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# How are decisions made? Exploring the Strategic Decision-Making Process

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# Abstract

In business, managers seem to make decisions and afterwards look for ways to justify the decisions. Why is business conducted this way? What is the process for decision-making? Decision-making is at the core of everything that happens within an organization and has fascinated researchers for decades. These researchers have developed theories that can be linked to the observation made in the first sentence, but they do not seem to fully explain the phenomena. To explore the process of decisioning, an abductive approach, using the observations that the authors have made in business, a theoretical framework and extreme case studies focusing on decisioning with regard to new product development in small international companies, was used. In confronting the theoretical propositions in the form of a conceptual model against the empirical research findings, this study was able to highlight a number of factors that influence the process; the process driver, political support, inertia, knowledge and analysis. Their interaction provides a model where the process driver drives the process, political support influences the decision-maker, inertia determines the process used, knowledge is the basis for decisions and analysis is used to justify, legitimize or gain commitment for decisions. The model can be use by managers to shed light on the process of decisioning and be used as a basis for further academic studies in the practical exploration of strategic decision-making.

**Keywords**: strategic decision-making, process, new product development, small companies, international business

# Abbreviations

| | |
|---|---|
| CEO | Chief Executive Officer |
| ESA | European Space Agency |
| NPD | New Product Development |
| Q-CMD | Quartz Crystal Microbalance Technology |
| SDM | Strategic Decision-Making |
| SSC | Swedish Space Corporation |

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# 1 Introduction: Frustration to Research

*"The process itself is very rational, it is built on experience and tests and has proven its way many times … Even with all these processes in place and this enormous structured way of working [in the space industry] it still comes down to a few people that need to have the commitment, personal involvement and will to push it forward. The process itself is a good toolkit, but it always needs someone to push it through."*
- Tor-Arne Grönland, CEO, Nanospace AB

*"Overall, one hopes that there is a structured way of doing things, and that everything is well planned in advance, that there is a clear strategy, but that is always written afterwards. Life and people work in other ways, it's more ad-hoc, it has more to do with circumstances … Ideally you sit down make a business plan, you do the strategy, then you take your actions. But you don't have those kinds of answers and knowledge actually."*
- Ted Ternander, CEO, Q-Sense AB

## 1.1 Background

When faced with the opportunity to develop a research topic for our master's thesis, the author's began by having discussions about our own business experiences. We reflected on observations we had made in business. We asked each other and ourselves why we thought business was conducted the way it was. Was there anything that did not make sense to us?

During these discussions one of the authors shared her frustration over an observation that she had made time and time again; that it seems that most of the projects she had been involved in as a consultant all involved managers asking for help with justifying decisions. For instance, about four years ago, an American Fortune 25 bank called on the consultant company the author was working for to help with an eBusiness strategy. In the author's idealized young mind there did not seem to be any better project then to go to such an important company and create for them an amazing strategy. Quite soon during the first meeting with the bank manager it became very clear that the consultants were not there to create a new strategy, but instead to back up a strategy the manager had already initiated. The manager had actually already engaged a software vendor to implement the strategy. So why were they there? The manager wanted the consultants to produce a report that she could then use as a third party perspective to give other stakeholders on the decisions she had already made.

After hearing this story, the other author was soon to add her insights from a project she had recently finished. In this case it was a small Norwegian entrepreneurial company that was looking to supply tofu to the Scandinavian market. The CEO of the company thought the timing was perfect as there were no major competitors and the market was now ready for his company's tofu. With her team the author was to conduct analysis on how the company could enter the Swedish market. Soon after the project started it became apparent that little or no formal analysis had been

carried out, that the CEO was pursuing this venture largely on a conviction that Europe was screaming for tofu. Regardless of the fact that author and her teammates had already found multiple competitors, it became very clear that the results of the research were irrelevant; the CEO had already made his decision a long time ago.

The authors began to think further into this phenomenon. Where else had they experienced instances where the decision makers made decisions in this way? That was when they realized that the project they just completed at that time was also the same. They had been asked to develop a new global brand strategy for a large car manufacturing company in Sweden. On the first meeting with the company the project team was very surprised to find out that instead of assessing a number of potential options for the strategy they were actually being asked to provide background on one specific target market. When asked how this market had been decided upon the company manager responded that was what we were supposed to determine. But how could that be done without looking at any other possibilities? With further analysis it was discovered that the company had already started sponsoring activities within this target market. So the decision had already been made. The project was really not to develop a strategy but instead to provide the company with more information and data that they could use to go to their managers to convince them to continue to support this brand initiative.

## 1.2 Problem discussion

The authors were frustrated by the observations they made with how decisions occur in business. Is there not a better way to do business? It was not long until this frustration was turned into wonder and the authors began to ask themselves why. Why was business conducted this way? If decision-making is so important to business why do managers not do more research in order to make better decisions? Why was there not a more formal process used by these companies?

With these questions on the tips of our tongues, we turned to what academia has hypothesized about decision-making. As a central issue in strategic management, decision-making is one of the most important aspects of a manager's job. Due to this, a great deal of research has occurred in the area over that past thirty years. Most academics can agree on three dominant paradigms; rationality and bounded rationality, politics and power, and garbage can. Starting with the last first, the garbage can theory states that decisions occur randomly by managers looking for something to decide and making decisions based on the choices that are available. This theory does not explore how decisions are made as much as why decisions are made and therefore does not adequately apply to the observations. The next theory is around politics and power and how groups affect decision-making. While power itself probably comes into play the authors did not believe that the observation involves group decision-making as much as individuals. Therefore the authors focused on the first and most explored theory within decision-making; rationality and bounded rationality.

The concept of rationality comes from economics, stating that decision makers will never choose one theory over another if the decision maker prefers the second option. In applying this to decision-making the rational model, as first outlined by Simon in 1957, states that managers gather data and develop alternatives that they then use to select the best option. Conducting what people refer to today as a reasonable or rational decision. Researchers since that time have found that decision makers, however, do not always choose the best option due to the process they follow.

These findings then turned into the bounded rationality model. Furthermore, within this area more study was done in field settings. Here the research focuses on the process of decision-making and how the process used affects the decisions made. This is known as procedural rationality. This theory can be used as a basis for the exploration of the observations. By researching the *process* decision-makers go through in order to make decision maybe the reasons as to why decision-makers follow that process and make decisions the way they do could be understood.

In order to dive deeper into the process of decision-making the research needs a more specific context. An excellent area to look at is innovation. Innovation in the form of new product development is critical for all companies in order to succeed and is considered a corner stone of strategic management. Similar to decision-making, new product development is another area that has been studied thoroughly. Many model and factors have been identified that influence the outcome of a product. The studies have focused on the rationality of the process, the communication, and problem solving. Decision-making takes place everyday in product development. From the point of idea to commercialization, managers are forced to make numerous decisions regarding whether or not to proceed and how to proceed in the development process. Hence, at these decision points managers are influenced by a number of factors that determines the process they follow. By studying what happens during the product development process with regard to decisions, insights can be gained as to the process that is followed, how decisions are made, and what influences the decisions.

Using the existing studies as a basis the authors intended to shed light on their original observations by conducting case studies focusing on new product development. In order to guide the research the following question was used:

*What is the process for decision-making?*

The case studies were used as a means to conduct an in-depth study of the processes. In order to provide more understanding the study was performed using extreme-case sampling where two companies with opposing ways of doing business were analyzed. In this study, one company that uses defined processes and another without defined processes was used. Additionally, the research was accomplished by interviewing small companies as opposed to larger companies. While large companies also can be innovative, in smaller companies the decision-maker is closer to the entire process and will be able to provide additional insight into the overall process of decision-making, the people involved, the interactions that take place and the influences on the people involved in the decisioning.

## 1.3 Research purpose

The purpose of this study is to explore decision-making focusing on the process managers go through when making decisions. Through the use of existing theories as well as empirical data the authors hoped to contribute to not only their own understanding but to the academic and managerial arenas through the resulting decision-making process model.

For academia the results of this study provides a more holistic look at decision-making. This is done by taking a practical look at the process of decisioning, the factors influencing the process, and how those factors interact. For managers the resulting model of the decision-making process

provides insights into how decision-making occurs. By looking at this model, managers can self-examine their own process of decisioning and through that examination and enlightenment possibility improve the way they themselves make decisions.

## 1.4 Delimitations

As with any study, the context under which it occurs has a bearing on the research, the data gathered as well as the analysis and conclusions. This section identifies the boundaries of the research, which should, among others, be viewed as areas for possible future research.

The first restriction is around the empirical study of the two companies. The study was conducted by asking questions around the decision process with regard to new product development. While some insights were provided with regard to decision-making in general most of the data is focused only around innovation and therefore any conclusions drawn are not necessarily applicable outside of this realm.

Secondly the study was conducted on small companies. Therefore while the theoretical data and original observations may have involved larger companies the conclusions drawn from the empirical data can only be assumed to be applicable to small businesses.

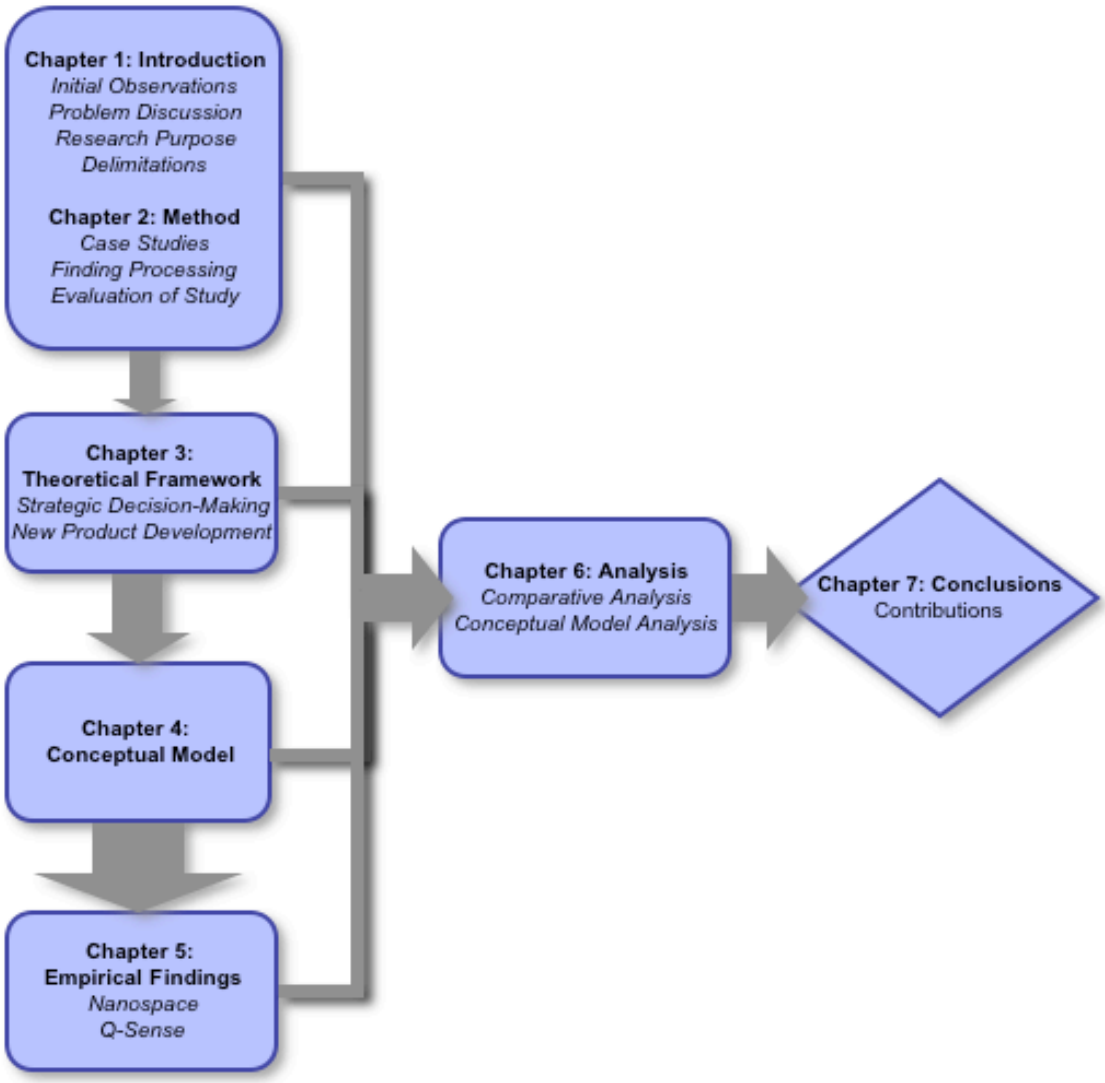
A final delimitation that should be identified is the exclusion of the success or failure of the case study decision-making process. This was not taken into account as the purpose of the research was not to determine how to make successful or unsuccessful decisions, but instead to look at the process under which the decisions are made.

While this section has identified the boundaries of the study, the authors believe that they do not affect the application of the analysis or conclusions. The study was conducted using a defined research process that the authors believe is valid (see Chapter 2: Method). The delimitations, as outlined here, can be used by future researchers in order to further the study of the decision-making process.

## 1.5 Thesis disposition

The structure of this thesis follows closely the journey that the authors took during the study, as depicted in Figure 1. The thesis begins with the introduction chapter, which describes the authors' frustration with regard to decision-making, the resulting research discussion and how that was developed into a research purpose and into the delimitations of the study. The second chapter presents the method that was used to conduct the study including details about case studies how the findings are processed as well as legitimacy of the study. The first two chapters are intended to provide the reader with a background and the context of the study.

**Figure 1 Thesis Disposition**




Source: Authors' own (2005)

The thesis then moves on to the theoretical framework. During Chapter 3 the study explores strategic decision-making as well as new product development. This information is then used in combination with the initial observation to produce the conceptual model, which is outlined in Chapter 4. Progressing forward the study then is conducted of the two case companies in light of the knowledge that has been gained thus far. Based on all the data gathered including the original observations, the theoretical framework, conceptual model and empirical findings, a comparative analysis is conducted in Chapter 6. Following this analysis, confrontation is made between the new knowledge gained through the comparative analysis and the conceptual model. This results in a new conceptual model (Chapter 6) that explains the process of decision-making. In conclusion, the results of the study are discussed and the contributions and further research areas, to both academia and managers, are outlined.

# 2 Method

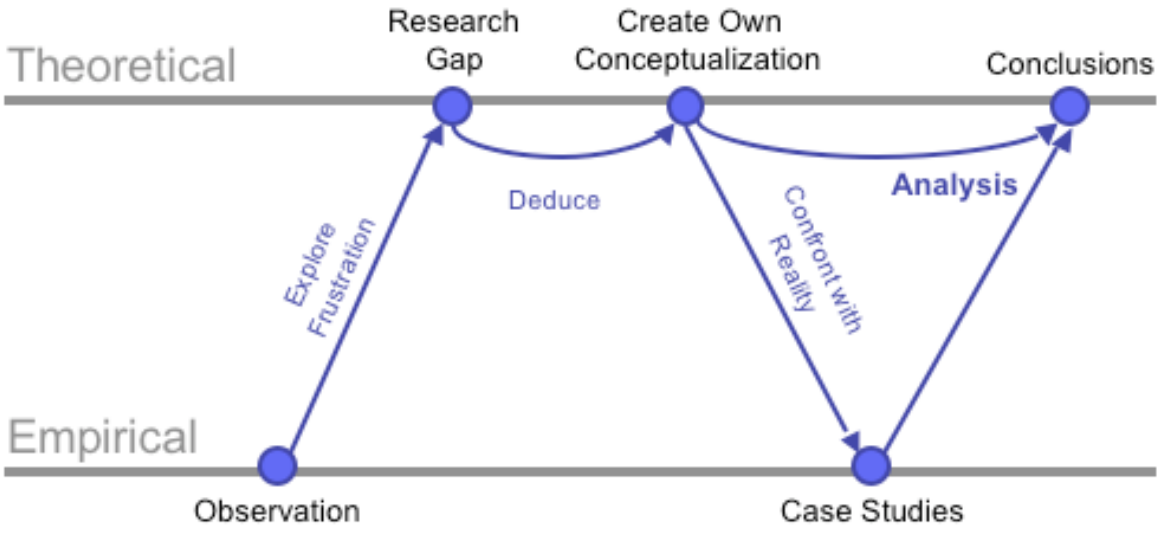
The purpose of this section is to present and discuss the method employed in order to complete this study. In this abductive study, research was carried out using extreme-case sampling. As the goal of the research was to explore the process for decision-making, semi-structured interviews were used to conduct the case studies. This method was seen as the best means to gather the necessary in-depth information that is needed to understand the process decision-makers go through. Other primary information was used such as journals and past experience in combination with the data gathered through the case studies in order to conduct the analysis and draw the final conclusions.

## 2.1 Research approach

Sources of information and research design go hand-in-hand with a clear problem formulation; therefore, data collection methods can only be selected once the purpose of the study has been determined (Churchill and Iacobucci, 2004). The research design then provides a framework for ensuring that the study is relevant to the problem and guides the researcher through the process of data collection and analysis. As stated in the previous chapter, the research question explored in this thesis is: *What is the process for decision-making?*

In order to investigate this question, an abductive research approach was employed. An abductive approach starts with an empirical observation and then "combines the deductive and inductive models of proposition development and theory construction" (Denzin 1978: 110). The final conceptualization, which describes the process of decision-making, was developed throughout this study using abduction and analysis as exhibited in Figure 2.

**Figure 2 Method Approach**




Source: Authors' own elaboration, adapted from thesis seminar on 9th September 2005

The final conclusions were gradually developed though interaction between the theoretical framework and empirical data, and the conceptual model was continuously modified and refined throughout the research process (Yin, 1994). The final conceptualization as developed in this thesis is an attempt to illustrate how decisions are made in companies based on the authors business experiences, findings in existing theories and the companies studied and should be used as a starting point for further academic research in the area.

The research approach, as illustrated in Figure 2, started with an empirical observation. Through their experiences in business, the authors faced several instances where decisions had already been settled and found themselves in projects backtracking to complete the analysis and research that ideally should have been done prior to making the decision. As discussed in the introduction chapter, the authors were frustrated in their various experiences such as with the case of the American Fortune 25 bank, Norwegian food manufacturer, and Swedish car manufacturer.

Based on these empirical observations, the authors then began to question the process of decision-making in companies. How are decisions made? What factors influence the decision-maker at the point of decision? Research was conducted in the field of strategic decision-making to explore this topic and to find answers to these questions within current academic research. However, what the authors found was a research gap. Whereas there are a vast number of studies available that discuss whether decision-making is rational or irrational, the authors did not find what they were looking for. While some research looks at various influences, very few explore the whole process of decision-making and the factors that influence decision-makers.

After a comprehensive literature review and the identification of a research gap, the authors started looking for possible areas of business where decision-making could be observed. Decision-making is at the core of everyday business, some decisions are more important whereas others are less important. In trying to limit the size of the area into a manageable task, the authors determined it would be wise to look at a specific area of decision-making, namely that of innovation. Decision-making is a core component of product development. Managers are influenced throughout the development process by a number of factors. By studying what happens during this process it is possible to identify: What is the decisioning process that decision-makers go through in order to develop new products?

Based on issues identified in the theoretical framework in combination with experiences and knowledge (i.e. analysis, a tendency to rely on intuition and experience) the authors developed a conceptual framework describing the process of decision-making in companies. The process is conceptualized in Chapter 4: Conceptual Model. The next step, then, was to confront the conceptual model with reality, through the use of two case studies as described in the following section.

The purpose of the conceptual framework was to guide the authors through the collection of empirical data. Although the conceptual framework played a central role in the data collection process, the authors were aware that this model was simply a preconception and therefore did not try to sway discussions or answers in the interview situation. On the contrary, alternative observations and influences were also explored. Thus the empirical data highlighted other issues and related factors that were further explored by the researchers (e.g. the importance of knowledge). This method allowed the authors to confirm certain assumptions of the model. Other

assumptions, however, were disconfirmed which lead to the redevelopment of the initial framework which is presented in the analysis chapter as the revised conceptual framework. Hence, using abduction and analysis, the conceptual framework continuously changed.

## 2.2 Case studies

As related before, the purpose of this study is to explore the process of decision-making within companies and therefore, a case study approach was selected. Case studies are appropriate when questions such as 'how' and 'why' are addressed and the goal is to observe a phenomenon within the context of 'real-life' (Yin, 1994). Moreover, case studies provide the researchers with the opportunity to challenge or confront models, theories as well as own experiences and knowledge (Gummesson, 1988) to "confirm, challenge or extend the theory" (Yin, 1994: 38). Further, using case studies, it is possible to gain an in-depth understanding of a phenomenon. Therefore, for this research, a case study approach was deemed appropriate. Examining the process for decision-making through case studies allowed the researchers to use existing theories, models and own observations as a guide in collecting and analyzing the data.

