How to create an organizational culture that promotes innovation

A case study at Siemens Industrial Turbomachinery AB

Ida Andersson
Linn Andersson

Technology Management

Lund University
Department of Business Administration, School of Economics andManagement
Department of Machine Design, Faculty of Engineering

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Machine Design, Department of Design Science
Faculty of Engineering, Lund University
Box 118
221 00 Lund
Sweden

Department of Business Administration
School of Economics and Management, Lund University
Box 7080
220 07 Lund
Sweden

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Abstract

Title: How to create an organizational culture that promotes innovation – A case study at Siemens Industrial Turbomachinery AB

Authors: Ida Andersson and Linn Andersson

Supervisors: Robert Bjärnemo, Professor, Machine Design, Faculty of Engineering, Lund University.

Fredrik Häglund, PhD-Candidate, Department of Business Administration, School of Economics and Management, Lund University.

Niklas Lundin, Technology Manager, Future Technology, Product Development, Siemens Industrial Turbomachinery AB.

Problem discussion: Siemens Industrial Turbomachinery Gas Turbine R&D experiences a successful past and present. They operate in a mature industry and have ascertained a need for improvement with innovations. Companies, likely SIT AB, that have practiced a successful past and are operating with a mature technology, often face the risk of being caught in the so called performance trap. The definition of a performance trap is a company that currently is performing well and experience sufficient growth, but is too occupied with its core business and forgets to search for those opportunities that will lead to future growth. The challenge for companies that are using mature technology is to be able to adopt new technology, i.e. perform radical innovations.[1] Companies that have experienced successful pasts and are operating with mature technology, in mature industries, often face the risk of being caught in the performance trap. To increase radical innovations and not only incremental like improvements of products, companies and also SIT AB, need to develop a system or way of working to meet the challenge to avoid a performance trap.

Purpose: The purpose in this thesis is to construct a customized plan of action regarding how to improve the organizational culture for innovations.

Method: The thesis is an exploratory case study, meaning that existing theory are matched with empiric findings in order to expand and develop theory on the factors in the organizational culture that will influences innovation. The

[1] Christensen, p. 45

case study has been conducted at SIT GT R&D, but empirics have also been gathered from two companies, Alfa Laval and SCA. They are comparable companies in the sense that they are they are manufacturing companies with a successful past, high level of educated employees and operating in at mature industry with a mature technology. Both a qualitative and a quantitative method were applied in order to make use of the synergic effects. The working process have been divided into three main steps; firstly, a pre-study to map the current situation at SIT GT R&D and to do a theoretical research, secondly a matching of the empiric findings with theory and, thirdly, recommendations regarding how to organize for innovation.

Conclusion: According to the academic theory of how to work with and support innovations, SIT GT R&D fulfills many factors that are essential to possess in order to promote innovation and creativity. The company has the necessary presumptions that are needed in order to generate innovations, but the presumptions are not sufficient enough and there is definitely room for improvement. SIT GT R&D, just like other companies in mature industries, faces the risk of being caught in a performance trap because they prioritize short time projects, with more immediate results and benefits, before the long term projects and solutions. Too become a more innovative organization changes need to be adopted, since innovation does not occur by itself just because the company states that it wants to be innovative. A plan of action for innovation is needed. The fours step solution presented in this thesis includes the following; Step one, clarify and implement a strategy for innovation. Step two; secure communication for innovation, e.g. effective communication between R&D and the market department. Step three; implement support systems for innovation, e.g. budget for innovation. Step four; provide the individual drivers and motivators needed for innovation, e.g. providing the employees with empowerment and autonomy. By implementing those steps that are presented in the plan of action, the organization will develop those capabilities and assets that are needed to promote innovations and to avoid a performance trap. This will not only lay the foundation for future survival but also bring along the potential of making the capability to generate innovations a signification competitive advantage.

Keywords: Innovation, creativity, organizational culture, mature industries, performance trap

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Lund, June 2008

Ida Andersson and Linn Andersson

Frequently used terms

Abductive reasoning	A type of method of reasoning that includes both inductive and deductive reasoning, meaning that both theory and empiric are used in order to explain observations and generate conclusions.
Autonomy	The freedom to set one's own agenda, i.e. how much control one has of one's time.
Creativity	Bringing up valuable ideas.[2]
Determinant	A contextual variable. In this thesis; a cultural factor of the organization, e.g. structure or strategy, that influence creativity and innovation.
Empiric	Data that, unique for this thesis, have been collected through interviews, surveys and observations.
Empowerment	The permission and/or power to do something.
Innovation	An implemented idea, process, product or procedure that adds value and is, at least, new to the organization.[3]
Mature industry	An industry that consists of companies operating with a mature technology.
Mature technology	The level of technology maturity can be described as a product life cycle and are following the stages; introduction, rapid growth, maturing and decline stage. A mature technology is hence on the top of the technology S-curve.

