British Accounting Review, Vol.38, pp.149-173

Amram, M. (2005) *The challenge of valuing patents and early-stage technologies*, Journal of Applied Corporate Finance, Vol.17 Issue 2, p.68.

Arnold, G. (2010) *Financial Times Handbook of Corporate Finance*. New Jersey: Prentice Hall. pp.7, 34, 36-49, 50-57, 72-76, 91-95,111-123, 129-135, 239-240

AstraZeneca Annual Report 2012, pp.2-3

Berkovitch, E., Israeli, R. (2004) *Why the NPV Criterion does not Maximize NPV,* The Review of Financial Studies, Vol.17 Issue 1, p.241

Boquist, J., Milbourn, T. & Thakor, A. (1998) *How Do You Win the Capital Allocation Game?* Sloan Management Review, Vol.39 Issue 2, p.59

Brunzell, T. Liljeblom, E. & Vaihekoski, M. (2013) *Determinants of capital budgeting methods and hurdle rates in Nordic firms.* Accounting & Finance, Vol. 53 Issue 1, pp85-110)

Cainelli, G., Evangelista, R., Savona, M. (2004) *The Impact of Innovation on Economic Performance in Services* The Service Industries Journal, Vol. 24, No.1, pp.116-130

Cooper, R. (2009) *How Companies are reinventing their idea-to-launch methodologies* Research Technology Management, Vol.52 Issue 2, pp.47-49, 54

Copeland, T.E.,Weston, F., Shastri, K (2005) *Finance Theory and Corporate Policy* Boston, Mass. : Pearson Addison-Wesley. pp 24-26

Eriksson, P., Kovalainen A. (2008) *Qualitative Methods in Business Research* London: Sage Publications. pp.4-5, 23, 82, 292

Hutchins, N. & Muller, A. (2012) *Beyond stage-gate: restoring learning and adaptability to commercialization* Strategy & Leadership, Vol. 40, No. 3 pp.30-35

Jaruzelski, B., Loehr J. & Holman R. (2012) *The Global Innovation 1000: Making Ideas Work.* Global Innovation 1000, Issue 69*,* p.5

Li, X. & Wu, Z. (2009) *Corporate risk management and investment decisions* The Journal of Risk Finance, Vol. 10, No. 2, p.155

Luehrman, T. (1997) *What is it worth?* Harvard Business Review, Issue May, pp.132-133

Myers, S. (1984) *Finance Theory and Finance Strategy* The Institute of Management Sciences, Issue 1, p.134-135

Oke, A., Walumbwa, O. F. & Myers, A. (2012). *Innovation Strategy, Human Resource Policy, and Firms' Revenue Growth: The Roles of Environmental Uncertainty and Innovation Performance*. Decision Sciences, Vol. 43 Issue 2, p.277

Pike, R.H. (1988) *An empirical study of the adoption of sophisticated capital budgeting practices and decision making effectiveness.* Accounting and Business Research, Vol.18 Issue 72, pp.341-351

Pike, R.H. (1996) *A longitudinal survey of capital budgeting practices.* Journal of Business Finance and Accounting, Vol.23 Issue 1, pp.79-92

Radas, S., Bozic (2012) *Overcoming Failure: Abandonments and Delays of Innovation Projects in SMEs* Industry and Innovation, Vol.19 Issue 8, pp.649-669

Rainey, D. (2005) *Product Innovation* Cambridge: Cambridge University Press. pp.10-11, 29-32, 105-106, 149-151, 189-194, 199, 209-211, 226-228, 471-473, 516-517, 549-565

Sandahl G., Sjögren, S. (2005) *En spegling av teori och praxis* Gothenburg: BAS Gothenburg University. pp.78-81

Triantis, A. (2005) *Realizing the Potential of Real Options: Does Theory Meet Practice?* Journal of Applied Corporate Finance, Vol.17 Issue 2, pp.8-16

SCA Annual Report 2012, p.3

Attachment I

Interview Questions

General questions

- What is your role in the company?
- What education do you have?
- What are your work tasks?
- How long have you been working for this company?

The Innovation Process

- What types of innovation are there in your company? (Incremental/Radical)
- What types of innovation models do you use for the innovation process? (Eg. Standardized NPD process)
- What phases are there in your innovation process?
- How did you develop the innovation process model? From theory/practice?
- How do you work with innovation globally?

Financial Evaluation

- What is the role of financial evaluation of projects in your company?
- How do you evaluate innovative projects today? (NPV, IRR, Payback ratio, ROI, real options etc.)
- Why did you choose these methods? Theory/Practice?
- How does the financial evaluation differ in the phases of the innovation process?
- What differs the financial evaluation of innovation projects and ordinary investments?
- How do you estimate the life time of projects?

Risk

- How do you manage risk in different innovation projects?
- What types of risk calculations do you do? (Sensitivity/Scenario Analysis etc.)
- What is the risk strategy of the firm?