In qualitative research (e.g. case studies) the objective is purposeful sampling as opposed to probability sampling, which is the focus of quantitative research. Purposeful sampling seeks information-rich cases that can be studied in depth (Patton, 1990). In research the most common type of purposeful sampling is typical-case sampling. The authors, however, were not sure what a typical case for decision-making in product development was. Additionally, the authors believed it was important to have more than one case study in order to increase the validity of the results. Therefore the authors decided to use the extreme-case sampling technique. It is believed that through extreme-case sampling, information can be gathered about the extreme conditions that can be applied to enlighten on general cases (Patton, 1990).

### 2.2.1 Design of extreme-case sampling

**Selecting extreme cases**

Based on the goals as discussed above, the researchers began their search for possible cases. The search for suitable companies began by contacting agencies such as *Business Region Göteborg* and *Business Region Stockholm,* agencies that are in contact with many companies for facilitating business in these regions. Individuals within these organizations were contacted and asked to help the authors identify companies that they believed would be good candidates to participate in the study. At this point, the authors were open to any small company; the only requirement was that they develop new products as part of their business. These contacts provided the authors with a list of possible candidates.

Through this method, Per Bengtsson at the Uppsala Innovation Center (a group within Business Region Stockholm) was able to recommend a company that he thought we might be interested in contacting. That company was Nanospace AB, a small high-tech company located in Uppsala, Sweden which uses extremely defined processes for product development, as conveyed by Mr. Bengtsson. After a brief conversation with the CEO of Nanospace, he agreed to participate in an interview, and confirmed that the company did use processes to conduct business. As there was now one extreme for the study the other extreme needed to be located. Ideally a company in the

same industry would provide a good base for comparison. One of the authors had conducted previous work with a small high-tech company that she knew did not have defined processes. This company was contacted and agreed to participate in the study. The second company was Q-Sense AB, located in Gothenburg, Sweden.

Once the case companies had been identified, it was determined to use depth interviews to gathered the necessary data. Depth interviews are an excellent means to gather an understanding of the process being researched. During an interview, others do not influence the interviewee, which allows for more honest and insightful answers. Interviews are also useful when trying to analyze candid and sensitive topics (Churchill and Iacobucci, 2004), which is the case for this study.

There are three types of qualitative interviewing, (1) information, conversational interviews, (2) semi-structured interviews, and (3) standardized, open-ended interviews (Patton, 1990). The authors determined to use semi-structured interviews in order to allow for exploration within the predetermined inquiry area.

**The interview guide**

The qualitative data that is produced by interviews provides insight into attitudes, perceptions, and opinions of participants (Krueger, 1994). For this study the focus is on the view that the participants have with regards to the process they go through in making decisions with regard to new product development.

An interview guide was developed to provide the interviewers with the general topics that the need to be explored. The goal of the guide is to insure that generally the same information is gathered from the interviews. The questions were open-ended to allow for no predetermined responses. Additionally interview guides are helpful in making the most out of limited interview time by keeping the discussion focused. The questions were asked in a logical sequence from generic to more specific questions to provide context to the interviewee. The interview guide used for this study can be found in the Appendix, Chapter 9.

### 2.2.2 Interview situation

The interviews took place at the offices of each of the companies. As discussed above, the interviewers used a semi-structure interview format. Each interview lasted approximately 90 minutes. The interview guide was used as a basis for the questions asked. During the interview, in keeping with the flexible nature of qualitative research, the interview questions were modified to focus attention on areas of particular importance, or to exclude questions that were found to be unproductive for the goals of the research (Lofland and Lofland, 1984).

**Recording data**

In going into the interview a decision point was how to record the data. Various researchers have different opinions on where or not to take written notes or to use a tape recorder. In knowing that technical devices can seem intrusive it was deemed that it was more important to have an accurate account of the interview results, therefore a tape recorder was used. This allowed for the

interviewers to also focus more on the discussion as opposed to the taking of notes. Key notes, however were taken in case of technical failure.

**Perspective of researchers**

While the theoretical framework and the conceptualization has already occurred prior to the empirical focus groups, it is imperative that the researchers had an open mind to the insights shared during the discussion. It was not the goal of the researchers during the interview to test or confirm the pre-conceived conceptualizations but instead to understand as much as possible about the process during the discussion (Krueger, 1994).

**Potential problems and mitigation**

There are various limitations in interviews, which were identified and discussed prior to conducting them. One of the biggest concerns was the consistency from one interview to the next. In order to deal with this limitation the interview guide, as discussed above was used. During the interview, the guide did provide a good basis for the questioning.

Another key concern was the knowledge of the interviewee around the study topic. In each company the president was the individual being interviewed. While it can be assumed that in a small company the president will know about the decision-making process it was unknown prior to the interviews the level of knowledge. As it was unknown prior to the interviews there was little the authors could do to mitigate this risk. During the interview, however, it was established early on the level of involvement of the presidents in the decision-making. For the first case of Nanospace, the interviewee was very familiar and in-fact involved at every level from the start of the company onward of the decision-making process. For the second case of Q-Sense, the president did have a good deal of knowledge about the process although he was not personally involved with the decision-making at the beginning of the company as he was not part of the company at the time. Additional data, however, was available from the founder of Q-Sense regarding the decision-process at the beginning of the company.

Another risk was that the two companies would not be extreme cases. As the first case of Nanospace was a recommendation by a third person the authors had to trust the knowledge of that person with regard to the company. As the second case was based off the personal contact with one of the authors there was little risk that the case would not be on the extreme. After the interviews, it was determined that the two cases were in fact radically different in their business methods and would be two good cases to confront the conceptual model against.

## 2.3 Findings processing

The interview results were analyzed as descriptions of experience. After the interviews, the authors went through the recordings to group and summarize the information. The process of going through the data and identifying these key themes is known as “open coding” (Strauss and Corbin, 1990). Words, phrases and events that appeared to be similar were grouped into similar categories (Strauss and Corbin, 1990). These categories were modified as needed throughout the processing of the data.

After the open coding the authors then began to examine the categories to see how they were linked in a process referred to as "axial coding" (Strauss and Corbin, 1990). During the axial coding the authors began to develop an abstract "big picture" of the data. At this stage it was determined that there was enough data to conduct the actual analysis of the research question.

After the coding was complete, the authors wrote a linear case study for each of the two companies. The cases as written attempt to report an accurate account of the reality of the two cases as described by the presidents during the interviews.

## 2.4 Evaluation of the study

The method used to conduct a study arguably influences the results of the study. Therefore the method used needs to be evaluated in order to assess the reliability of the study itself. Reliability is dependent on three elements (Patton, 1990: 461):

1. rigorous techniques and methods for gathering high-quality data that is carefully analyzed, with attention to issues of validity, reliability, and triangulation;
2. the credibility of the researcher, which is dependent on training, experience, track record, status, and the presentation of self; and
3. philosophical belief in the phenomenological paradigm, that is, a fundamental appreciation of naturalistic inquiry, qualitative methods, inductive analysis, and holistic thinking.

In order to address the first element two primary techniques were used. The use of negative cases allows for the analysis of trends that do not fall within the typical case (Patton, 1990). Using extreme-case sampling allows the researchers to look at trends that were outside of the norm. By comparing and contrasting the two case studies, more validity is brought to the study.

During the analysis, theory triangulation was used to look at the data from multiple theoretical perspectives (Patton, 1990). This technique provided the researchers with the knowledge that the data found is not a result of only this study, thereby providing reliability. The true question to measure validity is whether or not the research results can be reproduced. In this study, the authors believe that the method used can be repeatable and therefore, the results themselves can be replicated.

The second element addresses the credibility of the researchers. Throughout the study the authors continuously and purposefully addressed the issues of subjectivity and bias. It was extremely important to the outcome of the study to make sure the level of subjectivity was limited as the study itself began by observations made by the researchers. One of the problems with an abductive study, where a conceptual model is developed prior to the data collection process is that the researchers own ideas and observations (as exhibited in the conceptual model, Figure 7) may be very much on their mind during the collection of the empirical data. The observations themselves can be seen as starting with a bias. To minimize this bias the first step taken by the authors was to do a broad review of the literature comparing multiple perspectives. In this study, this involved collecting both primary and secondary data. Initially a large number of well-established academic journals and books were used to gather information and develop a comprehensive understanding of decision-making.

During the empirical data collection the authors went out of their way to not influence the interview subjects. For example, the authors did not inform the subjects about the purpose of the research, any results of the literature review, or opinions of the researchers. On the contrary, they maintained a very open dialogue, using open-ended questions that allowed the subjects to discuss the processes as they saw fit and encouraging the discussion of other factors and issues related to decision-making that may not have been previously identified.

The third element looks at the paradigm orientation and assumptions that underline the study (Patton, 1990). This element is based on a discussion of philosophical beliefs on the nature of research methods. Some researchers believe or disbelieve in qualitative research such as case studies. It is not the purpose of this study to prove or disprove the use of qualitative research methods. The authors believe that qualitative research methods are effective especially when attempting to understand the depths of human interaction and thoughts.

In evaluating a study, the issue of validity needs to be addressed including the issues of construct, internal and external validity (Yin, 1994). With reference to construct validity, the purpose is to reduce the level of subjectivity in the study. As highlighted previously, researchers do bring with them their ideas, observations and thoughts into the data collection process. However, in collecting the data the researchers made every effort to minimize its effects. By being aware of the problem and evaluating the data based on the literary review, the authors tried to ensure construct validity. The purpose of external validity is to "establish the domain to which the study's findings can be generalized" (Yin, 1994: 33). In the case of this study, the authors were careful not to generalize about the process of decision-making.

### 2.4.1 What could have been done differently?

At the end of a study it is interesting to look back at the research process and assess what could have been done differently. In the case of this study, the researchers interviewed the CEOs of Nanospace and Q-Sense. It might have been the case that certain factors, such as the influence of the power of information in the decision-making were not discussed as the CEOs control most of the information. Hence for them, it was not an interesting or relevant factor to discuss. If the research process was to be repeated, it might have been of interest to interview other people in the organization to obtain their perspective on decision-making.

Additionally, while it was helpful for the comparative analysis that both companies were similar in terms of size, industry and business model, it may have been interesting to study companies that were completely different in order to see whether the results were applicable there as well.

# 3 Theoretical Framework

The purpose of the theoretical framework is to provide a discussion of the concepts and hypothesis that will have impact on the research being conducted. The discussion will begin at a broad level and will then narrow to the most pertinent data for the study. These areas will be used as a basis for the conceptual model that will be presented in the next chapter. The first dialogue will center on strategic decisions making, followed by new product development. The discussion will be used as a basis for conceptualized model that will be presented in the next chapter.

## 3.1 Strategic decision-making

Decision-making is at the core of every manager's daily role. Some would say that is what managers get paid to do; make decisions. Some even go further to say that good managers are the ones that can make the hard decisions. But what are these hard decisions? Today's business world calls these 'strategic decisions'. What makes a strategic decision can and will continue to be debated by both academics as well as practitioners. A commonly used definition, to be used during this study, crafted by Mintzberg, Raisinghani, and Theoret (1976: 246), defines a strategic decision as 'important, in terms of the actions taken, the resources committed, or the precedents set.'

During the past thirty years researchers, using empirical data to lead their theories, have come to develop three dominant paradigms within strategic decision-making; rationality and bounded rationality (e.g. Simon, 1978), politics and power (e.g. Pfeffer, 1981), and garbage can (Cohen et al., 1972). The rationality and bounded rationality models contend, as they describe, that a managers decisions are rational. In other words they follow a logical process in order to arrive at the best conclusion. The two other theories, political and garbage-can, contradict the rational mode as discussed below.

The political perceptive on decision making takes into account the effect that a group has on decision-making. This model demonstrates that decisions are a result of the process where decision makers all have individual goals, and come together in groups. When they come together the group with the most power will make the final decision (March, 1962; Hinings et al., 1974; Salancik and Pfeffer, 1974). Here the most powerful can reach decisions without a great deal of analysis and then after they have made their decisions, require additional research to prove their point to the larger body. While the political model may have some influence on the original observations of the study, it will not be directly studied, as the researchers were not able to conduct the in-depth study needed to look at the impact of the power on the decisions.

The garbage-can theory was first presented by Cohen, March and Olsen (1972). This theory is the least proven and accepted of the three. This model shows that decisions occur in random meetings of choices looking for problems, problems looking for choices and solutions looking for problems to answer, and decision makers looking for something to decide (Eisenhardt and Zbaracki, 1992). Unfortunately this newer conceptual framework has failed to provide comprehensive solutions (Langley et al., 1995) to the issues that face managers in today's market place. Therefore this theory will not be explored as a foundation for this study.

As the original observation is centered around the process of how decisions are made the theoretical framework will focus on the most accepted and process oriented theories; rationality and bounded rationality.

### 3.1.1 Rationality and bounded rationality

Are managers rational? Followers of the 'economic man' paradigm assume that people as well as organizations (since organizations are made of people) are rational (Allison, 1971). This assumption holds that managers have the interests of the firm at heart first and foremost, and therefore use a logical model for decision making in order to provide the best possible solution to decisions. Most managers ideologically follow this standard, at least formally and publicly.

Rationality is a concept from economics, which holds that individuals make choices that are utility maximizing. According to this theory, decision makers will never choose one feasible option over another if they prefer the second (Stanford Encyclopedia of Philosophy, -1). The rational choice theory is normative meaning that it shows what a manager should do, not due to morality but due instead to rationality (Stanford Encyclopedia of Philosophy, -1).

Based the economic model, the rational perspective was first outlined by Simon in 1957 and explains that actors enter decision situations with known objectives, which determine the value of the possible outcomes. The actors in the model, gather data and develop a set of alternatives, and then select the best option. The model basically assumes that human behavior has a purpose, which translates into rational action (March and Simon, 1958; Allison, 1971).

The original research into the application of this economic theory in decision-making showed that the process and decisions made did not meet the normative theories (Cyert and March 1963; March and Simon, 1958). The research showed that the most optimal outcome was not achieved due to the process followed by decision-makers, which turned into the bounded rationality model (Cyert and March 1963; March and Simon, 1958). Based on this model, two paths of researched followed.

The first path focuses on the psychological aspects of decision-making; behavioral decision theory. Here researchers have conducted lab tests that look directly at how subjects choose alternatives and where those alternatives are mathematically the best option based on expected value (e.g. Payne et al. 1988). This analysis looks only at the individual and does not take into account the organizational context that surrounds the decisions. On the whole, the research has been able to show that the decision makers continually infringe on what they know to be true (Tverksy and Kahneman, 1983).

The other path takes into account the organizational aspects of the decision (Cyert and March 1963; Cyert *et al.*, 1956; Carter, 1971). The research is typically conducted in the field setting (as is this study). When conducting the studies it is impossible to determine if a decision will maximize the persons (or organizations) utility, therefore researchers accept that decisions are not rational but boundedly so (Dean and Sharfman, 1993).

Therefore, the second line of research, focuses on the *process* of decision-making and how that process reflects the desire to make the best possible decision based on the circumstances (Dean

and Sharfman, 1993). Simon (1978) named this procedural rationality and is the focus of this study.

When a manager begins the decision-making process, they gather information needed to form an understanding about the various alternatives and then they use this information to determine the final result (Dean and Sharfman, 1993). Dean and Sharfman (1993: 370) define rationality within this context as 'the extent to which decision process involves the collection of information relevant to the decision, and the reliance upon analysis of this information in making the choice'. This definition will be used for this research as well.

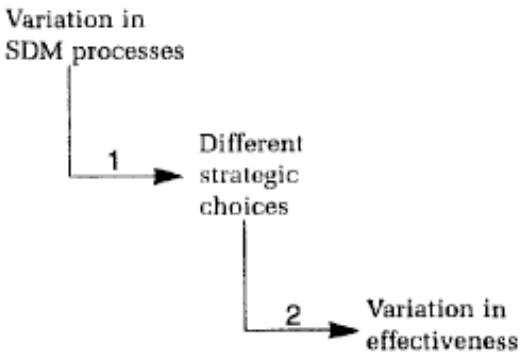
In their study of 57 strategic decisions in 24 companies, Dean and Sharfman (1993) were able to conclude that companies (and thereby the decision-makers) use rational procedures when there is little competitive threat, when the companies perceive little external control and when they are facing well-understood issues. Could it be that for the most part these conditions are not met when managers are making decisions therefore they do not act rationally?

In order to further their research Dean and Shafman (1996) dive deeper by looking at how decision-making processes are related to decision success. There are two assumptions used to prove that the process by which decisions are made matters. As stated and illustrated in Figure 3 by Dean and Shafman (1996: 369):

*(1) the different processes lead to different choices, which is to say that SDM processes influence the choices organization make and,*

*(2) that different choice lead to different outcomes, that all choices are not equally good.*

**Figure 3 Assumptions Underlying the Strategic Decision-Making Process-Effectiveness Relationship**




Source: Dean and Sharfman (1996: 369)

The research conducted by Dean and Sharfman showed that strategic decisions are influenced by the processes used. More specifically that managers who used analytical techniques made decisions that were more effective than those who did not and that managers who engaged in the use of power or pushed hidden agendas were less effective than those who did not (Dean and Sharfman, 1996).

### 3.1.2 Adjusting rationality

An alternative view of rationality that has been explored starting in the 1980s is that of rationality that does not necessarily follow the decision-maker throughout the entire continuum of their decision process. There are a few examples of this occurring in various empirical studies. For example in 1986 Isenberg found that managers made contingency plans (following a rational strategy) but they also made decisions quickly without complete information (following a bounded rationality strategy). During the same time in 1985, Fredrickson found that managers were both rational but also relied on intuition. A little later, Eisenhardt (1989) showed that while managers developed many alternatives (a rational strategy) they did very little analysis of these alternatives (bounded rationality strategy). Therefore, these studies showed that decisions makers were continually adjusting their rationality in complex ways instead of following a continual process of rationality.

In more recent times, more studies have been done taking into account the impact of globalization on organizations and therefore managers. Some of these factors are the pressure to make decisions quicker, a quicker changing environment, and less or more information than what is needed. The new environment has led to managers searching for new ways to make decisions. Various observations have been made. A number of researchers have seen that the rational model does not work in this changing environment (Hayward and Preston, 1998; Andersen, 2000; Kuo, 1998). Nutt (1999) was even able to show that rational decision-making strategies are not successful about 50 percent of the time. Additionally, the bounded rationality model is also becoming difficult to satisfy (Eisenhardt and Zbaracki, 1992; Langley et al., 1995). Researchers have been looking at these observations and trying to determine a new model that will work in the fast-past environment. Eisenhardt (1989) and Wally and Baum (1994) remarked that organizations are using more holistic approaches to decision-making. But what are the holistic approaches?

As mentioned above, one attempt was the garbage-can theory, but it has been unable to fully take into account the dynamics of today's decision-making environment. In their search, academics have begun to pull together elements that they see within decision-making today.

There are three elements that seem to have an ongoing occurrence in literature, that of analysis, intuition, and inertia. They will be examined more closely below as they may have an effect on the original observation of this study.

**Analysis in decision-making**

Every manager knows that they must conduct formal analysis for most activities they do within the organization. Particularity of emphasis has been the use of analysis to provide information. There are various types of motives that lead to analysis being conducted. Researchers have identified some of these:

- Control function (Dalton, 1959)
- Justification for decision already made (e.g. Bower, 1970; Kerr, 1982; Meyer, 1984)
- Focus attention on specific issues, raising comfort levels, gaining commitment (Quinn, 1980)

- Tool for debate (e.g. Lindblom and Cohen, 1979; Porter, Zemsky, and Oedel, 1979; Prince, 1979; Widavsky, 1979)
- Deflect attention by giving impression of action (Brewer, 1981; Metsner, 1976)
- Legitimizing organizational actions (Edelman, 1985; Feldman and March, 1981; Meyer and Rowan, 1977; Pfeffer, 1981)

Most of these motives for analysis have been identified through conclusions of studies looking at other aspects of the organization or decision-making. In her 1989 article, Ann Langley presents a direct study on the purposes behind formal analysis. Langley finds that companies that regularly conduct formal analysis are not necessarily more rational, but are more likely to be pluralistic (1989), meaning decisions are taken by groups instead of a single person and that the analysis is linked to the social interactive processes.