[2] There is no generic definition of the word creativity, this one is used in this thesis.
[3] There is no generic definition of the word innovation, this one is used in this thesis.

Organizational culture	The deep-rooted values, traditions, beliefs and expectations of the organization, consisting of historic and long-established factors that have risen from management styles, experiences and lessons learned. The historic factors have resulted in working procedures, responses and regulation based on experiences the organization has been through.
PDP	The product development process that is used at SIT GT R&D
Performance trap	Describes what might be the case for a company that currently is performing well and experience sufficient growth, but is too occupied with its core business and forgets to search for those opportunities that will lead to future growth.
SIT GT R&D	Siemens Industrial Turbomachinery, the Gas Turbine division, Research and Development
TDP	The technology development process that is under consideration for being used at SIT GT R&D

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1 Innovation for survival

In the post-industrial society of today the success and survival of organizations are becoming more and more dependent on the knowledge-base they possess and how they chose to work with it.[4] Along with the globalization the access to information has increased and the asset of knowledge one organization enjoy is central when it comes to generating economic growth.[5] Business processes and products are becoming outdated and no longer qualify as competitive advantages in a developed economy. They are outsourced and companies are left under the pressure of innovate new, rare and profitable assets. The belief that one should focus on the core competence does no longer apply in all situations and does not guarantee competitive advantages.[6] Organizational assets such as creativity and innovation are becoming more crucial for an organization's competitiveness,[7] a fact that also applies for mature industries.[8] According to an OECD[9] report, innovation is predicted as one of four important factors in the challenge of driving economic growth. Unless the organization has the capacity of changing what is offered the customers and the way it is offering its products/services, it is jeopardizing its future survival.[10] Cutting costs may improve the results, but it will not lead to economic growth.[11] When a company performs well and has a pleasant growth there is a risk that the company overlooks the opportunities that may be significant for the future. A tendency to ignore the future is connected to the fact that managers often are fully occupied with managing the existing growth of the company.[12] Without innovations, the competitors will catch up, move ahead and sooner or later take over.[13]

Innovation is not something that takes place randomly or by luck,[14] innovation is about making choice and taking action. Either an organization chooses to innovate or it chooses a state of inertia.[15] Either an organization makes the choice of sticking to the current products and the way they are produced, and are left to pray that it will not become outdated and outrivaled by its competitors or the organization accepts that the business environment of today is all about dealing with the pressure to innovate.[16]

[4] Martins & Terblanche, p. 64
[5] OECD & Eurostat, p. 10 and Krogh, Nonaka & Aben, p. 421
[6] Moore, p. 86
[7] Martins et al., p. 64
[8] Davila, Epstein & Shelton, p. 92
[9] Organisation for Economic Co-operation and Development
[10] Bessant, Lamming, Noke & Phillips, p. 1366
[11] Davila et al., p. 8
[12] Välikangas & Gibbert, p. 58
[13] Davila et al., p. 8
[14] Ibid., p. 59
[15] Ibid., p. 8
[16] Moore, p. 86

1.1 The turbine tradition

The manufacturing of turbines in Finspång is a tradition that goes back to 1913. One of the first turbines is still in operation in the beginning of the 21st century. During the company's history it has changed owner and has had several different names; Stal-Laval, ASEA Stal, ABB Stal, ABB Alstom Power and Alstom. It is now called Siemens Industrial Turbomachinery AB, from here on SIT[17]. They develop, manufacture, sell and service single gas and steam turbines. They also deliver complete power plants and compressor plants to customers worldwide. The products are used to generate electricity, steam and heat, as well as the mechanical power for driving pumps and compressors for the gas market. Annually SIT AB has a turnover of six billion SEK.[18]

Unique for SIT AB and its business sector is the high costs that are involved when investing in new projects for product development. The gas turbines are sold at prices between 50 and 150 million SEK and approximately 60 gas turbines are produced annually[19].

The site in Finspång is owned by Siemens AG since 2003. It has grown since day one, which is shown in the increasing number of employees as well as in financial figures. See Figure 1 below that illustrates the annual turnover between 1962 and 2007. In the year between 2004 and 2008 the number of employees increased with fifty percent[20].