### Inertia

Decision-makers tend to make decisions the same way they have made them before, with little or no change to the process itself. Although it may seem prudent to adapt the processes to be more or less comprehensive depending on the situation or other forces effecting the organization, decision makers tend not to make changes, and if they do they are very slow in being implemented (Miller and Frisen, 1980a,b; Mintzberg, 1978; Quinn, 1980; Starbuck, 1983; Steinbruner, 1974; Tushman and Romanelli, 1985; Yasai-Ardekani, 1986). This perspective is known as inertia, momentum or simply habit (Fredrickson and Iaquinto, 1989). For this study and in relation to strategic decision-making inertia is referring to organizational change in relation to their environment. This lack of change, or force to continually move forward without change, is eloquently described by Starbuck (1983: 93):

> *Behaviors get programmed through spontaneous habits, professional norms, education, training, precedents, traditions, and rituals as well as through formalized procedures.*

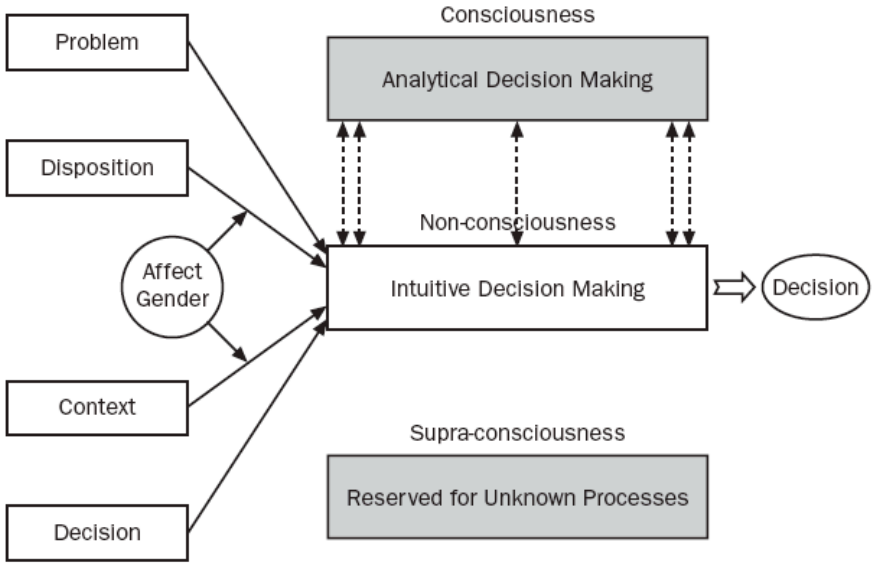
Fredrickson and Iaquinto contend that although decision processes not suitable based on the company's current environment, companies are likely to continue to make and implement strategic decisions the way they have done in the past (1989). This factor is discussed as it may have some impact on actions (or lack of actions) that decision-makers take during the process itself.

### Intuition

One possibility is that today's inertia can be seen as the use of intuition in the process of decision-making. In 1999 Eisenhardt stresses the impact of intuition, which allows managers to make decisions in a dynamic environment. Langley et al (1995), identify emotion, imagination and insights as drivers of the process. But intuition itself cannot stand alone as a method for decision-making. Isenberg (1984) and Burke and Miller (1999) showed using empirical data that managers tend to use intuition as well as rational analysis to make decisions. This holds with Eisenhardt and Zbaracki's (1992) contention that there must be a multidimensional approach to the strategic decision-making process. In their 2005 study, Sinclair and Ashkanasy use these conclusions as a basis to develop a model for decision-making using intuition as well as the rational process. Sinclair and Ashkanasy define intuition as a non-sequential information-processing mode, which comprises both cognitive and affective elements and results in direct knowing without any use of

conscious reasoning (1992). Based on their position that conscious and un-conscious cognitive systems happen in parallel they have developed a decision-making model. In the model, Figure 4, the conscious process is the analytical (or rational) aspect, while the non-conscious is the intuitive decision-making.

**Figure 4 Intuition and Analytical Decision-making Model**




Source: Sinclair and Ashkanasy (2005)

Sinclair and Ashkanasy's model focuses on the non-conscious aspects of decision-making. The model shows that the intuitive decision-making is affected by factors such as the problem characteristics, the personal disposition, the decision-making context and the decision characteristics. The model also incorporates the affect of gender, which has been identified in various studies. Additionally they reserve a space for supra-conscious processes that may occur outside of the conscious or non-conscious level. This can be used to explain intuitive insights outside of the non-conscious recognition, what some have identified as the 'sixth-sense' (Sinclair and Ashkanasy, 1992). As an outcome of the interaction between the conscious and non-conscious decisions are made. This model is obviously new and while it has been tested against existing decisions, it has yet to be substantially proven with empirical analysis.

### 3.1.3 The process of decision-making

This study aims to look at the process of decision-maker. In summary, the various theories discussed thus far in this framework will have an impact on the process that occurs during decision-making. The researchers do not contend to disagree with the bounded rationality model, but instead like Sinclair and Ashkanasy use it as a piece of the puzzle as to what is occurring during decision-making. The researchers see a few key pieces of the puzzle, first is that of analysis or what is believed a lack of analysis that is conducted. Why is this so, and how important it is to the overall decision process? Another key piece as discussed is that of inertia. Does inertia play a role in the way the decisions are being made? And finally intuition, is it the new standard for decision-making in the global environment? In order to be able to answer some of these questions, the researchers turn to a very specific area and critical part of decision making, that of innovation.

## 3.2 New product development

For the past couple of years, the new buzzword 'innovation' has been embraced by the business world. Companies have brought innovation to the top of their agendas, supported by researchers who argue that innovation is the key to corporate success (Schumpeter, 1942; Porter, 1990). Hence, innovation has become a highly prized practice within organizations and in industries where products move through the product life cycle faster, the need for innovation and new product development is greater than ever before. Therefore, new product development is no longer a strategic option; it has become one of the most crucial functions of the modern firm.

In line with the growing interest in innovation and new product development, researchers and managers have debated whether innovation is a process or a discrete event (Cooper, 1998) and discussed the different dimensions of innovation. Essentially, as related by Roberts *et al* (2005) innovation is concerned with change or renewal, for example through the introduction of a new or modification of a good, opening up of a new market segment or distribution channel or creation of a new business model or organizational form. A commonly used definition, to be used during this study, is innovation as a 'mindset, a pervasive attitude, or way of thinking focused beyond the present into the future vision' (Roberts *et al*, 2005: 408).

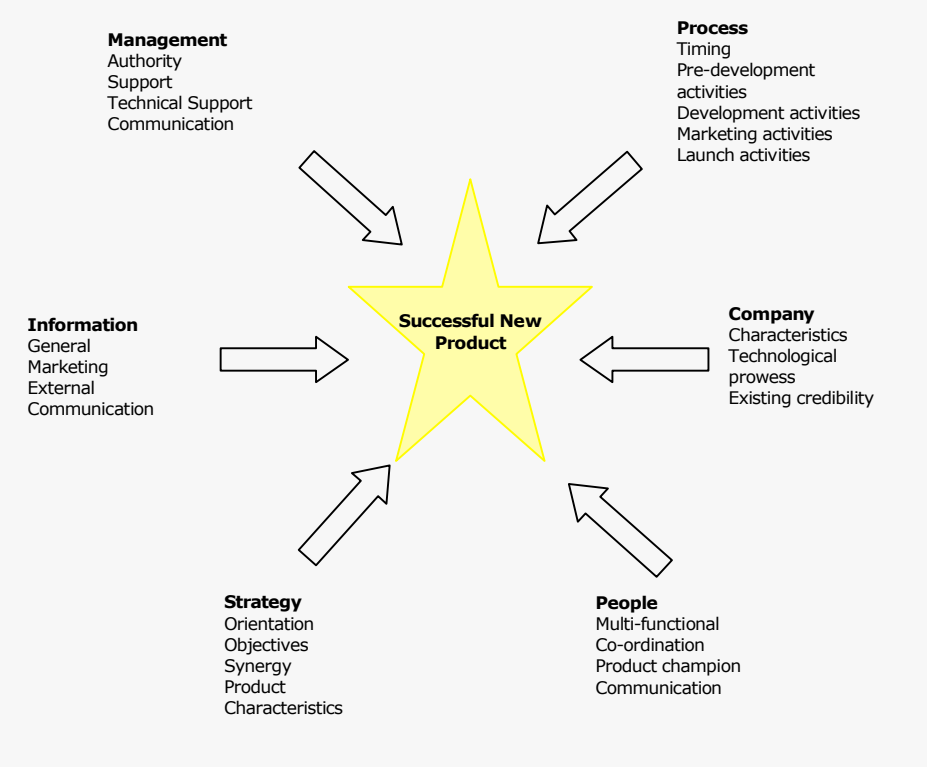
While innovation and new product development is a strategic goal for most companies, it stands out as one of the most deficient functions of the modern corporation (Cooper, 2001). Virtually all companies talk about the importance of innovation while only a few actually succeed at doing it. According to a study by Cooper (1994), failure rates range between 30 and 60 percent. Hence, new product development remains a hit-and-miss affair and companies seem to be making the same mistakes today as they did one or two decades ago.

Therefore, new product development (NPD) has been a popular research area among academic scholars who have looked at the decision-making process and tried to identify factors that increases the chances of success. The result has been a wealth of studies that investigate why some products are successful while others fail and what separates 'winners' from 'losers' in NPD (Montoyn Wiess and Calantone, 1994). The literature available is vast and includes both broad general explorations as well as in-depth case studies. However, because this research has not been tied together to create actual knowledge it is difficult to grasp what is actually known and what's unknown.

This section provides a brief review of the current literature and presents three key themes within NPD. Within each section, a number of factors that influence product success are identified. Some factors are more specific to the decision-making process while others are more general and influence the overall process. Few studies have focused specifically on the decision-making process, although there are hints and traces of factors that influence the way products are evaluated within each theme. Ozer (2003) however, is an exception and his study provides an integrated framework for understanding how various factors affect decision-making in new product evaluation. The key conclusions from his study will be related to this notion. Finally, the authors will summarize the research available focusing specifically on factors that influence new product evaluation.

In their review of the current literature on product development, Craig and Hart (1992) provides a categorization of critical success factors according to key themes as presented in Figure 5 below.

**Figure 5 New Product Development Factors- Key Themes**




Source: Craig and Hart (1992: 14)

In their model, Craig and Hart (1992) distinguish between two types of success factors, namely those related to the way in which certain projects are developed, i.e. the NPD project and those connected to how a company approaches new project development, i.e. strategy. Strategy covers factors such as Company, Management and Strategy; these factors are fairly constant and exert influence in a similar way over all projects. Project themes, People, Information and Process, relate specifically to the way in which a project develops. Craig and Hart's (1992) model illustrates how a vast array of factors can influence decisions related to new product development. The empirical research available can be further categorized into three streams of research; product development as a rational plan, communication web and disciplined problem solving. These three streams will be discussed subsequently, focusing more specifically on factors that influence decisions related to new product development.

### 3.2.1 Product development as a rational plan

The rational plan perspective emphasizes that successful products are the result of a rational decision-making process which involves careful planning, implementation and execution (Brown and Eisenhardt, 1994). Moreover, chances of success increases if the product has specific advantages, is targeted at a lucrative market segment and the process is supported by top management.

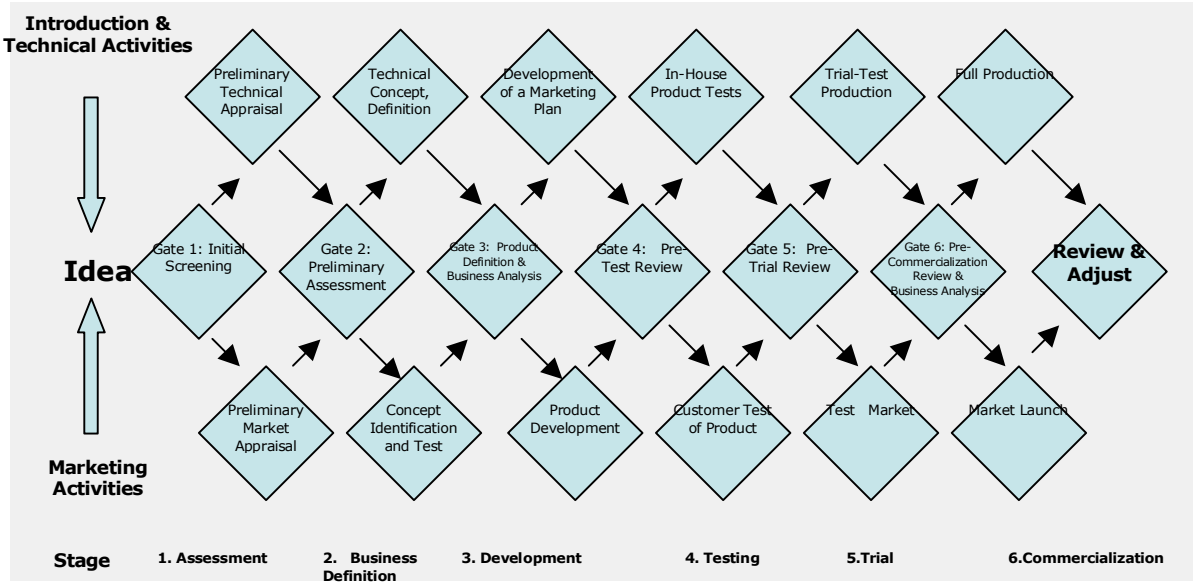
Early research (Meyers and Marquis, 1969) within this area highlight the importance of understanding users' needs (market pull) and hence product development decisions must be based on sound and comprehensive market analysis. Building on this research Cooper (1984) argues that it is important to combine a market and technology driven focus through the 'marriage of technological prowess and a strong marketing orientation' (258). Chances of success increase even more if a cross-functional approach is adopted so that the team developing a product consists of representatives from both marketing and technology departments (Rothwell, 1972; Meyers and Marquis, 1969; Pinto and Pinto, 1990). By successfully integrating marketing and technical skills, coordinating research and development with marketing the chances of successful product development can be further increased (Maidique and Zirger, 1984).

Moreover, studies within the rational plan perspective also emphasize the importance of leadership and top management support (Meyers and Marquis, 1969; Maidique and Zirger, 1984). Top management need to demonstrate their support for new product development ventures, either through the development of a NPD strategy (i.e. Goltz, 1986; Cooper, 1987; Cooper, 1984) or through linking new product development strategy to corporate strategy. As such, a top manager can ensure that innovation is the center of company strategy, through for example a 'Product Innovation Charter' (Crawford, 1980). Cooper and Kleinschmidt (1987), however, found that products that failed had as much managerial support as successful products. Thus, the evidence here is inconclusive. Nevertheless, it should be noted that top management fills an important role as climate setters in an organization. By creating an environment in which risk-taking is encouraged, top management can provide the framework for successful innovation.

One of the most important steps within the NPD process is evaluation and related activities such as data gathering and information assessment. According to Cooper (1992), evaluation should cover both market and technical appraisal and be carried out throughout the development process. Moreover, Cooper and Kleinschmidt (1987) make particular reference to the importance of; initial screening; preliminary market assessment; preliminary technical assessment; detailed market research; and business/financial analysis. Here the importance of market research activities is emphasized including pre-launch activities such as concept and product testing as well as new product forecasting as suggested by Wind and Mahajan (1987). Furthermore, Cooper (1992) also suggests that these activities are to be accompanied by 'decision points' where the project is checked for quality and progress. Here, project managers have the options to hold, kill or let a project through.

Coopers (1988) model, called the 'Stage-Gate Process', represented in Figure 6, includes a series of stages highlighting the most important activities at each stage. Stages are then controlled by a 'gate system' which ensures that all activities are carried out and completed in a quality fashion. Moreover, the process integrates marketing and technical activities and these are carried out, as depicted, simultaneously. As Cooper (1988) points out this 'Stage-Gate-Process' should simply be used as a model or a starting point and each firm needs to develop its own version to fit with the needs of that particular company and industry. As illustrated below in Figure 6, this model contains six main stages or 'gates'.

**Figure 6 NPD Process: the 'Stage-Gate Process'**




Source: Cooper (1987: 72)

This stream of research has provided a comprehensive list of success factors; however, its breadth is also a major weakness. Studies commonly report as many as 40 to 50 important findings (Hise *et al,* 1990) making it extremely difficult to weed out the most important factors. Furthermore a majority of these studies rely on single informants trying to make sense of past processes. Hence, this renders the validity of the results highly vulnerable to subjective judgments and other biases. Another criticism relates to the way in which the results from these studies are presented without well-defined constructs. Variables are often relatively vague and theoretical. For example, saying that 'better products' are more likely to be more successful does not serve as basis for theory building. The next step would be to identify what constitutes a 'better' product and as such take a step towards theory building (Brown and Eisenhardt, 1994). Additionally, there is a pressing need to distinguish between factors, some may be more important than others and to identify the right mix of variables.

### 3.2.2 Product development as a web of communication

Another more specific stream of research focuses on one independent variable; communication, which emphasizes communication among team members and with key outsiders as a driver of team performance. Consequently, the better members of a team communicate with each other and outsiders, the better the outcome of the development project (Brown and Eisenhardt, 1994). Within this area, two theoretical themes emerge, namely information-processing and political communication. Instead of providing a broad overview of factors research within this area tries to understand other aspects of decision making by in-depth analysis of political and information processing aspects of product development.

The first theme, information processing, highlight the importance of frequent and structured communication channels both within the team and with outsiders. Early studies within this area such as Allen (1971; 1977) emphasize the importance of a 'gate-keeper', a person that facilitates the exchange of information externally by bringing information into the organization and dispersing it to other team members, thus encouraging team communication outside of the group

(Allen, 1971). Moreover, according to a study by Katz and Tushman (1981) teams with gate-keepers perform better than those without thus highlighting the importance of excellent communication channels, both within the organization and outside including customers and suppliers.

Building on previous research, the second theme, a resource dependent theme argues that a team needs to engage in political communication to increase the resources (budget, personnel and equipment) available to the team. Ancona and Caldwell (1992) argue that communication strategy rather than frequency is tied to successful product development and that teams need to pay attention to the nature of their interaction. Hence, by acting as ambassadors and task-coordinators at the same time, teams can secure the resources and access appropriate information. Moreover, research has highlighted the importance of team cohesion and that those teams with more thorough communication, clear goals, lists of priorities and plans perform better (Brown and Eisenhardt, 1994).

Moreover, a team's performance is heavily influenced by internal communication flows and mechanisms. Here researchers have emphasized the importance of breaking down cross-functional barriers and thus combining their perspective across boundaries in an interactive fashion (Dougherty, 1990). According to Dougherty (1990) teams structured around concrete tasks, novel routines and fluid job descriptions have been associated with product success.

Furthermore, good communication skills is one of the company characteristics that Bentley (1990) associates with successful product development. To sum up, companies that have a flexible structure and style with respect to communication and where individuals are encouraged to be innovative, make decisions and solve problems are more likely to support successful product development. Similarly, Rothwell and Whinston (1990: 163) suggest an organization characterized by:

- freedom from rigid rules;
- participative and informal;
- all views are aired and considered;
- face-to-face communication, little 'red tape';
- breaking down departmental barriers;
- emphasis on creative interaction and aims;
- openness and willingness to take on external ideas;
- flexible with respect to changing needs, threats and opportunities;
- flat and non-hierarchical
- information flows upwards and downwards

Although this area of research has been highly influential in explaining communication processes of successful product development projects, one of the major shortcomings is that it is so narrowly focused that other areas, for example organization or market attractiveness, are neglected.

### 3.2.3 Product development as a process of disciplined problem solving

The third area of research as identified by Brown and Eisenhardt (1994) views product development as a process of problem solving. Successful product development is the result of problem solving activities between the project team and a more powerful leader (strong management) and an overall product goal. The role of the leader is to provide guidance or a vision for the team while at the same time granting the team autonomy. This area focuses specifically on effective organization and considers the role of suppliers, senior management, the project leader as well as the team (Brown and Eisenhardt, 1994).

An additional consideration which can influence the success of NPD project is the organizational structure and the daily management of the project team. Within this area, numerous studies have tried to determine the role of top managers and among others Cooper and Kleinschmidt (1987) argue that senior management should engage in subtle control. To accomplish this, top managers can give team members the freedom to work autonomously while exercising the control to ensure that the result fits with corporate strategy and goals.

Furthermore, team leaders play an important role as the link between top management and the team. Successful teams have team leaders who are able to gain access to resources, break down barriers between different functions and simultaneously communicate a product vision (Clark *et. al*, 1987). As discussed previously, structure and management which fosters boundary spanning, cooperation and integration of different structures are associated with successful outcomes. Hence, project managers play an important role as 'communicators', conveying objectives and goals, as 'climate setters'; by fostering team cooperation and encouraging risk-taking; as 'planners'; outlining goals and activities; and finally as 'interfacer' by being an interface between project members, top managers and other functional units (Barczak and Wilemon, 1989).

Studies have also attempted to identify the particular roles and skills (Roberts and Fusfield, 1991) that people within the project team ideally should fulfill for the team to be successful. These are idea generating; entrepreneuring and championing; project leading; gatekeeping; sponsoring and coaching. Generally different types of people fulfill different roles, therefore various people have to be recruited and managed differently. Within NPD research, the 'entrepreneur' has received more attention than the other work roles, this person acts as the product champion "recognizing, proposing, pushing and demonstrating a new technical idea, approach, or procedure for formal management approval" (Roberts and Fusfield, 1991: 22).

Empirical studies have identified an array of factors that influence new product development, focusing specifically on factors that increase the chances of success. The three themes of research, as presented above, focus on different aspects of product development and identify different key themes that are more or less important. One of the problems with this research is that it is atheoretical in the way that it lists a large number of factors which are difficult to define and thus do not serve as a basis for theory building. For example factors such as 'good communication channels' are vague and ambiguous and cannot be easily applicable in real life. Moreover, factors are rarely put in relation with each other. Therefore, research must try to identify the most important factors and make them easily accessed and implemented.

As related before, most studies in this area focus on critical success factors and how these affect performance. Naturally, broad factors such as process, leadership and people, overshadow and influence the decision-making process. Within this area, however, only a few researchers have chosen to study which factors influence, more specifically, the decision-making process. An exception is Ozer (2003) who in his study looked specifically at which factors affect decision-making in new product development process and in an attempt to try to understand how these factors affect evaluation. The outcome of this study was four sets of factors as related below;

- *Task related factors*; task complexity, task importance, information scarcity and task instructions
- *Decision maker related factors*; expertise and diversity
- *Elicitation related factors;* discrete value elicitation and probability distribution elicitation
- *Aggregation related factors*; mathematical, behavioral, mixed, electronic meetings

The first sets of factors that Ozer (2003) identifies are task related. The ability to evaluate a decision is inevitably dependent on the complexity of the task and information available, and there is very little the decision-maker can do to chance the nature of this task. Further, the person or people involved in the evaluation will attach different meanings or importance to different products and this can lead to erroneous judgments. For example, research and development may tend to focus too much on product application at the expense of thorough market research. Finally, the clarity of instructions provided influences the process, thus product extensions may be easier to evaluate than new-to-the-world products.

As highlighted by Ozer (2003) the role of the decision-maker should not be underestimated, and here the importance of two factors are emphasized, namely expertise and diversity. Expertise is highlighted as a very important factor as research has shown that people, when asked to make judgments outside their knowledge domain, are less accurate (Ozer, 2003). Moreover, objectivity also comes into play here. For example, the opinions of the original designers of a product are often biased because of their emotional attachment and involvement with the development process. Therefore, diversity is important. Moreover, the way the opinions of new product decision-makers are elicited and aggregated also influences the outcome of a decision (Ozer, 2003).

### 3.2.4 Factors in decision-making

The aim of this study is to look at the process that decision-makers go through when developing new products and to identify what factors influence them. Whereas Ozer (2003) provides some interesting insights into understanding the process of decision-making, the authors believe that Ozers findings are only a piece of the larger puzzle. Other studies touch upon a number of issues that influence the decision-making process and therefore this section will provide a summary of factors will be used in the conceptual model.

According to the rational plan perspective, successful products are the result of careful analysis and implementation. A key factor here is information; hence, comprehensive analysis should serve as a basis for any decision. Thus, the amount of relevant market and technical analysis available will inevitably influence the decision-maker. Moreover, the rational perspective postulates the need for the right 'processes', e.g. Coopers (1993) 'Gate Stage Model'.

Whereas the authors do not contend to disagree with the rational plan perspective, in many ways it is too rational and fails to take into consideration that some decisions may also be influenced by other, less rational factors. For example, the communication web perspective emphasizes the importance of information, and the manager's ability to access the right information. Finally, product development as problem-solving perspective highlights the importance of top management in driving the process of decision-making. Top managers, specifically, may influence and guide teams.

However, the question remains, what influences managers when they make decisions? A number of factors have been identified which will serve as the basis for a conceptual model. This model and these factors will be discussed in the following chapter.

# 4 Conceptual Model

As discussed in Chapter 3, within the rational perspective of decision-making multiple models for new product development decisions have been proposed to guide managers though the process of decision-making. Supported both theoretically and empirically, models such as the 'Stage-Gate Process' are widely held as industry standard. The theoretical framework also presented a number of factors that influence decision-making within companies. These require further attention and hence, the purpose of this section is to discuss and analyze factors that influence the process of decision-making within companies.

The purpose of this thesis, as stated before, is to examine the process of decision-making in companies. Therefore, whether a decision is successful or unsuccessful is largely irrelevant. However, two pieces of information lead the researchers to question the rational perspective on decision-making, and lead us to ponder about possible influences. Firstly, if rational and structured processes are the key to successful decisions, why then is it that approximately 50 percent of rational decision-making processes fail (Nutt, 1999)? Further, why do as many as 30 to 60 percent of new products fail, despite adhering to processes and rational decision-making (Cooper, 1994)? These two pieces of data clearly challenge what the rational perspective on decision-making preaches. Could it be that decision-makers follow a less than rational model? Are there other factors that drive the process of decision-making? The authors believe that there are, and these factors in combination with our own experience and knowledge led to the development of a conceptual model.

Based on a comprehensive literary review, it became obvious to the authors that no models or theories exist that combine the perspectives of (1) the process of decision-making in companies, and (2) the factors that either influence or affect decision-makers. Nevertheless, there exist a number of models that describe the process of decision-making and others that highlight various factors separately. These models and factors can be effectively combined to develop a model that highlights all the factors that influence decision-makers as well as the process they undergo thus providing a more holistic view of decisioning.

To fill this gap, the authors have chosen Dean and Sharfman's (1996) model that focuses on the process of decision-making as a basis for our conceptual model. Although valuable in describing the process, this model does not account for other factors that influence the decision-making process as seen in the authors' observations. The factors, which have been selected for the conceptual model, are *analysis*, *inertia*, *intuition* and *information*. By adding these influences to the process described by Dean and Sharfman (1996) a conceptual model was developed.

## 4.1 The strategic decision-making process

The framework, as developed by Dean and Sharfman (1993), suggests that when a manager commences the decision-making process, they gather the information they need in order to form an understanding of the different alternatives. This information is used to determine the final result. Dean and Sharfman (1996) found that processes for strategic-decision making influence the choices organizations make and that these choices lead to various outcomes, all of which are not equally good. Hence, decisions are influenced by the processes used. Dean and Sharfman (1996) found that managers who use analytical techniques make more effective decisions than those who

did not and that managers who engaged in the use of power or pushed hidden agendas were less effective than those who did not.

An alternative view of decision-making, which was developed during the 1980s, postulates that rationality does not necessarily follow the decision-maker throughout the entire continuum of their decision process. On the contrary, many decisions are made quickly without the use of complete information and managers, regardless of being rational or not, also rely on other factors, for example intuition. Studies, such as those by Eisenhardt (1989) showed that decision makers continually adjust their rationality and do not follow a continual process of rationality. This information prompted the researchers to question, what influences managers to adjust their rationality in certain situations? Why do they steer off the path of rational processes?

It is not the purpose of this thesis to contend or disagree with the bounded rationality model. Instead, it is seen as a piece of the puzzle. Dean and Sharfman's (1996) model provides a good starting point as it describes the process of decision-making. Influences to this process have been identified based on concepts and principles discussed in the theoretical framework and pulled out due to an ongoing occurrence in the literature. In addition to this, the authors own experiences and ideas have come into play. As described previously, the authors can cite several examples where they have worked on projects where decisions have been made without conducting formal analysis. In other instances, industry practice (or the effect of inertia) has dictated a decision. For example, in the case of car manufacturer, managers based their decision to enter into a sport sponsorship largely on the fact that competitors were heavily involved in sponsorship of this sport. Fears of being left behind prompted a decision. Additionally, the influence of intuition, in decision-making should not be underestimated. In some cases, when faced with difficult problem or unknown situations managers tend to rely on 'gut feeling' to guide them in the process of decision-making. The final factor is information. The ability to access the right information and how information is shared within teams ultimately impacts the decision-making process. For example, it is possible that team members withhold certain relevant information from other members of the team. The influencers of the process will be described in more detail in the following sections.

### 4.1.1 Analysis

Analysis has been selected as one of the factors that influence decision-making for two reasons; (1) it has received much attention in the academic literature; (2) the authors have experienced first hand how analysis is used not as a basis for decisions but used afterwards once the decision has been made to justify or to legitimize a decision.

Although most managers know that they should conduct formal analysis prior to undertaking certain activities, this is not necessarily always the case. A number of studies of decision-making in organizations have found that analysis is carried out for a number of reasons, some of which are; justification for decisions already made (e.g. Bower, 1970, Kerr, 1982; Meyer, 1984) and legitimizing organizational actions (Edelman, 1985; Feldman and March, 1981; Meyer and Rowan, 1977; Pfeffer, 1981). This evidence clearly contradicts what the rational model for decision-making preaches and the impact of this factor on the process of decision-making needs to be explored.

### 4.1.2 Inertia

Inertia, the tendency to make decisions the way they have always been done, is an important factor that has received much attention in the academic literature as a factor that impacts the decision-making process in companies. Therefore, it has been included in the authors' conceptual model for decision-making.

Within this field, a number of studies have been done which look at the impact of today's fast pasted world on organizations and therefore managers (e.g. Eisdenhardt,1989). Today's environment influences decision-makers in a number of ways, but one of them which may be applicable to this study is the pressure to make decisions quicker, faster and cheaper. In these cases, the decision-maker does not have time to search for data, hence less information than what would normally be required is needed. Instead they rely on inertia, or do things the way they have always been done before as described. For example the authors themselves have experienced the use of inertia in the decision-making process. A quite common method for making decisions is 'Copy and Paste', the first step is to assess the situation and the context of the problem, once this has been done, the decision-maker quickly searches for similar problems or situations and based on the solution applied in that specific case, copies and pastes the solution into the current case. The authors surmise that this is done as a response to the pressure to make decisions quicker, faster and cheaper. Globalization pressures have prompted managers to find new ways to make decisions and here inertia has come into play and become an important factor which influences managers when making decisions.

Similarly, in the case of the car manufacturer discussed in Chapter 1, the decision to sponsor a particular sport was largely based on the fact that 'competitors' were doing the same and the company feared being left behind and therefore implemented the same strategy. In both these cases, inertia influenced the decision-making process. Consequently for all of these reasons, inertia has been included as a factor that influences the process of decision-making

### 4.1.3 Intuition

Another factor that has received much attention in the academic literature is the importance of intuition in the process of decision-making. According to researchers, intuition, emotion, imagination and insights allow managers to make decisions in a dynamic environment (Eisenhardt, 1999; Langley *et al.*, 1995). In looking at the case of the American Fortune 25 bank when asked how she made the decision to move forward with the eStrategy, the manager responded she just knew it was what she needed to do. She also stated that she had to move quickly before the industry changed again so she did not have time to go about picking vendors the way she probably should have.

Intuition, however, as a method for decision-making, cannot stand-alone. Therefore, as shown by Isenberg, (1984) and Burke and Miller (1999), managers tend to use intuition to complement the rational decision-making process. Therefore, the authors believe that intuition should be included in the conceptual model for decision-making.

### 4.1.4 Information

From the literary review of new product development research, the authors were able to identify another potentially interesting influencing factor, namely that of information. Information is an important aspect that influences decision-making within a team, either though the manager's ability to present and access the right information and further through the role that managers play in guiding teams through the decision-making process. In certain cases a powerful manager may exert considerable influence over the decision-making process, using information to steer the decision in a certain direction. Similarly, by setting goals, stating preferences and supporting different aspects of the process, top managers influence and guide the decision-making process. As a result of the above stated reasons, information has been included in the authors' conceptual model as a factor that influences the process of decision-making within teams.

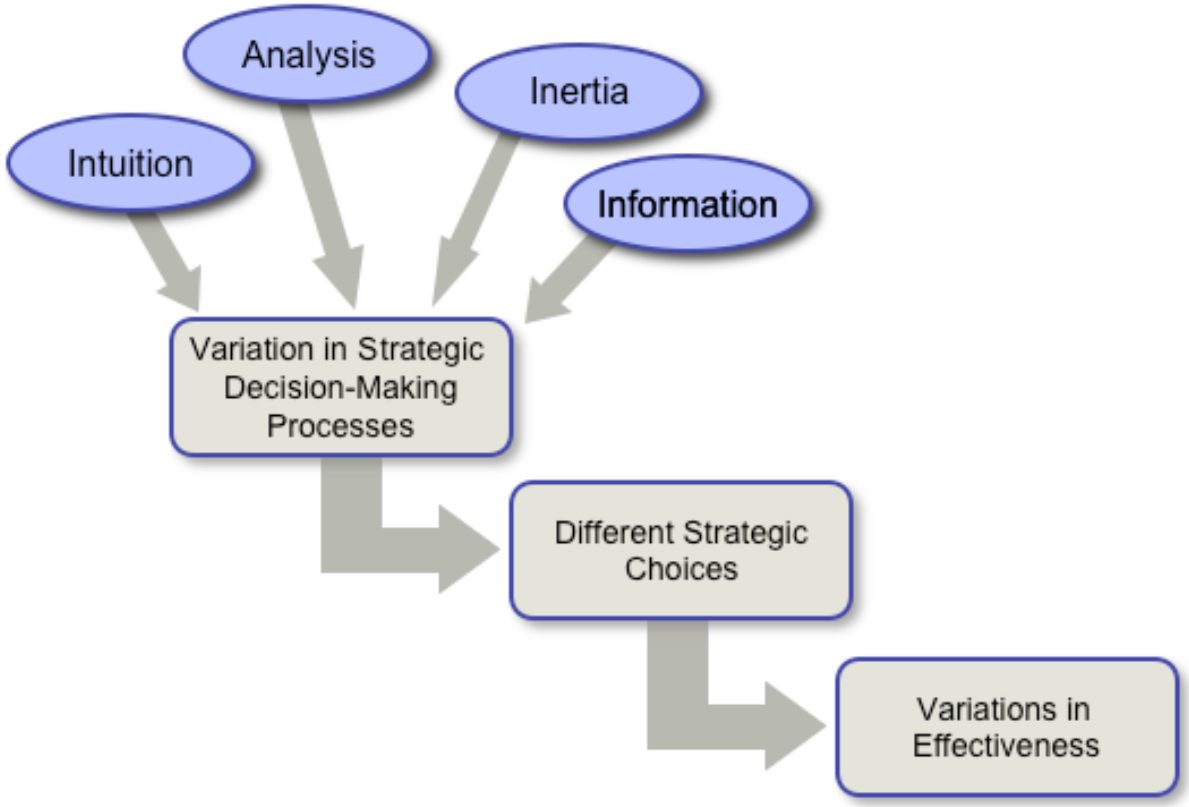
## 4.2 Influencers in decision-making

Based on the concepts and principles discussed in the theoretical framework, such as the bounded rationality perspective on decision-making, in combination with the authors' own experiences and ideas (i.e. the importance of analysis, intuition, information and inertia) a conceptual model was created. These particular factors were chosen as they receive a great deal of attention in the academic literature, in addition to which the influence of these has been experienced first hand by the authors in various projects, both during their education and through work experience.

The authors' model for decision-making is seen in Figure 7 and identifies a number of factors that influence the process of decision-making in companies. These factors either influence or drive managers through the process. *Analysis, inertia, intuition and information* are believed to influence decision-makers steering them off the path of rationality. The model outlines the process of decision-making as illustrated by Dean and Sharfman (1996). These key factors influence the process of decision-making, and results in variations in strategic decision-making processes. Hence, under the influence of these factors, managers steer away from the rational process and are instead guided by intuition, inertia, analysis, and information or by a combination of these factors.

These factors influence the process of decision-making and thus result in variations in the decision-making process, leading to different strategic choices. Hence, guided by inertia or intuition, managers may follow a different line of strategic choice than had been the case if they had not succumbed to that particular influence. If a manager bases his decision on 'this is the way things are done around here' the strategic choice will be different than if it had been based on sound analysis and assessment of different options. Finally, different strategic choices may result in variations in effectiveness. It is not the purpose of this study to look at whether the outcome of a decision is successful or not, however, different strategic options will vary in effectiveness and it is important to highlight this aspect.

**Figure 7 Conceptual Model for Decision-Making**




Source: Author's own elaboration of Dean and Sharfman model (1996)

As stated in the method section, this model was tested and confronted with reality through two case studies (seen in the next chapter). The conceptual model was used as a reference, and its purpose was to guide the researchers though the data collection process. Once the empirical data had been collected, this data was compared, analyzed and assessed with respect to the model in Chapter 6: Analysis.

# 5 Empirical Findings: Decision-making in two small international high-tech Swedish companies

This section presents the information gathered through in-depth interviews with two small, high-tech companies located in Sweden. The first company, Nanospace AB, operates in the space industry and is based in Uppsala, Sweden. The interview was conducted of Nanospace CEO, Tor-Arne Grönland (2005). The second company, Q-Sense AB, is in the analytical instruments industry and is located in Gothenburg, Sweden. The data for the Q-Sense case study was gathered from interviews with Q-Sense CEO, Ted Ternander (2004; 2005) and one of the company founders Bengt Kasemo (2004). Each company is presented in the following sections. A description of how each company came into business and how they have made decisions and conduct product development is provided. The information provided through the empirical findings will be used in order to conduct the analysis and final conclusions.

## 5.1 Nanospace: Structured Decision-Making

Nanospace AB is a small high-tech company which develops and provides commercial products for the space industry. The company is headquartered in Uppsala, Sweden. Nanospace has 10 employees and several commercial products based on Micro Electro Mechanical Systems (MEMS). The micropropulsion technology could appear in projects such as formation-flying space telescopes that may be used commercially to trace alternative life in the universe. The company is jointly owned by the Swedish Space Corporation (SSC), which recently acquired 75 percent of the shares and founder Lars Stenmark who controls the remaining 25 percent. The purpose of the acquisition was to "keep us (SSC) at the forefront of this exciting new technology field, which we believe has considerable commercial potential" (Nanospace website, -1).

### 5.1.1 The Nanospace story

The MEMS technology was developed by Lars Stenmark, a professor of space and Swedish space technology pioneer at the Ångström Laboratory, Uppsala University, Sweden. He patented the technology in order to protect his intellectual property before making the technology public. Mr. Stenmark then founded Nanospace AB. Early 2002, Nanospace's current CEO, at the time representing SSC, Tor-Arne Grönland attended a meeting in Uppsala to discuss micropropulsion technology with industry experts and representatives from the European Space Industry (ESI). At this meeting, Mr. Grönland became "sufficiently interested" in this new field of technology. Based on this interest and upon returning to SSC's main offices in Stockholm, Mr. Grönland started to advocate for it within the SSC. Convinced there was considerable commercial potential in this product, he started sending out emails and setting up informal meetings to inform colleagues about the opportunities that this technology presented.

When asked what prompted him to initiate this process, Mr. Grönland responded that the meeting in Uppsala had convinced him that this was an interesting new technology and that the purpose of these meetings and emails was to bring about a formal steering meeting to discuss the prospects

and possibilities for the SSC to invest in this technology. In Uppsala, Mr. Grönland experienced the excitement around this new technology and the presence of industry representatives from the European Space Agency signaled that this was a technology worth investing in. While discussing the importance of this factor, Mr. Grönland singled out political support as one of the most influential determinants during the acquisition of Nanospace. Within the space industry, political support is crucial. If a technology or idea is supported by top managers in the European Space Industry or Swedish National Space Board the right funding and resources required can be easily obtained. It may be that another idea is equally good, but if it does not have the right support as related by Mr. Grönland, "its political suicide".

Back at the Swedish Space Corporations headquarters, Mr. Grönland spent a couple of months preparing a business plan, highlighting business opportunities, projecting costs and other business related tasks. This information was then presented at a meeting with a steering committee consisting of the CEO of SSC, an external consultant and a couple of experts within this field. The new technology was discussed and the commercial potential assessed. Based off this meeting, Mr. Grönland conducted further research and then a decision was made for Nanospace's technology and products to be acquired by the SSC. Mr. Grönland was subsequently appointed CEO of Nanospace AB.

The process leading up to the formation of Nanospace was driven by Mr. Grönland himself. His interest in this new technology, as well as his knowledge of the industry, inspired him to push for its development within the Swedish Space Corporation. Although the final decision rested in the hands of the steering committee, he put in a lot of work and effort to bring about a meeting with senior managers to decide on whether SSC should invest in this field of technology. The support provided by the European Space Agency gave legitimacy to his quest.

### 5.1.2 Decision-making at Nanospace

New product development within the space industry follows a very formal and set process starting with idea generation. Within this decision-making process, there are two processes that were primarily discussed; technological product development and assessment of the business potential.

**Technical product development process**

At the early stages of product development, the primary focus is on technological development and maturity. This is largely due to the fact that it is difficult to assess commercial use so early on in the process. Looking at the process related to technological development, the first step is to secure a patent. This in itself is not a big decision, a group of people involved with the project, that have knowledge in the field decide. The application process takes place at a very early stage even before the product has been tested or even fully developed.

Once a patent has been secured the new product or technology travels though a number of stages, which are referred to as 'Technology Readiness Level' (TRL). Based on the US National Aeronautics and Space Administration (NASA) processes, the TRL process is standard across the space industry. The purpose of this scale is to evaluate the technological maturity of the product. The highest level, TRL9 is defined as "flown in space several times". The TRL scale provides a checklist for product development and is useful as everyone knows what is required at each stage

and how far along in the process they have preceded. Early on, typically, the project manager (and decision-maker) is often the inventor. As the product matures, however, it is passed on to someone else.

As related, the technological process is highly formalized and structured. It is widely accepted across the industry as industry practice. Hence, few people question it and as Mr. Grönland relates it "allows you to work", especially when you manage a project with 60-80 people, as people know what is expected of them and when. He states that there may be a better way of doing it which is quicker or cheaper, but no one in the industry will accept or allow it. Further, he argues that one of the benefits of this process is that it provides people within the industry with a "common language to communicate through".