Figure 1 Annual turnover for SIT from 1962 until 2007[21]

[17] SIT, *Company History*, homepage, 09/03/2009
[18] Annual report 2007 Siemens Industrial Turbomachinery AB
[19] Lundin
[20] Presentation Siemens Industrial Turbomachinery
[21] Annual reports, starting at 1962 because ASEA acquired De Laval Ljungström this year and the site in Finspång became very much similar to its current operation.

Gas turbines have been produced at the site in Finspång since the fifties and there is no question about the fact that the site always has delivered world class gas turbines. The R&D department for gas turbines engages approximately 350 employees and many of them are highly educated. Over ten percent hold a PhD, approximately 15 percent of the employees hold a Licentiate degree and more than the half has a Master of Science degree. Fifty employees are University Engineers.[22]

Four different types of gas turbines are produced with an output ranging from 15 to 50 MW. The latest gas turbine was launched in the early years of the 21st century. The development of a new type gas turbine takes about ten years to reach market acceptance, time for development of fundamentally new technology not included. Natural gas is the most common type of fuel, but other types of gas are also possible to use. The gas turbines are produced for power generation or for mechanical drives. They are mainly used to generate electricity, but they can also be used as engines, in pipelines and for mechanical drive purposes, driving compressors and pumps. The principle design is the same for industrial gas turbines and jet engines and demand expertise within many different areas, e.g. thermodynamics, aerodynamics, mechanical design, combustion etcetera. Due to the short time for start-up, they are often used as back-up power. The turbines from Finspång are known for their quality and sturdiness. They are developed to be stationary compared to competitors, which have initially developed turbines for airplanes.

A combination of a gas turbine and a steam turbine is called a combined cycle. When the gas turbine is combined with a steam turbine, the reaming heat from the gas turbine is used to partly run the steam turbine and boiler is often added in the cycle. The combined power and heating plant in Rya, Gothenburg, consists of three gas turbines and one steam turbine. It provides Gothenburg with 30 percent of its total need of electricity and district heating and the efficiency in the combined cycle is over 90 percent.

1.2 Problem discussion

The gas turbine division at SIT, SIT GT, is according to themselves[23] operating within a mature industry,[24] meaning the technology of gas turbines has been known for more than half a century. The level of technology maturity can be described as a product life cycle and are following the stages; introduction, rapid growth, maturing and decline stage. A mature technology is hence on the top of the technology S-curve. The challenge for companies that are using mature technology is to be able to adopt new technology, i.e. perform radical innovations.[25] Companies that have experienced successful pasts and are operating with mature technology, in mature industries, often face the risk of being caught in the so called performance trap. The definition of a performance trap is a company that currently is performing well and experience sufficient growth, but is too occupied with its core business and forgets to search for those opportunities that will lead to future growth. For this reason, it loses its focus on innovations.[26] Performance trap may also occur when a company falls into a crisis and put all efforts into cutting costs, instead of searching those opportunities that will

[22] Gustafsson
[23] Lundin
[24] Kim, p. 371 and Christensen, p. 44.
[25] Christensen, p. 45
[26] Välikangas et al., p. 58

lead to future growth. To secure future survival, the key for success seems to be an organization with the right presumptions for innovation.

Many scientists would argue that Sweden does not generate any good product ideas, and have not done so in a long time. In contrast, other says that Swedish companies are staffed with good inventors, business administrators and creative engineers. The problem is to get support for the new ideas.[27]

The department of R&D at SIT GT is uncertain whether they have the optimal conditions to generate innovations. Further, they believe that there is room for improvement regarding how they work with innovations. It is clear that SIT GT experiences a successful history and possesses a high level of both competence and knowhow. To increase radical innovations and not only incremental like improvements of products, companies and also SIT AB, need to develop a system or way of working to meet the challenge to avoid a performance trap.

1.3 Objectives

SIT GT R&D believes that there is room for improvement regarding their work with innovation. They want to get better in the area and to do that the current situation needs to be mapped. The objectives presented bellow will be the foundation of this thesis. With the problem discussion in mind, the following objectives are taken into considerations:

- Find out if there is a risk that SIT GT R&D is on the way of ending up in a performance trap.
- To find out how the current organizational culture at SIT GT R&D working when it comes to support innovation.
- Present what SIT GT R&D will need to do in order to improve their work with innovation.

1.4 Purpose

The purpose in this thesis is to construct a customized plan of action regarding how to improve the organizational culture for innovations.