Although the process itself is very formalized, Mr. Grönland emphasizes that like in any organization, the final decision to launch a product or not, comes down to a few people with the drive and the commitment to push things through. Processes, according to Mr. Grönland are a good "toolkit" but they need someone with the personal commitment to see the product through. Further he argues that as a product matures, commitment grows, and often even if the project manager begins to realize that a product has low potential, the closer you get towards the end the harder it is to put a halt to the process. Generally, there is a tendency to keep pushing through. Mr. Grönland terms this, the 'engineers problem', and argues that this is one of the most common mistakes in new product development.

**Business potential process**

A business-focused process complements the technological process. Although these processes are somewhat intertwined, they are carried out separately and often by different people. Once a patent has been secured, a business plan is developed. This plan is then assessed by a group of senior managers, the steering committee. These people decide whether the project should receive further financing. At the early stages they require information from the inventor who justifies the idea and highlights opportunities and its commercial potential. Quite often, the focus however is on the technological aspect, which is largely due to the fact that market potential is often highly uncertain.

The steering committee plays an important role in the product development process. In assessing the commercial viability of a product they rely to a great extent on past experience. Mr. Grönland relates how the space industry is extremely conservative and how technology that has been tested and used before is often reused, "when launching a satellite, you want to be absolutely sure it works and the only way of doing that is by using applications that have been applied before". Hence, past experience is an important driver in the decision-making process and a huge factor that influences both him and the steering committee when trying to determine whether a product has commercial potential.

Mr. Grönland discussed that while at the beginning of product development the technology is more a focus, as the product nears commercialization the business side takes the focus. This is especially true in the space industry where the time it takes to go to market is around 10 or more years. It is difficult to project what the market climate will be like when the product is finally ready to be marketed. Any number of things can happen during the development cycle that can impact

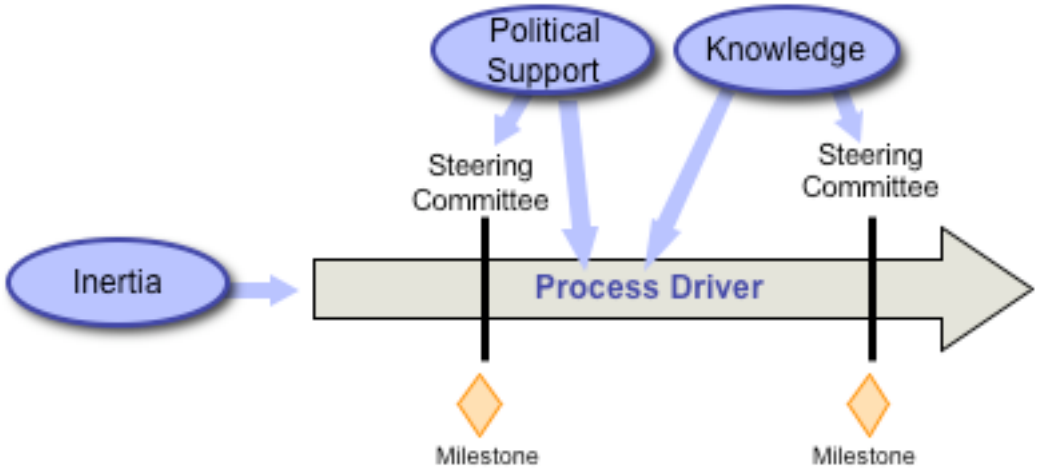
the outcome. For example, a competitor can come out with a new technology that makes your technology obsolete. There can also be political changes that can have influence on the marketability. If for example at the beginning, the company believed they could sell to another country as well as Sweden, but by the time the product is ready that country no longer wants to buy from a European country, then there would be a significant impact on the sales projections.

In this regard, Mr. Grönland commented that with such a long cycle, the driver of the process be it the project manager or original innovator many times keeps pushing regardless of things such as what is mentioned above occur. Especially if the product is nearing the end of the life cycle. At that point so much time and money has been put into the development that the product must be taken to market, even if they know it will fail.

### 5.1.3 Structured decisioning

While there are many components to the way decision-making occurs at Nanospace, the company is very reliant upon the structured processes as defined by the industry (inertia). The process is seen as being linear where you go from one step to the next with key milestones that must be met before proceeding. It is the responsibility of the process driver, in this case Mr. Grönland to push through the different required processes. The steering committee is responsible for all final decisions. Both the process driver and the steering committee is influenced by politics as well as their own or combined knowledge. The decision-making process for Nanospace is depicted in Figure 8.

**Figure 8 Nanospace Decision-Making**




Source: Authors' own (2005)

In the case of Nanospace, the first important influencer of the process is inertia. Inertia determines the process for decision-making, i.e. a very structured process that entails both technological and market assessment as described above. Once the process has been determined, another crucial factor is the process driver. The process driver is depicted at the center of the process, and is part of the whole process from idea generation through to commercialization or product launch. Typically, the process driver is a person involved either from the start with idea generation (inventor) and who has the strength to see the entire process through.

Two other factors also influence the process, political support and knowledge. These factors influence the process in a number of ways. Initially, as in the case of Mr. Grönland and Nanospace, political support influenced Mr. Grönland (the process driver) to commence the process of product development. As described above, at the first meeting with the inventor, a large number of industry representatives were present which influenced Mr. Grönland and lead him to believe in this technology. Hence, as the result of political support, he initiated the process. Political support not only influences the process driver but also the steering committee. The steering committee typically consists of senior managers and as in the case of Nanospace, if these members know that this technology is supported at a higher level by top industry representatives in Europe, this will ultimately influence their decision.

The other factor which affects both the process driver and the steering committee is knowledge. What is known about a product or technology ultimately influences the decision of the process driver and the steering committee. Within the space industry where a substantial amount of money and time are invested in product development, the industry is extremely conservative and therefore technology that has been tested and used before are often reused. Therefore, past experience or knowledge is important when trying to assess a products commercial potential.

While Mr. Grönland related that defined processes are mandated by the industry, he also related that "processes are necessary to hold on to in this uncertain environment". It is the way Nanospace and every other legitimate company does business in the space industry and it is not something that should or will change.

## 5.2 Q-Sense: Ad-hoc decision-making

Q-Sense AB is a small high-tech company within the analytical instruments market. The company is headquartered in Gothenburg, Sweden and has a presence in more then 20 countries. Q-Sense has 15 employees and one product, Q-Sense D300. The product is based on a multi-frequency quartz crystal microbalance with dissipation monitoring (QCM-D) technology that measures the viscoelastic property in liquid (Q-Sense website, -1). The company is fully owned by a Swedish investment company Biolin, AB.

### 5.2.1 The Q-Sense story

QCM-D technology was developed by Michael Rodahl, a Ph.D student of applied physics, and Bengt Kasemo, Professor of Physics, at Chalmers University of Technology in Gothenburg, Sweden. Prior to publishing Mr. Rodahl's PhD thesis in the beginning of the year 1996, Mr. Kasemo made the suggestion that they should patent the technology. Based on his experience in the field, Mr. Kasemo could see potential for this new technology. Mr. Kasemo and Mr. Rodahl then proceeded with the patent. After the patent was granted, in the fall of 1996, Mr. Kasemo, Mr. Radahl and two other students founded a company based on the technology and called it Q-Sense.


In 1997 the Institute of Entrepreneurship was founded at Chalmers University in order to turn ideas into commercial products. The foundation of Q-Sense and the development of the strategy

was one of the first projects of this program. In association with this new program, a meeting was held at Chalmers University with twenty-five CEOs to discuss various business ideas and solve case studies. The case of Q-Sense was one of them. This provided the founders with ideas and suggestions from business professionals on how to commercialize their product and a resulting formal business plan focused on the academic market.

Soon after the entrepreneurship meetings, Anna Vehne joined the founders as the President of the company. She had experience in the biomedical sector and began to lead the company towards the market. In 1998 the company began to develop its first commercial product, which resulted in the Q-Sense D300.

Based on the experience of Ms. Vehne and the backing of the founders of the company, a market strategy was developed. The goal was to identify enough customers in academia to begin to penetrate the market with a not yet mature product. The network of the founder in academia became the first customers. Q-Sense first officially went to market at the end of 1999 and the beginning of 2000. Q-Sense, even today, is continually upgrading the product in order to make it a more mature and market ready product. The commercialization of Q-Sense has been a reactive process, where the company is passively waiting for customers to come to them from the network.

### 5.2.2 Decision-making at Q-Sense

During the development of Q-Sense there was no formal processes used for decision-making. The current President of the company, Ted Ternander, described the way Q-Sense has conducted business and continues to conduct business as organic. He explained that Q-Sense as a company has developed gradually and naturally without being forced, each step was taken after the next as the members of the company saw fit. This type of ad-hoc process works in a small company where everyone is well educated in the same field. Since everyone knows the field, the process itself becomes intuitive.

Mr. Ternander explains the way business is conducted in the following statement:

> "Overall, one hopes that there is a structured way of doing things, and that everything is well planned in advance that there is a clear strategy, but that is always written afterwards. Life and people work in other ways, it's more ad-hoc, it has more to do with circumstances … Ideally you sit down make a business plan, you do the strategy, then you take your actions. But you don't have those kinds of answers and knowledge actually."

Looking back at the process Q-Sense went through, Mr. Ternander commented that at the point when Q-Sense was being helped through the entrepreneur school, they should have looked for problems out in the market that could be solved with the new technology, then focus on trying to sell to the industry where the problem was. This was not done because at the beginning there were sales made within the academic network. These sales projections showed great potential especially in countries like the US. Unfortunately, it was not realized at the time that these sales were friends and early adopters and that it would be more difficult to produce ongoing sales. Therefore decisions were made based on the high projections, without a lot of additional analysis.

In discussing how decisions are made on both the technical and business side, Mr. Ternander stated that on the technology side, it is easier because the technology itself can be continuously proven. On the business side that is not necessarily the case. Experience has shown Mr. Ternander that "in business life, it's better to do something, then nothing". Whatever you decide to do, you will learn something from it and if it is the wrong decision, you can always change it or back off from it and do something different. The action itself is more important then the analysis.

This type of ad-hoc decision-making is what has been done and continues to be done at Q-Sense. It is also how their global expansion has occurred. For example, Chinese students who were educated in the US market where the Q-Sense technology was used, move back home, raised the money and then call Q-Sense to buy the product. Q-Sense has not directly marketed to China, but they do have some products there through this informal process of adoption.

Mr. Ternander does not necessarily see this type of ad-hoc decision making as effective or in-effective. He does see that from a national point of view, Sweden would benefit from a more structured process of moving academic ideas into commercial products. In looking at Q-Sense directly, he commented that perhaps Q-Sense could be more successful if the decisions were more structured. For example, they could have brought people that were more trained in business into the company and decision-making process earlier. This probably would have provided more knowledge about predicting sales, etc. However, most small technology based companies struggle with the "not invented here syndrome", as well as the feelings that the technology is "my baby". These barriers keep technologists from using a more formal structured process involving a more business focus.

Mr. Ternander believes that regardless of a structure process or not, at the end of the day there are a hand-full of people in the room that make a decision that is not always based on fact. Decision-makers are influenced by their background and experience. Experience in turn is based on all the knowledge that has been accumulated. It is more of a human process of getting consensus out of the knowledge. He comments that "if you go back and ask why did I make that decision then you say it was 'gut feeling'". But in reality there is a lot of experience behind that. People do not make decision like computers where facts are evaluated and scored. After the decisions are made then the justification or analysis is completed. In discussing experience, Mr. Ternander explained that if a person has actually done it before it is a lot easier to do it the second time. He truly believes that if you can get a handful of great people you can manufacture and market any product. Furthermore, personal beliefs about the market or the product is very important. All the decisions are influences, based on what you know and your experiences. It is very difficult to make decisions on something that you do not know, that you do not have experience with.

If in the end, the decisions are made on 'gut feeling', why do people feel the need to appear to have a systematic process? Mr. Ternander believes that the need to seem rational is there because "we take a lot of time and money to get educated, and at the end of the day realizing that all of that is fine, but you are still going to go with your gut feeling". If you are in charge of a company with many employees and a lot of money, you do not want to admit that you make decisions by gut feeling or flipping a coin. This can be seen as being politically driven. The decisions that are made are very political. Everyone in the hierarchy needs to build prestige and trust. To promise something that cannot be delivered is not an option and people need to believe there is more actual data behind the decision-making.

**How decision-making occurs at Q-Sense**

An excellent example on how decision-making takes place at Q-Sense can be illustrated by their expansion into the US market. Q-Sense sold its first product on the US market directly from Sweden in the year 2000. At the end of 2000 after the sale of another three instruments, it was decided to establish a legal entity in the United States. This decision was made by projecting the initial sales and assuming sales would continue to grow at a large rate. An additional influence was the knowledge that the US market itself had a great deal of opportunity with many academic institutions as well as being the primary driver for new products in the analytical instruments market.

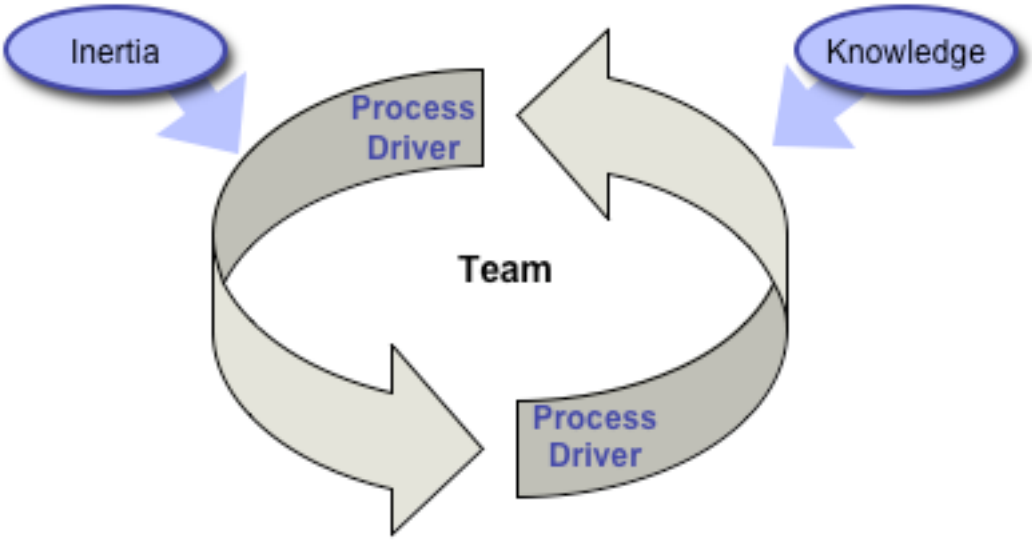
In March 2001, Q-Sense Inc. began its operations based out of California. Unfortunately it was not long until the company began to realize the difficulty with the US market. With only one key person to sell from the US, the enormity of the market as well as the difficulties with communicating with the headquarters in Sweden, nine times zones ahead of California became overwhelming. The one individual in the US had the responsibility to follow-up on all leads, conduct sales as well as support all existing clients. The original estimates expected approximately 45 instruments sold by 2004 with at least five employees. In 2004 the company found itself with only 26 instruments sold and still relying only on the one employee.

According to Mr. Ternander there were many reasons for the difficulty with the US market entry. But one of the main issues was the way the decision was made to enter the market in the first place. The decision itself was not thoroughly analyzed. Many assumptions were made such as with the sales projections. Another problem was not thinking out the placement of the office in the US. It may not have been the wisest move to have the office on the West coast of the US where it was difficult to reach the majority of the customers who were located on the East Coast. But the decision was made ad-hoc by the team based on what they thought was the best decision at the time.

### 5.2.3 Ad-hoc decisioning

Decision-making at Q-Sense is informal. The industry itself (inertia) does not require any formal process and therefore Q-Sense is encouraged to conduct business in an unstructured way. Mr. Ternander explains the process of decision-making as follows. Typically the manager (process-driver) has a hypothesis of what should be done. This hypothesis is created based on existing knowledge. This hypothesis is then tested against other people's knowledge until the group can make a decision on the combined knowledge. This process is illustrated in Figure 9.

**Figure 9 Q-Sense Decision-Making**




Source: Authors' own (2005)

Unlike the process at Nanospace, Q-Sense does not follow a linear process. Decision-making is less structured and more organic, hence the circular figure as illustrated above. The process driver, however, plays an important role in driving the decision-making process, seeing and driving the process through. With a clear idea of what needs to be done, the decision-maker takes a number of decisions. Typically, technological and business assessment takes place at the same time.

The decisions that the decision-maker takes are typically influenced by inertia and knowledge. In the case of Q-Sense, the industry and companies within this industry are highly innovative. Innovation is the key to survival, growth and prosperity and therefore it is almost expected that companies continuously find new ways to do things which helps foster innovation and change. Hence, Q-Sense does not follow any set processes for decision-making. Q-Sense as a company developed gradually and naturally without being forced, and the next step was taken as the other members of the company saw fit. Instead of following set processes, these processes are highly intuitive and Q-Sense is influenced by the industry and the way business is conducted in their field.

Another factor highlighted by Mr. Ternander at Q-Sense was the importance of knowledge. Mr. Ternander argued that knowledge rather than intuition influences decision-makers. When questioned whether intuition or gut feeling guided decision-makers, Mr. Ternander stated that often you initially think that intuition is behind a decision. However, in reality there is a lot of background knowledge and experience behind decisions that ultimately influence the decision-maker. Background and experience provide the foundation for knowledge, therefore in reality knowledge influences decision-makers.

In summary to the discussion, Mr. Ternander related a Chinese saying, "planning is everything, plans are nothing". Doing the planning, going through all the knowledge, discussions and debating is important, but in the end it is your "gut feeling" or really your knowledge.

# 6 Analysis

The purpose of the analysis section is to compare and contrast the theoretical framework with the empirical data. This will be done with two main components. First a comparative analysis will be conducted between Nanospace and Q-Sense. Key aspects of the empirical data will be identified and discussed incorporating aspects of the theoretical framework and the authors' original observations when applicable. Following, the conceptual model (as presented in the theoretical framework) will be confronted based on the comparative analysis. Each proposed process driver will be discussed and the limitations as well as strengths of the model will be analyzed. Following these two discussions a new revised conceptual model will be presented.

## 6.1 Comparative analysis

As extreme case sampling was used for the qualitative research, an opportunity is provided to draw distinctions as well as similarities between the two case companies. The analysis is conducted by identifying the key aspects from the empirical data. The key aspects are:

- Similarity of overall business development processes
- Process drivers are key
- Influencers of the process
- Link between technology and business side of processes
- Importance of knowledge
- Use of analysis
- Impact of inertia

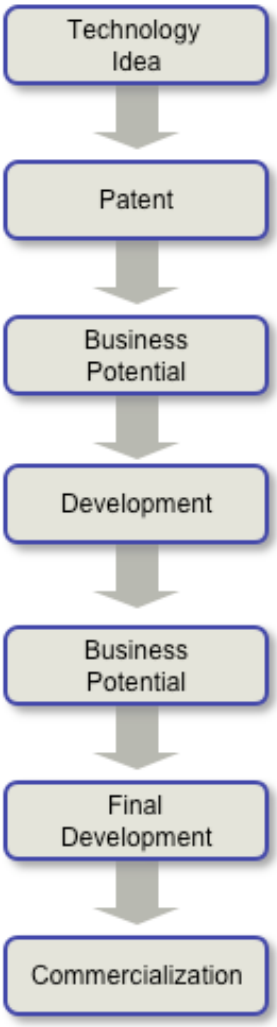
Each of these aspects will be discussed in the following sections. The theoretical framework will be used in the analysis to show any links to existing research and hypothesis.

Before beginning the comparative analysis the overall similarities and differences of the two case companies should be recognized. Both companies are small international high-tech companies located in Sweden. Both companies began based on new technologies that were developed at Swedish universities. The similarities between the two companies diverge in the way that decisions and business is conducted. In Nanospace there are multiple formal processes and organizational hierarchy that come into play. While at Q-Sense business is conducted informally. These overall observations should be kept in mind during the following comparative analysis.

### 6.1.1 Similarity of overall business development

One of the first and most obvious comparisons between the two different cases was the similarity in the overall processes for business development. While Nanospace was very formal and Q-Sense was informal, the high-level processes were very much the same starting with the original technical idea and moving through development towards commercialization. Figure 10 illustrates this process. The process is depicted as being linear although it should be noted that while overall the processes did occur in this fashion at times some of the steps were overlapping.

**Figure 10 Process of Business Development for Case Companies**




Source: Authors' own (2005)

For both companies the process began with an initial technical idea. This idea was then protected by the inventors through the use of a patent. After a patent was obtained, both companies assessed the business potential for the product. In the case of Nanospace, this was done formally by conducting analysis and the use of a steering committee. For Q-Sense this step was conducted through the help of the Chalmers Entrepreneurial School where analysis was conducted by outside consultants and recommendations on how to proceed were provided. Both companies then commenced with formal product development. Mr. Grönland of Nanospace commented that in their instance this usually occurs for three years based on the funding that was provided. The company during this time proceeds through the 'Technical Readiness Level' (TRL) process. For Q-Sense this time was spent getting the product into a state (packaging etc) where it could be more usable within the market. At some point a decision point was researched where the business potential needed to be analyzed again. For Nanospace the decision is where to get additional funding. This was also true for Q-Sense as at some point they went to Bioline, their investment company, to get additional funds for the development.

After additional funds are secured the final development is conducted. Nanospace is still in the final development stage. Here the focus is again on completing the TRL process. While Q-Sense has already technically gone to market, and Nanospace has not, it could be seen that Q-Sense is actually still in final development as well as they have not yet gone into industry with a mature product. Q-Sense is using the products they have sold to academic institutions as a means to validate their product before formally selling the product to other companies. The final step is the actual commercialization of the product. As discussed both companies have yet to complete this step.

Even though both companies went about this process very differently the overall results have been the same thus far. While Nanospace could easily look at this process and agree that is what they have done as they have such defined business conditions, it might take Q-Sense a bit of time to acknowledge this process that they do not see their business in such a defined pattern.

### 6.1.2 Process drivers are key

Within strategic decision-making and particularly in the case of new product development decisions, the role of the project manager in driving the process cannot be underestimated. As highlighted by Ozer (2003) the person involved in the project will attach different meanings or importance to a product, which may potentially lead to erroneous judgments. For example, the opinions of the original designers of a product are often biased because of their emotional attachment and involvement with the development process. Mr. Grönland terms this phenomenon the engineers' problem, highlighting how "you keep pushing regardless if you know it is going to fail. Towards the end of a project, so much time and money has been put into it that it is impossible to walk away even if you know it is going to fail".

To overcome this problem, at Nanospace and Q-Sense, the final decision whether to commercialize a product lies in the hands of a steering committee or team. The steering committee and team, nevertheless receive their information from the project manager who is heavily involved with the project. This manager is often the one to "push" the project forward.

In both the case of Nanospace and Q-Sense, a project manager has been and is particularly influential in driving the project. For Nanospace, Mr. Grönland himself began to advocate for the technology within the organization. Following his first meeting in Uppsala, he became "sufficiently interested" in this new technology and started sending memos and holding meetings. Having done so he conducted some additional analysis in order to sufficiently convince himself it was worth the time and effort to move this product idea into the formal decision-making process.

In the case of Q-Sense, the main process driver switched hands at multiple points of the development, from the innovator to the first president to the second president. Based on the discussions with Mr. Ternander, however, it can even be concluded that the processes driver in some respects is all the members of the company. As it is a small company each person has a responsibility to keep moving forward. Moreover, in such a small company each person truly needs to believe in the possibilities for success. At different points in time, various members will push harder than others. When this happens it could be because that individual member has a strong belief that a certain step should happen next.

Although Ozer (2003) identifies some aspects related to the decision-maker, he does not explore the role of the project manager or decision-maker in the process. As related by Mr. Grönland, the process for decision-making is "a good tool-kit but it needs someone to push it forward. Without that it will not be successful regardless of how good the process is." Hence, regardless of whether the process is clearly defined, structured or not, it is necessary for the project manager to make the go-ahead decision prior to the formal decision in order to be an advocate for the product as well as the process itself. Without believing in the product or business himself, it would be almost impossible for the project manager to convince anyone else to believe in its commercial potential.

Therefore, in looking back at the original observations it seems possible that this was the phenomenon that the authors observed. Regardless of the fact that the 'actual' decision is made within a formal rational process by designated decision-makers, like a steering committee, without the initial less-rational decision being made by the process driver, in Nanospace's case Mr. Grönland himself and for Q-Sense , Ms. Vehne and Mr. Ternander, it is impossible to move along the process.

### 6.1.3 Influencers of the process

The process Nanospace uses for product development decisions is used across the space industry and is somewhat of an 'industry standard'. Described previously, the process is extremely defined, structured and consists of steps of technological product development as well as market or business related product development. Within the space industry this process is considered 'proven' and has been developed in response to the amount of time and money required to develop a successful product. Failure is not a viable option and therefore prior to its commercialization a product must travel through this set of extremely defined and challenging stages. Hence, the purpose of this process is to reduce the risk involved in product development decisions.

According to the 'Rational Plan' perspective, successful products are the result of a rational decision-making process which involves careful planning, implementation and execution (Brown and Eisenhardt, 1994). The process itself as employed at Nanospace and within the space industry adheres to these principles and covers both market and technical appraisal. It is somewhat similar to Coopers (1988) 'Stage-Gate Process' which is represented in Figure 6 and includes a series of stages controlled by a gate system, which integrates all marketing and technical activities and thus ensures that all activities are carried out and completed in a quality fashion.

The 'Stage-Gate Process' however reduces the complex process of decision-making into a set fairly straightforward steps and as such fails to encompass certain elements that also are bound to affect the process. Mr. Grönland identified these influences as political aspects, the nature of the industry or business, market related and finally customer related aspects. The role these factors play in the decision-making process will now be discussed separately.

Within the space industry, Mr. Grönland argues that the impact of politics should not be underestimated. Similarly, the rational plan perspective emphasizes the importance of top management support and leadership (Meyers and Marquis, 1969; Maidique and Zirger, 1984). Without the support of top managers and their commitment to the development of new products it would be impossible to gain access to the resources and funds needed. However, the type of politics described by Mr. Grönland goes beyond purely leadership and top management support

and the rational plan perspective fails to account for its importance. In the case of Nanospace and the decisions that led up to the formation of the company, one of the factors that influenced Mr. Grönland was the fact that this new technology already had a great deal of political support from the Swedish Space Agency as well as the European Space Agency. Further, he also argues that if two products are equally good, but one has support from the 'right' people whereas the other one does not have such support, the one with political support will receive funding.

The second influence as related by Mr. Grönland is the nature of the space industry itself. He describes the space industry as extremely conservative, "one of the most conservative industries in the world" where things are done in the same manner they have always been done. For example, the highest stage on the TRL scale is TRL9 which only products which have been flown in space several times before pass. This conservative nature is largely a response to the amount of investment, both in monetary terms and in terms of effort that is required to develop a successful product. Project managers must be absolutely certain that the product will be successful, therefore, to reduce this risk there is a tendency to rely on past experience and on old products which have been successful in the past. Moreover, Mr. Grönland describes how only companies that with the right knowledge, history, connections and support will be successful in the industry.

Moreover, market related factors also influence the process of decision-making. Within the space industry, the time frame from initial idea to market launch is relatively long, approximately 10 years or more. Therefore, early on in the process it is difficult to assess market potential and a products commercial viability. Hence, early on in the development cycle there is a tendency to rely on technical product development over market appraisal.

The final aspect that Mr. Grönland highlights is closely related to customers and politics and is largely specific to the space industry. As a product is usually specific to a national space program it can be difficult to sell the product to all customers, especially as customers may not want to purchase a product because it was developed in Sweden and not in their native country. Due to the relatively long development cycle, the influence of this factor is impossible to assess until a product is released and sold.

### 6.1.4 Link between technology and business processes

Another key aspect that was brought to attention by both Mr. Grönland and Mr. Ternander was the lack of coordination between technical product development and business appraisal. As discussed in the theory section, one of the most important steps within the NPD process is evaluation, which covers both market and technical appraisal throughout the development process (Cooper, 1992). Moreover, the importance of breaking down barriers between technological and market appraisal have been discussed by Dougherty (1990) who argues that teams where these tasks are carried out simultaneously have been associated with higher success rates.

In both the case of Nanospace and Q-Sense, the companies seem to have relied heavily on technological development during the early stages of product development and then, in retrospect focused on market and business appraisal. This may be in response to the fact that in both cases the technology was new, unknown and therefore it was difficult to assess its commercial potential. As Mr. Grönland states, at the early stages of technical product development it may even be impossible to conduct a market related appraisal because you do not know what the outcome will

be. Most theories and research on new product development fail to account for this fact; they postulate the importance of early market research and assessment. However, in certain high technology industries it may in fact be impossible to carry out detail market research so early on. In fact, at this stage decision-makers may have to rely on other factors such as gut feeling or just the technological superiority of a product.

### 6.1.5 Importance of knowledge

During the interviews of the case studies a recurring theme was knowledge and the use of that knowledge in order to support decision-making. When discussing knowledge different terms are used both by managers as well as academics such as phrases like 'gut-feeling' or terms like expertise or intuition. The question at hand is how is this knowledge relied upon or used and how does it relate to other aspects of non-conscious decision-making?

First it is important to try and put some definitions around the terms of this discussion. Knowledge can be defined as facts, truths and principles learned. This information is gained through experience, which is the actual involvement a person has in an activity, events, or people. In contrast, intuition is not tangible but instead something that is believed, without actual evidence for it. But this intuition comes from somewhere. Therefore it can be said that knowledge is based off experience and is the backbone of intuition.

In looking at the use of experience, knowledge and intuition by each of the decision-makers, Mr. Grönland stated that experience is relied upon heavily, especially since much of the development within the space industry is based on existing proven technology. He explained that intuition is used when there is a new technology. Here proven experiences do not exist to help the decision-maker, instead the decision-maker needs to rely on what they believe will provide the best outcome based on what do they know from their experiences. Basically intuition is filling in the gaps of the person's knowledge. Furthermore, when decision-makers use intuition instead of knowledge there is a higher-level of risk that it will not be the correct decision. In this instance Mr. Grönland pointed out that the rational process is used to try and decrease the risk level.

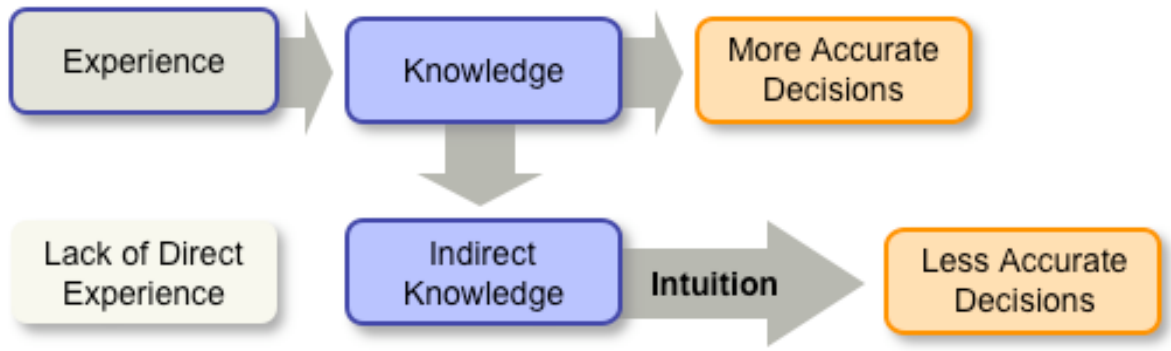
Within the space industry, much of the product decisions are based on verified technology as well as very defined processes for development, therefore intuition does not come into play very often. What is referred to as 'gut-feeling' or intuition is much more common on the business side of decision-making. Here based on his knowledge of the industry, Mr. Grönland was quickly able to assess that he thought the product itself had a great deal of possibility in the market. The process he went through could be the processes as described by Sinclair and Ashkanasy (2005) and depicted in Figure 4. While his knowledge was a base to his decisions, there was a great deal of unknowns as well. These unknowns are there because less can be known or tested about the market. On the technology side the engineers have the ability to continually test to make sure the product is working and moving forward in the development. There are set milestones within the development process where it is impossible to move forward if the product is not working. In looking at the market a decision-maker is really never sure until the sale has actually been made, and this is typically not done until the very end of the development cycle.

Mr. Ternander of Q-Sense also talked about knowledge in the context of decision-making. He commented that when asked about how a decision was made, people commonly reply that it is

'gut-feeling', but he believes that there is really a great deal of knowledge behind that. Furthermore it is very difficult to make decisions when you do not have direct experiences to relate to. He stated that in small companies decisions are made by groups of people combining their various experiences in order to come up with a plausible solution.

In following with Mr. Ternander's statement as well as Mr. Grönland, Ozer (2003) states that when decisions makers are asked to make judgments outside of their knowledge domain they are less accurate. Based on this statement as well as the experiences conveyed through the empirical data the following model, Figure 11, can be created.

**Figure 11 Basis of Decision-Making**




Source: Author' own (2005)

Figure 11 illustrates the interaction between experience, knowledge, intuition and decision-making. It shows that with experience people are able to obtain knowledge. This knowledge can then be used to make decisions. If this knowledge is directly applicable to the decision at hand it will yield a more accurate decision. If the knowledge is not directly applicable, then the decision-maker must then rely upon intuition. When relying on intuition a less accurate (or at least higher risk) decision will be made.

### 6.1.6 Use of analysis

As discussed in the theoretical framework there are many uses for analysis in business, from a tool for debate (e.g. Lindblom and Cohen, 1979; Porter, Zemsky, and Oedel, 1979; Prince, 1979; Widavsky, 1979) to being used as a control function (Dalton, 1959). During the interviews, Mr. Ternander was much more upfront about the use of analysis, while Mr. Grönland discussed the use of analysis in the context of the processes they used.

For Mr. Grönland the use of analysis was a component of the process they go through for decision-making. In Nanospace the initial analysis was done by the process driver, Mr. Grönland, and used to help the steering committee make a decision upon whether to proceed with funding or not. In order to make the final decision, additional analysis was conducted. It can only be inferred by the researchers based on the discussion with Mr. Grönland that the analysis was therefore used to gain commitment (Quinn, 1980) from the steering committee. Mr. Grönland, however, also made comments that prior to the formal analysis he had already began solicitation of informal support within the organization. It can therefore be inferred that Mr. Grönland himself had already

sufficiently made up his mind with regard to the great potential of the product. This was done through his existing experiences and knowledge of the industry. In this case it can be said that the analysis was then used as justification for decisions already made (e.g. Bower, 1970; Kerr, 1982; Meyer, 1984) internally by Mr. Grönland. As stated by Mr. Grönland, however, regardless if a decision is made by an individual, the final decision is still up to the steering committee when using a formal process for decision-making.

Mr. Ternander was very upfront about the use of analysis as he sees it not only in Q-Sense but within the business community. He said that analysis is typically always done after the decision has been made. He said that it is only human nature to make the decisions themselves within a person's head before the formal process is complete. It can therefore be surmised that Mr. Ternander believes that analysis is done as justification for decisions already made (e.g. Bower, 1970; Kerr, 1982; Meyer, 1984). It made be even possible to surmise that under certain situations it is also used to legitimize organizational actions (Edelman, 1985; Feldman and March, 1981; Meyer and Rowan, 1977; Pfeffer, 1981). In response to Mr. Ternander's frankness with the use of analysis, the authors probed as to why people are not more up-front about how decisions are made, and the true use of analysis. With a smile he then commented that a CEO of a large company cannot just come out and say 'it was my gut-feeling'. They need something to back them up, especially when making decisions involving a great deal of money and people's jobs. In this sense, we can again see the use of analysis as a tool to legitimize organizational actions (Edelman, 1985; Feldman and March, 1981; Meyer and Rowan, 1977; Pfeffer, 1981).

From the empirical date we have therefore been able to identify three different uses of analysis:

- Focus attention on gaining commitment (Quinn, 1980)
- Justification for decisions already made (e.g. Bower, 1970; Kerr, 1982; Meyer, 1984)
- Legitimizing organizational actions (Edelman, 1985; Feldman and March, 1981; Meyer and Rowan, 1977; Pfeffer, 1981)

Beyond the use of analysis another important aspect was discovered with regard to the person writing the analysis. If the process driver or decision-maker is the person conducting the analysis the decisions already made internally by this person will be conveyed within the analysis. This can make the analysis very strong in some respects but can also cause the decision-maker to not see aspects that could potentially damage the solutions. Furthermore, if good analysis is to be completed it should be done by someone that is not the decision-maker and someone who has not yet made up their mind with regard to the decision being made.

### 6.1.7 Impact of inertia

Inertia or habit is the tendency for people, in this case decision-makers, to conduct business the same way they have done before. As Starbuck wrote "behaviors get programmed through spontaneous habits, professional norms, education, training, precedents, and rituals as well as through formalized procedures" (1983: 93). Inertia can be seen in both of the case examples and is the justification of why business and decisions are conducted they way they are.

For Nanospace, the industry dictates the use of defined processes. All companies within the industry must use the formal processes if they are to be seen as a legitimate company. This is for

good reason. As Mr. Grönland stated you could not launch a product into space unless you are completely sure it is going to work, the formal process provides the certainty needed to make sure the everything has been done to make sure the product is a success. Mr. Grönland did comment that there might be a quicker or cheaper way to conduct business then using the formal process but that the industry itself will not accept it. This holds with various researchers observations that decision-makers tend not to make changes to the process of decision making (Miller and Frisen, 1980a,b; Mintzberg, 1978; Quinn, 1980; Starbuck, 1983; Steinbruner, 1974; Tushman and Romanelli, 1985; Yasai-Ardekani, 1986). In the case of Nanospace, they do not even have the option because if a change was made the product would never be seen as legitimate and would not be bought to be sent to space.

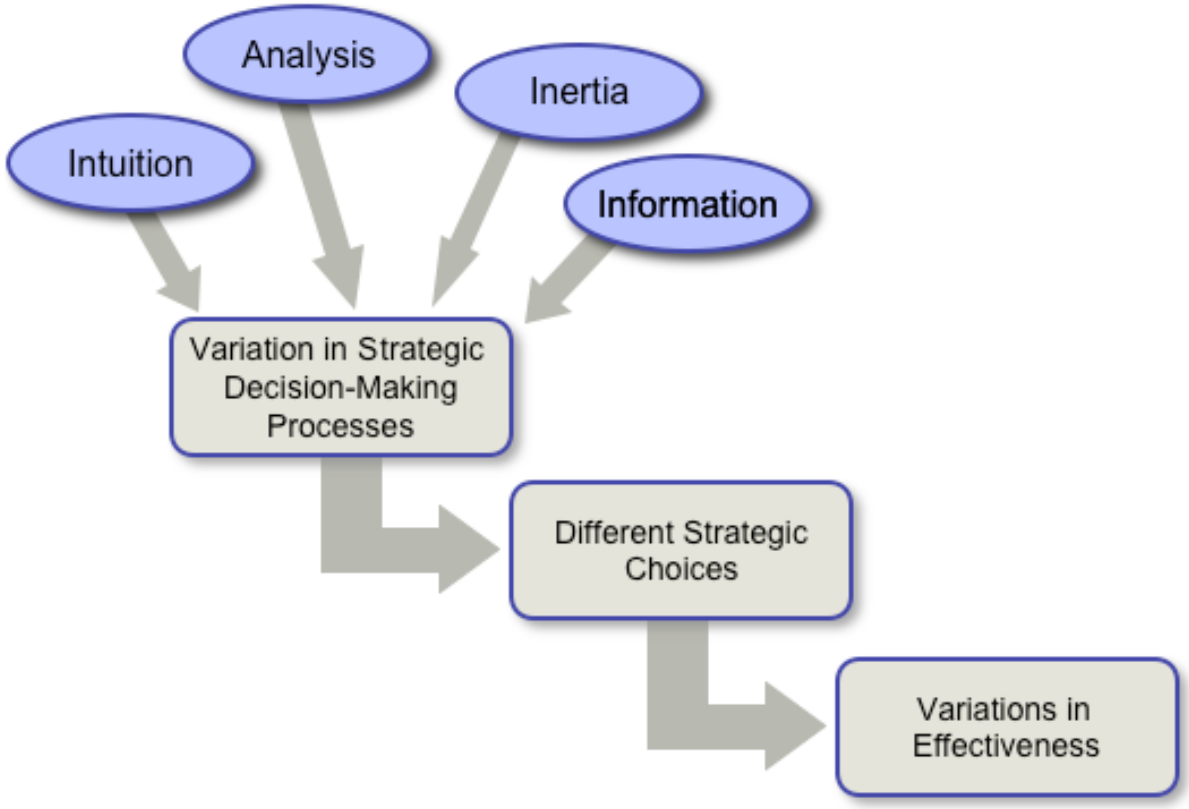
While the way Nanospace conducted business was through the influence of formalized procedures, Q-Sense did not see the necessity of formal procedures due to professional norms. Within their circle of influence set processes are not necessary. Instead organic decision-making is seen as acceptable and perhaps even expected of such a small, innovative company. As Mr. Ternander stated, "it is better to do something, then nothing". This shows the CEO's willingness to make decisions and move forward with a structured process of decision-making. In reflecting on the effectiveness of the ad-hoc method of decision-making, Mr. Ternander can see that while there could be some benefits from using processes, from a technology company it is difficult for the innovator to hand over the technology to the formal "business" people and processes. They struggle with the feeling that they know what is right for this product. Therefore even if a better way to make decisions comes forward, it is very difficult to implement the changes within an ad-hoc decisioning environment.

In both of the case companies the way business is conducted is dictated by the accepted norms within the industry. The industry is able to dictate how formal or informal the decision-making can be in order for the companies to be able to conduct business.