1.5 Delimitations

The thesis is limited to look into the innovation work at a specific department, which is SIT GT R&D. This department is seen as its own organization with its own culture. There will not be any long term market analyzes in order to answer whether the generating of innovations actually is required in order for SIT GT R&D to stay competitive. Instead, the assumption is that SIT GT R&D is needed to generate innovations in order to stay in the long term competition. No financial analyze regarding which financial impact an improvement of the work with innovations will lead to have been conducted. Hence, there will be no analysis regarding the financial costs and benefits of the recommendations to SIT GT R&D.

The recommendations discussed in the thesis will not highlight any directions regarding which specific type of innovation that are of future relevance for SIT GT

[27] Ekvall (1990), p.12

R&D or if there are any special technique or product areas which are of importance. Neither will the system for patent application be taken into consideration.

SIT GT R&D have been seen as one single company for this case study and since they have had several different owners, no attention will be taken to the varying corporate cultures that may have effected on the employees.

1.6 Target audience

This thesis is mainly directed to SIT GT R&D and other companies in a mature industry that want to improve trough innovation. The target audience also includes the Technology Management Education Program which includes examiners, supervisors, teachers and students.

1.7 Outline

Chapter 2 presents the method of the thesis.

Chapter 3 discusses the meaning of the word innovation and describes different types of innovations.

Chapter 4 describes the influence that the culture of the organization has on the capability to generate innovations.

Chapter 5 elaborate on which cultural determinants that influence the capability to generate innovations and, moreover, how and why they influence.

Chapter 6 describes the case study at SIT GT R&D and the current situation regarding the work with innovations at R&D. The cultural determinants presented in chapter five are used as a framework.

Chapter 7 presents the result of the analysis that has been made of the academic theory and the empiric findings. The question whether SIT GT R&D is facing the risk of being caught in performance trap is discussed. Further, a theoretical framework adjusted to explain the cultural determinants that influence creativity and innovation at SIT GT R&D and comparable companies. Comparable companies in the meaning that they are manufacturing companies with a successful past, high level of educated employees and operating in at mature industry with a mature technology.

Chapter 8 presents a customized plan of action that aims to improve the work with innovation at SIT GT R&D. The action plan consists of four different steps, clarified strategy for innovation, improved communication, support systems for innovation and providing of individual motivators and drivers for innovation. The action plan is customized for companies that, like SIT GT, are operating in mature industries.

Chapter 9 presents the conclusion. The question whether SIT GT R&D is facing a risk of ending up in a performance trap is answered. Furthermore, the customized plan of action, regarding how to improve the organizational culture for innovations, is elaborated on.

Chapter 10 is an executive summary.

2 Method

The thesis is an exploratory case study, meaning that existing theory are matched with empiric findings in order to expand and develop theory on the factors in the organizational culture that will influences innovation. [28] The case study has been conducted at SIT GT R&D, but empirics have also been gathered from two companies, Alfa Laval and SCA. Abduction reasoning has been used to handle the relation between theory and empiric.[29]A qualitative and a quantitative method were applied in order to make use of the synergic effects[30]. The three principles for data collection by Yin have been used. [31] The first principle refers to that empiric have been collected from several different sources, i.e. interviews, a survey and written documents. Secondly, the empiric results have been gathered in individual data files as well in the final thesis. Thirdly, the thesis covers and presents the whole working process of the case study.

Figure 2 below illustrates the working process of the thesis to answer the objectives and the purpose. The white boxes represent the three main steps of the working process. Step one, the *Pre-study* was made in the purpose of map the current situation regarding the work with innovations at SIT GT R&D. This was done through interviews, a survey, parallel with theoretical studies. In step two, *Empiric findings matched with theory*, result of the theory research where applied on the empiric findings in order to find cultural determinants at SIT GT R&D that needed to be improved. Further, in this step an extended theoretical framework that illustrates those cultural determinants that influence creativity and innovation at SIT GT R&D and comparable companies[32] where developed.

Step three, *How to organize for innovation*, where made in order to construct a customized plan of action regarding how to improve the organizational culture for innovations. The determinants that in step two were identified as in need of improvement where in this step developed into recommendations. It resulted in a customized plan of action, which is to be used to promote innovations.

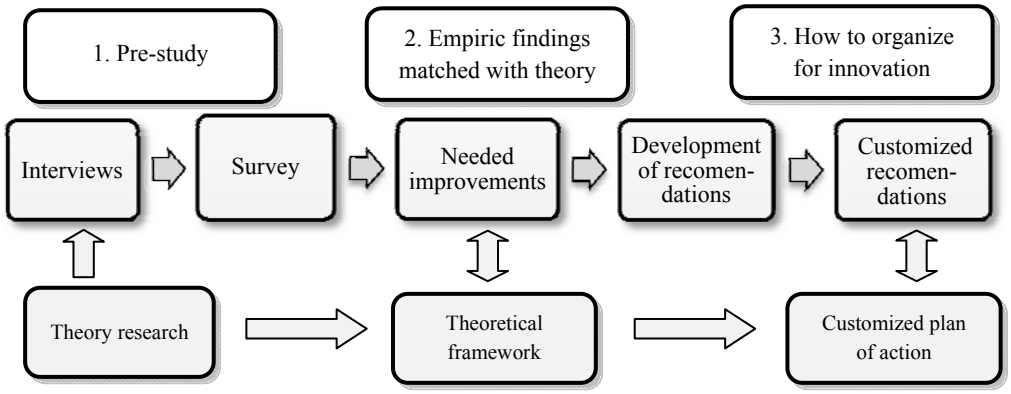

Figure 2 Working process

[28] Eisenhardt, p.534-535
[29] Patel & Davidson, p. 23
[30] Eisenhardt, p. 538
[31] Yin, p. 125
[32] In the sense that they are manufacturing companies with a successful past, high level of educated employees and operating in at mature industry with a mature technology,

2.1 Pre-study

Step one, the *Pre-study* was made in the purpose of map the current situation regarding the work with innovations at SIT GT R&D. The theory research was an iterative process and the pre-study had two approaches. Firstly, to ascertain which factors that is essential to possess for an organization in order to generate innovations. Secondly, to establish how to be able to measure and evaluate how an organization currently works with innovations. This was done through interviews, a survey, parallel with theory studies. The pre-study also included a study of other primary sources as documents for different sectors within the organization and documents of strategic characteristics, also documents explaining processes in the product development process. These where useful in order to get an understanding how the current work at SIT GT R&D is carried out. In this subchapter each step in the pre-study are presented.

2.1.1 Theoretical research

A theory research was made in the areas of *innovation*, *creativity* and *organizational culture.* Articles were searched from a relevant data base[33] and other literature was partly recommended by the supervisors from the university, who possess both experience and knowledge within the area, these sources were all secondary[34]. To illustrate important factors that influence the innovation and creativity within the culture of an organization the framework by Martins and Terblanche[35] where founded very useful. Their study is a literature study that aims to describe which determinants of the organizational culture that influences creativity and innovation. In order to verify the relevance of the framework by Martins and Terblanche and to make sure that those organizational cultural determinants that, according to them, are the ones that influence innovation a theoretical map was conducted, see Appendix I: Theoretical map of the cultural factors of the organization that influences innovation. The theoretical map resulted in that four organizational cultural determinants, that were not mentioned by Martins and Terblanche, where added to the theoretical base that have been used. Further, the theoretical map was used when the adjusted framework, that illustrates those cultural determinants that influence innovation at SIT GT R&D and comparable companies were developed, i.e. the theoretical development of this thesis.

2.1.2 Interviews

The interviews were made with employees at SIT GT R&D and concerned innovation, innovative organization and how the respondent experiences the work with innovation at SIT GT R&D. The guide was semi-structured which gave the respondents the opportunity to communicate their own thoughts to improve the quality of the study.[36] The guide was build up from the framework by Martins and Terblanche, combined with the result from the theoretical map, which is illustrated in Appendix I. The 17 respondents at SIT GT R&D were chosen by the supervisor at

[33] Electronic Library Information Navigator, Lund University
[34] Patel et al., p. 65, Ejvegård, p. 18
[35] Martins et al., for further reading see Figure 4 on page 22
[36] Patel et al., p. 78

SIT GT R&D in collaboration with requests from the authors.[37] 15 respondents were interviewed from different sectors at R&D including the R&D manager. All sectors were represented, even different levels of hierarchy. There were also two interviews made at the business department within SIT to get an insight in how the two departments collaborate.

Interviews have also been made at Alfa Laval and SCA by telephone to get extern influences in how other companies are working with innovations. Alfa Laval and SCA are comparable companies in the sense that they are they are manufacturing companies with a successful past, high level of educated employees and operating in at mature industry with a mature technology. The interviews were semi-structured was proceeded after the framework by Martins and Terblanche.