## 6.2 Conceptual model analysis

The purpose of this section is to analyze the conceptual model, Figure 12 (originally presented as Figure 7), with regard to its relevance to this study. As discussed in the method section, based on the theoretical framework provided in Chapter 4, the authors were able to create a conceptual model that highlights the process drivers that influence decision-making. These drivers were seen to dictate how decisions are made.

**Figure 12 Conceptual Model for Decision-Making**




Source: Author's own elaboration of Dean and Sharfman model (1996)

In order to test the applicability of this model, the authors used it as a guide in the data collection process. The model was tested or confronted with reality through interviews with the CEOs of two case companies, Nanospace and Q-Sense. Through this confrontation, the authors found that almost all of the factors had somewhat of an impact on the decision-making process. However, the factors affect different stages of decision-making; (1) the process, (2) the decision-maker.

Based on the data gathered from the case studies it was seen that while some of the factors identified did influence how decisions were made, the applicability of them was not necessarily the same as the authors had predicted. Additionally there were other factors that were found to be important that were not included in the original conceptual model. Therefore, although the conceptual model seems to reflect real life, some adjustments have to be made and based on these findings the authors have been able to produce a revised model. In order to create a new

conceptualization, the limitations and strengths in light of the empirical data is analyzed in the following sections.

It should be noted that some aspects of the comparative analysis were not seen by the authors as pertinent to the research question focusing on the process of decision-making. These pieces are the process for which the companies developed their businesses and the link between the technology and business side of processes. Specifically, they were not seen as relevant because they are either specific to the industry or to the product development processes. As the authors would like to attempt to make the conceptual model applicable to more than one industry and outside of just product development (where the authors' experiences and theoretical research provide insight) they were not included in the conceptual model.

### 6.2.1 Strengths of conceptual model

In looking at the conceptual model and comparing it to the empirical data there are two main elements that are still applicable, namely inertia and analysis. These two elements were highlighted in the theoretical framework and also found to influence the process of decision-making at the two case companies, Nanospace and Q-Sense.

Looking at inertia, the data collection process showed that in the case of both Nanospace and Q-Sense, the way business is conducted is influenced by the industry these companies operate in itself. Hence, the industry dictates or determines business practices or routines. For Nanospace the industry dictated a structured approach to decision-making in new product development. The company followed a clearly defined process for product development, especially in relation to technical development. This process is shared with other companies in the space industry, and in an industry where product failure is not an option, all companies adhere to continuously proven technology and processes. In the case of Q-Sense, the industry supports innovative companies. In an industry where innovation is key to success and survival, it is has become somewhat of an industry standard and is to some extent expected that an innovative company conducts business differently in order to continuously foster innovation. Neither Q-Sense nor Nanospace felt they needed or wanted to change the way business is done. In each case, the process works well for them; hence they move forward by making decisions the way they always have.

Analysis clearly impacted the process of decision-making in both companies. The comparative analysis highlights the use of analysis in both case companies but in the case of Nanospace, analysis was used to gain commitment. Analysis was conducted within a very structured process to provide the information required to secure commitment and managerial buy-in. Moreover, the process driver used analysis to justify decisions that he had already made within himself with respect to the potential of the technology. In the case of Q-Sense, analysis was used after decisions had been made to justify or legitimize actions that had already been taken to other stakeholders. In both cases, analysis was not seen as a key component of decision-making and therefore the inclusion of analysis in the conceptual model is valid.

As both inertia and analysis were seen in the theoretical framework and the empirical data, as key components of decision-making, they remain a part of the conceptual model.

### 6.2.2 Limitations of conceptual model

During the comparative analysis a number of components to decision-making, which had not originally been included in the conceptual model were brought forward. These were found to influence decision-making and will therefore be discussed subsequently. The factors brought forward were the importance of knowledge, political support and a process driver. Further, the application of information and intuition was somewhat different in reality than originally predicted and will be discussed first.

With respect to information, sharing information as an influence was not brought forward by the interviewees. In the original model, information referred to the ability of members in a team to access and share information. The issue of information sharing as discussed in the theoretical framework was not seen to influence the decision-making process in either Nanospace or Q-Sense. There may be a number of reasons for this; firstly, in both cases the interviewee was the CEO of the company. Quite often the CEO holds the power of information and therefore this was not an issue for them. On the contrary, they may be the ones using information to influence the decision-making process. It might have been that this issue would have been brought forward if team members had been interviewed instead of the CEO. Further, the issue of power within teams was not really discussed as the interviews focused on how decisions were made rather than how power and information was shared in teams as well as team-dynamics. The authors original observation does not involve group decision-making as much as individual decision making and therefore this factor was not analyzed in depth.

Although intuition was discussed during the interviews, more focus was put on what is behind intuition than the use of intuition on its own. Both Mr. Grönland and Mr. Ternander referred to the use of knowledge instead of intuition and refuted pure intuition as an influencing factor. They believed knowledge rather than intuition guided or influenced decision-making. Knowledge, intuition, and experiences are closely related and knowledge is seen as the basis for decision-making and it is only when there is a lack of direct knowledge or inability to have the knowledge needed, that intuition was used. This interaction is depicted in Figure 11. Therefore, instead of focusing on intuition, the authors believe the focus should be on knowledge and the use of knowledge to make decisions. Knowledge as an influencing factor will be included in the conceptual model.

The interview with Mr. Grönland brought forward the importance of political support and the part it plays in decision-making. Political support and power are closely related, but political support goes beyond the power or support of top managers. Mr. Grönland argued that political support is an important factor that influences decision-making within the space industry. Without support from the right managers or institutions, a good product will not be successful. Hence, decision-making is heavily influenced by these managers. As Mr. Grönland himself relates, the fact that the European Space Agency supported the technology lead him to consider it a good investment opportunity. Political support can take many different forms and expressions, it may be clearly communicated between top managers but it can also be quietly executed through attending meetings where potentially successful technology is presented. Political support was an important aspect throughout the entire decision-making process at Nanospace and the authors' have experienced this in business and it will therefore be included in the conceptual model.

Perhaps the most important factor discussed in the interviews with both Q-Sense and Nanospace was the importance of a process driver. A process driver is the person or group of people who drives the process forward; in some cases it may be the inventor or simply the project manager. This person or group of people is responsible for the success of the product regardless of the technology or process, and drives the idea though from generation to commercialization and is responsible for market and technical assessment. Both Mr. Ternander and Mr. Grönland highlighted the importance of a good process driver who passionately believes in the product, its commercial potential and success.

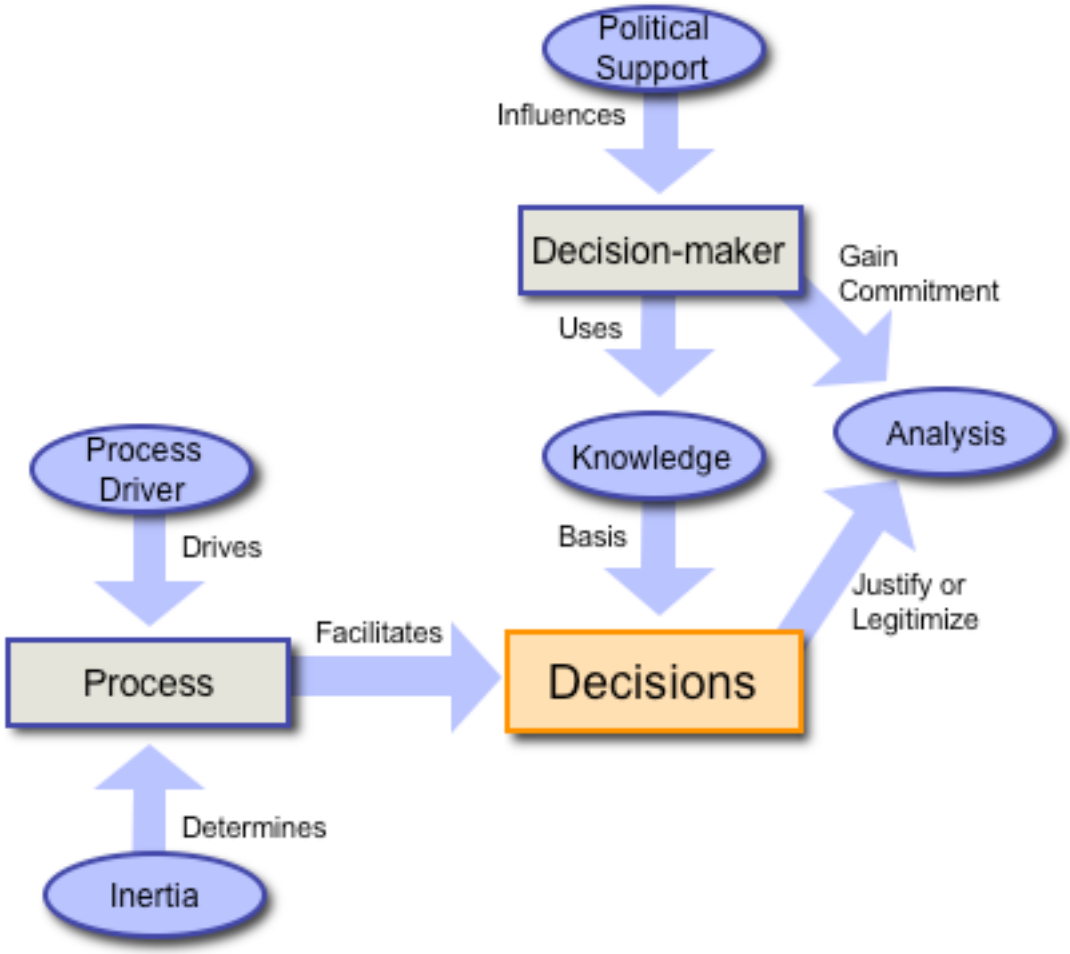
The process driver influences the process of decision-making in a number of ways. Firstly, as highlighted above, they drive the process though. Moreover, they supply the decision-makers, in Nanospace's case, the steering committee, and in the case of Q-Sense, the board, with information about the progress of the new product development process. They report on technical and market related assessment and as such, depending on how they present the information to these decision-makers, ultimately influence how they make decisions. The process driver will therefore be added to the conceptual model as a factor that influences the decision-making process.

In the original model, it was perceived that these factors influence the decision-maker at the early stages of development. However, during the data collection process, it became clear that these influences and factors influence the entire process. At some points the influence of one factor is greater than another and vice versa. In the end the decision-making process is influenced by a variety of factors. The next section outlines the revised conceptual model and takes into account the information provided by the theoretical framework and empirical data.

### 6.2.3 Revised conceptual model

The goal of this study was to examine how decisions are made in business. The interest for this stemmed from observations made by the authors that decisions are made in what some would consider illogical ways, where the decision-maker made the decisions and then afterwards tried to complete a formal process that they should have done from the beginning. In reviewing the theories for decision-making it was seen that models do exist but they lack in being able to examine the phenomena the authors have seen. During the review of theories, the authors selected influences that they believed might be part of what is effecting how decisions are made. These influencers were brought together into a conceptual model. In order to see if these influencers were part of the process for decision-making, a study was conducted looking at the process and influencers for decision-making in two small companies. From this research, a comparative analysis was done to identify the key components that were part of the process of decision-making. These new perspectives were then used to confront the conceptual model. In comparing the original conceptual model in light of the insights gained from the empirical research the authors have identified what they believe are the main components of the process for decision-making. These are **the process driver, political support, inertia, knowledge and analysis.** The authors see the process driver as driving the process to success. The political support positively or negatively influences the decision-maker(s) and/or process driver(s). Inertia from the business environment determines the process (structured, ad-hoc, etc). Knowledge is the basis for decisions. And analysis justifies, legitimizes or is used to gain commitment for the decisions. Combining these factors the revised conceptual model is illustrated in Figure 13. Overall the interaction of these factors provides the process for decision-making.

**Figure 13 Process for Decision-Making: How Decisions Are Made**




Source: Authors' own (2005)

As highlighted in the model above, there are two major components that come into play when decisions are made (1) the process, and (2) the decision-maker. The purpose of the process is to facilitate decisions whereas the decision-maker makes the decisions. Different influences affect the process and the decision-maker and these will be discussed separately.

In collecting the empirical data, two main factors were identified which influence the process of decision-making; inertia and the process driver. As described previously, the process driver drives the process of decision-making, seeing the process through from idea to commercialization. This person or group of people potentially exerts great influence over the process and the final decision through its commitment to the products and by believing in the product and communicating this to the final decision-makers. Inertia determines the process for decision-making. For example, within the space industry, all product development decisions follow a clearly defined rational process where decisions are made with respect to technical and business appraisal. The process driver and inertia jointly determines and drives the process of decision-making, which in turn is there to facilitate the act of making a decision.

There are also factors that influence decision-making, namely political support, knowledge and analysis. Political support influences the decision-maker. The impact of political support is either

positive or negative, either in support of the product/technology or not. Here knowledge also comes into play as an important factor. Knowledge is used as the basis for decisions, the decision-maker uses his/her pool of knowledge to determine the best alternative. In some cases analysis is conducted as part of the decision-making process to gain commitment to a decision. Under other circumstances it is used after a decision has been reached to justify or legitimize the decision.

Together these two components, with the influences upon them, determine how decisions are made and results in the overall process for decision-making. As depicted in the model, the process of decision-making is complex and a number of issues influence the decision-maker at different stages of decisioning. The exact impact of these influences is difficult to assess, however, it is important to note that in some decisions political support may not be an important factor whereas inertia is. Therefore the influence of the factors will vary from one decision to another; hence they will influence the process differently.

In summary, the model in Figure 13 is by no means a static or fixed figure. There may be other influences that have not been included in this model that also influence decision-making. The model is, however, a reflection of the aspects identified though the theoretical framework and empirical data.

# 7 Conclusions

This study began with observations made by the authors with regard to how decisions are made in business today. The process of decision-making is often overlooked, in both business and life in general, despite its importance, and the fact that there is a lot to learn by taking a moment to stop and reflect about the way things are done. This reflection allows people to think about their actions and make more educated decisions. This was also the overall intention of this thesis. The purpose of this thesis was not; however, to assess whether managers were wrong or right but simply to explore the way business is conducted. Hence, the process for decision-making became the focus. The authors believe that through looking at the academic theories, and then conducting the extreme-case studies, insights have been gained into the process of decision-making. These insights were encapsulated in the conceptual model (Figure 13), which describes the process of decision-making, and is the key deliverable of this thesis.

The conceptual model was developed through theoretical and empirical information. The theoretical framework provided a background to decision-making and a comprehensive review of the current state of academic research in the area. Through the literary review it became apparent to the authors that although there is much research available on the process of decision-making, what is missing is a more holistic approach. What is needed is a view on decision-making that combines models and influencing factors in a practical and realistic model, which can be used to explain the original observations. In order to develop such a model, the literary review was used as a basis, from which knowledge from existing models was gained. To provide a more comprehensive approach to decision-making, a number of influencing factors were gathered from these models and studies. The factors selected were intuition, analysis, inertia, and information. These were combined with Dean and Sharfman's (1996) model, into a conceptual model (Figure 7), which was used as a guide in the collection of the empirical data.

From here the empirical data was collected using extreme case studies, in the form of in-depth interviews, with the CEOs of two small high-tech international companies, Nanospace and Q-Sense. In focusing on the way decisions are made, Mr. Grönland of Nanospace continuously advocated the use of structured processes. However, as the discussion progressed, it became apparent that even with these processes in place, Mr. Grönland made decisions, in his mind, even before the process itself allowed the decisions to be made. This does not mean that Mr. Grönland's decisions were final, especially as the process for decision-making at Nanospace still dictated that a steering committee makes the final decision. However, once Mr. Grönland had made up his mind, he could successfully advocate, and drive the product through the structured processes. By making this internal decision before the appropriate steps were taken, Mr. Grönland was exhibiting irrational decision-making within a rational process. For Q-Sense, the ad-hoc process of decision-making led to non-rational decision-making. As highlighted by Mr. Ternander, what people say they do, and what they actually do, is not necessarily the same. In business, decisions are made based on people's knowledge, and it is only after the decision has been made internally that managers go back and try to backup their decisions with actual fact.

From these two extreme cases, aspects of interest were identified and analyzed in a comparative analysis. The key aspects were the similarity of the overall business development process, process drivers as key influencers of the process, link between technology and business side of processes, importance of knowledge, use of analysis and the impact of inertia.

The next step was to use the knowledge gained from the case studies to confront the conceptual model. In doing so, the strengths and limitations of the conceptual model were examined. From this analysis, a new revised conceptual model was developed. This model encompasses the authors' view on the process of decision-making. The key components of the process are process driver, political support, inertia, knowledge and analysis.

In making decisions a process driver is responsible for driving the process (structured or un-structured) through completion. The authors believe that this aspect is not nearly highlighted enough in existing research. Both the company CEOs repeatedly commented that they believed that, if there are good people driving the process, the product will be successful, regardless of the technology.

Political support, while mentioned in almost all decision-making research is not fully highlighted as an effect on the process. It is typically mentioned as something to be aware of, but not as a key component. During the interviews, especially with Nanospace, the effect of political support was seen as one of the biggest influences on the process of decision-making. While the effect of power may have more of an influence in organizations using structured processes, or even organizations that are larger, it was still an important influence on decision-making for the two companies and cannot be ignored.

Inertia seems like such an obvious influence on how decisions are made, and yet it is not highlighted in existing literature or by managers. It is inherent in people to continue to do things the way they have done them before, and especially when influenced by the higher authority of the industry. During the case studies, the interviewees were not even aware that they were heavily influenced by business norms even though they were. Furthermore, they did not realize that they could or should do things differently.

Even though recent research has focused on intuition as the biggest influence on how decisions are made in today's global environment, the case studies showed that is not really intuition, but the knowledge behind the intuition that is the real influencing factor. All decisions are made based on what is known by the decision-maker. In some cases it is the combined knowledge of the decision-makers. Regardless, the decision-makers only rely on intuition where there is a gap in their knowledge. Therefore, decisions are really made based on knowledge.

Finally, analysis is used by decision makers but in various ways. In a structured process it is more formally used during the official decision-making. In ad-hoc decisioning, analysis was used as a mean of justification and legitimization. But in both case studies, as seen in the original observations, analysis was not used by the decision-makers themselves when making their own internal decisions on whether to proceed or not.

These five elements when combined together, and illustrated to show their influences (Figure 13), provide a picture on the process that managers go through in order to make decisions. Therefore, in answer to the research question, what is the process for decision-making, the authors contend that it is the interaction between the factors where the process driver drives the process, political support influences the decision-maker, inertia determines the process used, knowledge is the basis for decisions and analysis is used to either justify, legitimize or gain commitment for decisions.

## 7.1 Contributions and areas for future research

Based on the results of the study the contributions for both the academic field as well as managers will be discussed. The aim is to provide scholars and managers with recommendations on how the findings can be applied to their areas. Furthermore, areas for further research will be identified in the hopes for continued study in decision-making.

### 7.1.1 Academic

This study provides scholars with multiple offerings to be combined with existing research, in order to further enhance the level of understanding of decision-making. As discussed above, an objective of the study was to provide a more holistic view of the decision-making process. By combining factors, as well as the process together, and ignoring where or not the process was rational this goal was achieved. As a result, the conceptual model provides an understanding for decision-making that it both theoretically grounded and practically proven. Academics can use the model in associated with other research to try and gain a better understanding of how decision-making occurs in our fast paced global environment.

With respect to future research, the model can be tested by conducting similar studies in larger companies or companies in different industries. Additionally, it would be interesting to look at decision-making in another business context outside of new product development. This additional data will provide for a stronger and more well defined understanding of the model, and the impact of the factors within the model. When looking at the impact of the factors, it may be possible to examine the resulting success or failure of the process in order to determine if the impact is negative or positive.

While the importance of the link between business and technology was not included in our model, as this a factor not necessarily seen outside of product development, it is an important aspect that should continued to be studied. Even though other researchers have identified this in the past, the authors stress that it needs to go beyond the level of importance that it currently holds in models, and should be more specific.

Another contribution was given in the way of looking at the interaction between experiences, knowledge and intuition. While intuition and ‘gut-feeling’ are buzzwords in today’s business climate, researchers should challenge managers in their studies as to what is behind what they call intuition. The author’s believe they will find, as this study showed, that it is knowledge that is behind the intuition.

Additionally, the authors stand by other recent calls within the decision-making arena to bring strategic decision-making closer to other strategy studies by conducting research in other environments. One such environment is the global business place. While international implications were not directly addressed in this study, the overall outside context of the study was the global environment, as the study conducted was of two international companies. Researchers should use this empirical data to further understand the differences between domestic and global decision-making processes.

### 7.1.2 Managerial

For managers there are two main contributions from this study. The first is a deeper understanding of small high-tech companies. The second is a greater awareness to how decisions are made.

For business people involved with small high-tech companies, digesting the empirical data will provide two extreme cases of how business and decisions are made within their industry. The reader may be able to see similarities or differences, and draw conclusions with regards to their own business. Such aspects as the overall process for business development can be used to understand where their own company is and where it will be going in the future.

It may also be of interest to further investigate the way small high-tech companies go to market. As was recommended by Mr. Ternander, by understanding this process, small companies and organizations can come together in order to support the process and provide more efficiency in business development.

Beyond the empirical data, decision-makers of all companies should be able to use the conceptual model to provide insight into their own decision-making. In realizing the importance of the process driver, the impact to inertia, the influences of political support, the use of analysis and the fact that knowledge is the basis for decisioning, managers should be able to themselves make better decisions. And perhaps through these better decisions have move success in business.

Finally, the authors would challenge managers to take a look in the mirror. Think about how decisions are made and think about the implications of those processes. If you do not like the outcomes have the strength and courage to change them.

# 8 References


Ahmed, P. (1998) 'Culture and Climate for Innovation' *European Journal of Innovation Management,* Vol. 1, No. 1, pp. 30-43

Allen, T.J. (1971) 'Communications, technology transfer and the role of technical gatekeeper' *R&D Management,* Vol.1, pp. 14-21

Allen, T.J. (1997) *Managing the flow of technology*. Cambridge: MIT Press.

Allison, G. T. (1971) *Essence of Decision: Explaining the Cuban Missile Crisis*. Boston: Little, Brown.

Ancrona, D.G. and Caldwell D.F. (1992) 'Bridging the boundary: external pressure and performance in organizational teams'. *Administrative Science Quarterly,* Vol. 37, pp. 634-665

Anderson, J. A. (2000) 'Intuition in Managers: Are intuitive managers more effective?' *Journal of Managerial Psychology*, Vol. 15, No. 1, pp. 46-67

Barczak, G. and Wilemon, D. (1989) 'Leadership Differences in New Product Development Teams' *Journal of Product Innovation Management*, Vol. 6, No.4, pp.259-267

Becker, S. and Whisler, T. (1967) 'The Innovative Organisation' *The Journal of Business,* Vol. 40, No. 4, pp. 462-469

Bentley, K. (1990) 'A Discussion of the Link Between One Organisation's Style and Structure and its Connections with its Market' *Journal of Product Innovation Management,* Vol. 7, pp. 19-34

Biemans, W.G and Harmsen, H. (1995) 'Overcoming the barriers to market-oriented product development'. *Journal of Marketing Science,* Vol. 1, No. 2, pp. 7-25

Bower, J. L. (1970) *Managing the Resource Allocation Process*. Homewood, IL: Irwin.

Brewer, G. D. (1981) 'Where the twain meet: reconciling science and politics in analysis' *Policy Science*, Vol. 13, pp. 269-279

Brown, S.L. and Eisenhardt, K.M (1994) 'Product Development: Past Research, Present Findings and Future Directions' *Academy of Management Review,* Vol. 20, No.2, pp. 343-378

Burke, L. A. and Miller, M. K. (1999) 'Taking the Mystery out of Intuitive Decision Making', *Academy of Management Executive*, Vol. 12, No. 4, pp. 91-9

Calatone, R. and Cooper, R.G (1981) 'New Product Scenarios: Prospects for Success' *Journal of Marketing,* Vol. 45, spring, pp. 48-60

Carter, E. E. (1971) 'The behavioral theory of the firm and top-level corporate decisions' *Administrative Science Quarterly*, Vol. 16, No. 4, pp. 413-29

Churchill, G. A., and Iacobucci, D. (2004) *Marketing Research: methodological foundations*. Versailles, KY: Thomson.

Cohen, M. D., March, J. G. and Olsen, J. P. (1972) 'A garbage can model of organizational choice' *Administrative Science Quarterly*, Vol. 17, No. 1, pp. 1-25

Clark, K.B., Chew, W.B and Fujimoto, T. (1987) 'Product Development in the World Auto Industry' in Brown and Eisenhardt (1994)

Cooper, J. (1992) 'A Multidimensional Approach to the Adoption of Innovation' *Management Decision,* Vol. 38, No. 8, pp. 493-502

Cooper, R.G. (1984) 'The Strategy-Performance Link in Product Innovation' *R&D Management,* Vol.14

Cooper, R.G. (1987) 'The New Product Process: A Decision Guide for Management' *Journal of Marketing Management,* Vol. 3, No. 3 pg. 238-255.

Cooper, R.G. (1994) 'New Products: the Factors that Drive Success' *International Marketing Review,* Vol. 11, No. 1, pp. 60-76

Cooper, R.G. (1998) 'Benchmarking New Product Performance' *European Management Journal,* Vol. 16, No. 1, pp. 1-17

Cooper, R.G. (1993) 'From Experience- the Invisible Success Factors in Product Development' *Journal of Product Innovation Management,* Vol. 16, pp. 115-133

Cooper, R.G. (2001) 'Project NewProd: Factors in New Product Success' *European Journal of Marketing,* Vol. 17, No 5/6, pp. 277-292

Cooper, R.G. and Kleinschmidt, E. (1986) 'An Investigation into the New Product Process; Steps, Deficiencies and Impact' *Journal of Product Innovation Management,* Vol. 3, pp. 71-85

Cooper, R.G. and Kleinschmidt, E. (1987) 'New Products: What Separates Winners from Losers?' *Journal of Product Innovation Management,* Vol. 4

Cooper, R.G. and Kleinschmidt, E. (1990) 'New Product Success Factors: A Comparison of kils versus Successes and Failures' *R&D Management,* Vol. 20, No. 1, pp. 168-184

Cooper, R.G. and Kleinschmidt, E. J (1995) 'Benchmarking the Firm's Critical Success Factors in New Product Development' *Journal of Product Innovation Management,* Vol. 12, pp. 374-391

Craig, A and Hart, S. (1992) 'Where to Now in New Product Development Research' *European Journal of Marketing,* Vol. 26, No. 11

Crawford, C.M. (1980) 'Defining the Charter for Product Innovation' *Sloan Management Review,* Vol. 22, autumn, pp. 3-12

Cyert, R. M. and J. G. March (1963). *A Behavioral theory of the Firm*. Prentice-Hall, Englewood Cliffs, NJ.

Cyert, R. M., Simon, H. A. and Throw, D. B. (1956) 'Observation of a business decision' *Journal of Business*, Vol. 29, pp. 237-48

Dalton, M. (1959) *Men Who Manage*. New York: Wiley.

Davis, S. and Moe, K. (1997) 'Bringing Innovation to Life' *Journal of Consumer Marketing,* Vol. 14, No. 5, pp. 338-361

Dean, J. M., and Sharfman, M. P. (1993) 'Procedural Rationality in the Strategic Decision-Making Process' *Journal of Management Studies*, Vol. 30, No. 4, pp. 587-610

Dean, J. M., and Sharfman, M. P. (1996) 'Does Decision Process Matter? A study of strategic decision-making effectiveness' *Academy of Management Journal*, Vol. 39, No. 2, pp. 368-396

Dougherty, D. (1990) 'Understanding new markets for new products' *Strategic Management Journal,* Vol. 11, pp.59-78

Edelman, M. (1985) *The Symbolic Uses of Politics*, 2nd ed, Urbana and Chicago: University of Illinois Press

Eisdenhardt, K. M. (1989) 'Making Fast Strategic Decision in High-velocity Environments', *Academy of Management Journal,* Vol. 32, No. 3, pp. 543-76

Eisenhardt, K. M. and Zbaracki, M.J. (1992) 'Strategic Decision Making', *Strategic Management Journal*, Vol. 13, Winter, pp. 17-37

Feldman, M. S. and J. G. March (1981) 'Information in organizations as signal and symbol', *Administrative Science Quarterly*, Vol. 26, pp. 171-186

Fredrickson, J. W. (1985) 'Effects of decision motive and organizational performance level on strategic decision processes' *Academy of Management Journal*, Vol. 28, pp. 821-843

Glaser, B. G., and Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Hawthorne, NY: Aldine de Gruyter.

Goldenberg, J. Lehmann, D. and Mazursky (2001) 'The Idea itself and the Circumstances of Its Emergence as Predictors of New Product Success' *Management Science,* Vol. 47, No. 1, pp. 69-84

Goltz, G.E. (1986) 'A Guide to Development' *R&D Management,* Vol. 16, pp. 243-240

Grönland, Tor-Arne. Personal interview. 24 October 2005.

Gummesson, E. (1998) *Qualitiative Methods in Management Research.* United Kingdom, Chartwell-Bratt Ltd.

Gupta, A. Faj, S.P. and Wilernon, D. (1985) 'The R&D- Marketing Interface in Hi-Tech Companies' *Journal of Product Innovation Management,* Vol. 2, pp. 12-24

Gupta, A.K. and Wilemon, D. (1988) 'The Credibility-Cooperation Connection in the R&D Marketing Interface' *Journal of Product Innovation Management,* Vol.5, pp. 20-31

Hart, S. Tzokas, N. and Saren, M. (1999) 'The Effectiveness of Market Information in Enhancing New Product Success Rates'. *European Journal of Innovation Management,* Vol. 2, No. 1, pp. 20-35

Hart, S.J and Service, L.M. (1988) 'The Effects of Managerial Attitudes to Design on Company Performance' *Journal of Marketing Management,* Vol. 4, No.2, pp. 217-229

Hayward, T. and Preston, J. (1998) 'Chaos Theory, Economics and Information: the implications for strategic decision-making', *Journal of Information Science*, Vol. 5, No. 3, pp. 173-82

Hill, P. (1988) 'The Market Research Contribution to New Product Failure and Success' *Journal of Marketing Management,* Vol.3, No.3, pp. 269-277

Hinings, C. R., D. J. Hickson, J. M. Pennings and R. E. Schneck (1974) 'Structural contradictions of intraorganizational power' *Administrative Science Quarterly*, Vol. 19, pp. 22-44

Hise, R.T. (1990) 'Marketing/R&D interaction in new product development research: Implications for new product success rates' *Journal of Product Innovation Management,* Vol. 7, pp.142-155

Howley, M. (2002) 'The Role of Consultancies in New Product Development' *Journal of Product & Brand Management,* Vol. 11, No.7, pp. 447-458

Isenberg, D. J. (1986) 'Thinking and managing: A verbal protocol analysis of managerial problem solving' *Academy of Management Journal*, Vol. 29, pp. 774-788

Isenburg, D. J. (1984) 'How Senior Managers Think', *Harvard Business Review* (Nov-Dec), pp. 81-6

Jensen, B. and Harmsen, H. (2001) 'Implementation of Success Factors in New Product Development- the Missing Links?' *European Journal of Innovation Management,* Vol. 4, No. 1, pp. 37-52

Johne, A. (1994) 'Listening to the Voice of the Market' *International Marketing Review,* Vol. 11, No. 1, pp. 47-59

Johne, A.F and Snelson, P. (1988) 'Success Factors in Product Innovation: A Selective Review of the Literature' *Journal of Product Innovation Management,* Vol.5, pp.114-128

Kasemo, Bengt. Personal interview. 9 December 2004.

Katz, H. and Tushman, M.L (1981) 'An investigation into the managerial roles and career paths of gatekeepers and project supervisors in a major R&D facility' *R&D Management,* Vol. 11, pp.67-87

Kerr, R. M. (1982) 'The role of operational research in organizational decision making' *European Journal of Operational Research*, Vol. 14, pp. 270-278

Kim, J. and Wilemon, D. (2002) 'Strategic Issues in Management Innovation's Fuzzy Front End' *European Journal of Innovation Management,* Vol. 5, No.1, pp. 27-39

Krishnan, V. and Ulrich, K. (2001) 'Product Development Decisions: a Review of the Literature' *Management Science,* Vol. 47, No.1, pp.1-21

Krueger, R. A. (1994). *Focus Groups: a practical guide for applied research*. 2nd ed. Thousand Oaks, California, SAGE Publications, Inc.

Kuczmarski, T. (1995) 'Inspiring and Implementing the Innovation Mind Set' *Planning Review,* Vol. 22, Issue 5, pp. 37

Kuo, F. Y. (1998) 'Managerial Intuition and Development of Executive Support Systems', *Decision Support Systems*, Vol. 24, pp. 89-103

Langley, A. (1989) 'In Search of Rationality: the purposes behind the use of formal analysis in organizations' *Administrative Science Quarterly*, Vol. 34, pp. 598-631

Langley, A., Mintzberg, H., Pitcher, P., Posada, E. and Saint-Macary, J. (1995) 'Opening up Decision Making: The view from the Black Stool', *Organization Science*, Vol. 6, No. 3, pp. 260-79

Lilien, G. and Yoon, E. (1989) 'Determinants of New Industrial Product Performance' *Transaction on Engineering Management,* Vol. 36, No.1, pp. 3-10

Lindblom, C. E., and D. K. Cohen. (1979) *Usable Knowledge*. New Haven, CT: Yale University Press

Lofland, J., & Lofland, L. H. (1984) *Analyzing social settings*. Belmont, CA: Wadsworth Publishing Company, Inc.

Maidique, M.A. and Ziger, B.J. (1984) 'A study of success and failure in product innovation'. *Transactions in Engineering Management,* Vol. 4, pp. 192-203

March, J. G. (1962) 'The business firm as a political coalition' *The Journal of Politics*, Vol. 24, pp. 662-678

March, J. G. and H. A. Simon (1958) *Organizations.* John Wiley and Sons, New York.

McDonough, E.F. (1986) 'Matching Management Control Systems in Product Strategies' *R&D Management,* Vol.16, No.2, pp. 141-149

Metsner, A. J. (1976) *Policy Analysts in the Bureaucracy*, Berkeley, CA: University of California Press

Meyer, A. D. (1984) 'Mingling decision making metaphors' *Academy of Management Review*, Vol. 9, pp. 6-17

Meyer, S. and Marquis, D.G. (1969) 'Successful Industrial Innovations', *National Science Foundation,* pp.67-72

Meyer, J., and B. Rowan (1977) 'Institutionalized organizations: formal structure as myth and ceremony' *American Journal of Sociology*, Vol. 83, pp. 340-363

Miller, D., and Friesen, P. H. (1980a) 'Archetypes of organizational transitions' *Administrative Science Quarterly*, Vol. 25, pp. 268-299

Miller, D., and Friesen, P. H. (1980b) 'Momentum and revolution in organizational adaptation' *Academy of Management Journal*, Vol. 23, pp. 591-614

Mintzberg, H. (1978) 'Patterns in strategy formulation' *Management Science*, Vol. 24, pp. 924-948

Mintzberg, H. D. Raisinghani and A. Theoret. (1976) 'The structure of 'unstructured' decision processes', *Administrative Science Quarterly*, Vol. 21, pp. 246-275

Montoya-Weiss, M. and Calantone, R. (1994) 'Determinants of New Product Performance' *Journal of Product Innovation Management,* Vol. 11, Issue 5, pp.397-417

Morsey, S. (2005) 'Understanding New to Market Product Development in SMEs' *International Journal of Operations and Production Management,* Vol. 25, No.2, pp.114-130

Nanospace website:
1- www.nanospace.se, accessed on October, 12, 2005.

Nutt, P. C. (1999) 'Surprising But True: Half the Decisions in Organizations Fail', *Academy of Management Executive*, Vol. 13, No. 4, pp. 75-89

Nyström, H. (1985) 'Product Development Strategy' *Journal of Product Innovation Management,* Vol. 2, pp.25-33

Patton, M. Q. (1990) *Qualitative Evaluation and Research Methods* (2nd ed.). Newbury Park, CA: Sage Publications, Inc.

Payne, J. W., Bettman, J. R. and Johnson, E. (1988) 'Adaptive strategy selection in decision making' *Journal of Experimental Psychology: Learning, Memory, and Cognition*, Vol. 14, No. 3, pp. 534-52

Pfeffer, J. (1981) *Power of Organizations*. Marshfield, Mass.: Pitman.

Pinto, M.B. and Pinto, J.K. (1990) 'Project Team Communication and Cross Functional Cooperation in New Program Development', *Journal of Product Innovation,* Vol. 7, pp. 200-212

Porter, R., R. Zemsky, and P. Oedel (1979) 'Adaptive planning: the role of institution specific models' *Journal of Higher Education*, Vol. 50, pp. 586-601

Porter, M. (1990) *The Competitive Advantage of Nations*. New York, Free Press.

Q-Sense website:
1- www.q-sense.com, accessed on October 21, 2005.

Quinn, J. B. (1980) *Strategies for Change: logical incrementalism*. Georgetown, Ontario: Irwin-Dorsey.

Ozer M, (2003) 'Factors which Influence Decision Making in New Product Development' *European Journal of Operational Research,* Vol. 163, pp.784-801

Roberts, D., Baker, S., Walker, D. (2005) 'Can we learn together? Co-creating with Consumers.' *International Journal of Market Research,* Vol. 47, No. 4, pp. 407-425

Roberts, E.B. and Fusfield, A.R. (1991) 'Staffing the Innovative Technology-based Organization' *Sloan Management Review,* Vol. 22, Spring, pp.19-34

Rothwell, R. (1972) 'Factors for success in industrial innovations' in Brown and Eisenhardt (1994)

Rothwell, R. (1977) 'The Characteristics of Successful Innovations and Technically Progressive Companies' *R&D Management,* Vol.7, No.3, pp.191-206

Rothwell, R. and Whiston, T.G. (1990) 'Design, Innovation and Corporate Integration' *R&D Management,* Vol. 20, No. 3

Salancik, G. R. and J. Pfeffer (1974) 'The bases and use of power in organizational decision making: The case of the university budget' *Administrative Science Quarterly*, Vol. 19, pp. 453-473

Schumpeter, J.A. (1942*) Capitalism, Socialism and Democracy Revisited*, edited by Diamond and Plattner. Baltimore, Md. : Johns Hopkins University Press, cop. 1993

Simon, H. A. (1957) *Models of Man*. John Wily and Sons, New York.

Simon, H. A. (1978) 'Rationality as process and product of thought' *Journal of the American Economic Association*, Vol. 68, pp. 1-16

Sinclari, M., and Ashkanasy, N. M. (2005) 'Intuition: myth or a decision-making tool?' *Management Learning*, Vol. 36, No. 3, pp. 353-370

Stanford Encyclopedia of Philosophy:
1- http://plato.stanford.edu/entries/economics/#5, accessed on September 20, 2005

Starbuck, W. H. (1983) 'Organizations as action generators' *American Sociological Review*, Vol. 48, pp. 91-102

Steinbruner, J. O. (1974) *The cybernetic theory of decisions*, Princeton, N.J.: Princeton University Press

Strauss, A., and Corbin, J. (1990). Basics of qualitative research: Grounded theory and procedures and techniques. Newbury Park, CA: Sage.

Ternander, Ted. Personal interviews. Multiple in 2004, and 26 October 2005.

Tushman, M. and Romanelli, E. (1985) Organizational evolution: a metamorphosis model of convergence and reorientation. In L. L. Cummings & B. M. Staw (Eds)., *Research in organizational behavior*, Vol. 7, pp. 171-222. Greenwich, Conn: JAI Pres

Tversky, A. and Kahneman, D. (1983) 'Extensional vs. intuitive reasoning: The conjunction fallacy in probability judgment' *Psychological Review*, Vol. 90, pp. 293-315

Voss, C.A. (1985) 'Determined of Success in the Development of Application Software' *Journal of Product Innovation Management,* Vol.2, pp.122-129

Wally, S. and Baum, R. J. (1994) 'Personal and Structural Determinants of the Pace of Strategic Decision Making', *Academy of Management Journal*, Vol. 37, No. 4, pp. 932-56

Widavsky, A. (1979) Speaking Truth to Power: the are and craft of policy analysis, Boston: Little, Brown

Wind, J. and Mahajan, V. (1987) 'Marketing Hype: a New Perspective for New Product Research and Introduction' *Journal of Product Innovation Management,* Vol.4, pp. 43-49

Yasai-Ardekani, M. (1986) 'Structural adaptations to environments' *Academy of Management Review*, Vol. 11, pp. 9-21

Yelkur, R. and Herbig, P. (1996) 'Global markets and the new product development process' *Journal of Product and Brand Management,* Vol.5, No.6, pp. 38-47

Yin, R. (1994) *Case Study Research: Design and Method*. Second Edition. United Kingdom, Sage Publications.

Zirger, B.J. and Maidique, M. (1990) 'A Model of New Product Development' *Management Science,* vol. 36, pp.867-883

# 9 Appendix

## 9.1 Interview Guide

1. Describe the process you and the company go through when making product development decisions.
    a. Explain each stage and milestone in the process.
    b. What is the time frame?

2. In this process what factors influence different stages?

3. Why do you use the process? Is it a set process? Does the process evolve? Is the process effective?

4. Who has the power in the decision-making?
    a. Are decisions made in teams?
    b. Who makes the final decision?
    c. Who drives the process?
    d. Who do you consider has the power in the decision-making and at which point do they make the decision?

5. At what point do you as the decision-maker make up your mind?
    a. What influences you at that point?
    b. Why do you make up your mind at that point?
    c. Where in the process?
    d. How does that influence the rest of the process?

6. How much analysis, what type, who does the analysis, when is it done, why is it done, who is the audience?

7. Starting at the beginning what happens outside of that process?

8. How do your personal beliefs about the products or market come into play?

9. Do you think the process is rational?
    a. What is rationality?
    b. Why does it need to be or seem rational?
    c. For whom does it need to seem rational?