To manage the risk to express the data in a personal way the interviews has always been fulfilled by the two authors together[38]. The result from every interview has been reviewed by one author each time to not influence each other[39] and the result was primary source[40] in this thesis. The interviews were analyzed in a structured way and the answers from the interviews made at the R&D department were analyzed with the aid of the framework by Martins and Terblanche, combined with the theoretical map. The results from the interviews were used as input to the following survey.

2.1.3 Survey

The theory research and the outcome from the interviews ended up in a survey to measure the general opinion about innovation, a quantitative research method[41]. The survey was seen as an innovation audit and was constructed by the authors, with inspiration from two articles within the area of measuring the work with innovation at organizations[42]. The survey included 59 statements and the respondents needed to take a standpoint at a five degree scale, the Likert scale[43], which are common to use when a populations opinion or value are measured.[44] There was also an opportunity to answer "do not know" in the survey, which means there was totally six answer alternative. Three questions where excepted from the other statements; one especially formed regarding type of employment; one required the respondent to decide if there was more successful innovation generated from technique development rather than product development and one asked the respondents to rank which three factors of seven they considered to be of most importance when generating innovations. It was also a possibility to add free thoughts in the survey to complement the qualitative data from the interviews. The headings used in the framework by Martins and Terblanche, were also used in the survey.

As mentioned above, the statements in the audit were partly based on two articles from the theory, *A health audit for corporate entrepreneurship: innovation at all*

[37] The respondents are anonymous
[38] Johansson, pp. 78-79
[39] Ibid.
[40] Patel et al., p. 65
[41] Patel et al., p. 109
[42] Duane Ireland, Kuratko, & Morris and Dobni
[43] The scale range from strongly disagree, disagree, not sure, agree and to strongly agree.
[44] Patel & Davidson, p. 84

levels part II[45] and *Measuring innovation culture in organizations*[46]. The last article aimed to develop a comprehensive tool to measure the innovation culture in an organization[47] and the first are more intent to foster entrepreneurial performance to improve the organization[48]. Statements from the articles were taken to secure that common formulations are used when measuring the organization culture and how it influences the work with innovations. Statements in survey were also complemented with input from the interviews. The survey addressed all employees at the R&D department except the administrative personnel and extern personnel. There was an opportunity for the respondent to chose if the statements should be presented in English or in Swedish, this to encourage the number of answers. The number of respondents was 308 surveys and the answering frequency was 71 percent.

2.2 Empiric findings matched with theory

Step two, *Empiric findings matched with theory*, was made in order to answer the first part of the purpose; examine why a well-doing company in a mature industry has ascertained a need for improvement with innovations. In this step a theoretical framework that illustrates those cultural determinants that influence creativity and innovation at SIT GT R&D and comparable companies developed by using the framework by Martins and Terblanche.

2.2.1 Empirical analyzes

The result from the survey and the interviews was analyzed and the results were used as primary source in this thesis. The empirical analyze did not only involve the result from the survey, the result from the interview was also added to secure that every thought and comment about the organizational culture at SIT GT R&D of use was included. Some questions where similar in the since that they where formulated different but had the same purpose in order to secure the reliability. In order to secure the reliability a few questions and answers had to be ruled out in the empiric analyze since too many of the respondent had chose to answer "do not know", due to how the question was formulated.

The interviews where semi-structured and the same question formula was used in the different interviews. The answers provide qualitative empiric and gave a deeper and clearer picture of the current situation at SIT GT R&D. Hence, the validity was improved with the input from the interviews.

The results from the theoretical map[49] were used when analyzing the empiric findings. Those different cultural determinants that, according to the theoretical map, influence creativity and innovation within the organizational culture were measured according to the empiric findings.

[45] Duane Ireland, Kuratko, & Morris
[46] Dobni
[47] Duane et al., p. 21
[48] Dobni, p. 540
[49] See Appendix I: Theoretical map of the cultural factors of the organization that influences innovation

2.2.2 Theoretical application

The theoretical application was done by using the framework by Martins and Terblanche, combined with findings from other literature and studies, seen in Appendix I: Theoretical map of the cultural factors of the organization that influences innovation.

2.2.3 Needed improvements

Findings in the empirical study that differed from what the academic theory consider important factors for an organization to generate innovations was identified as "weak conditions" and formed a gap between the current situation and the theory, which are shown in Figure 3 on the right. Theoretical conditions were founded in the academic theory as essential elements for innovation and these conditions were compeered with the current situation at SIT GT R&D. The identified weak conditions, that according to the theory needed to be improved, were discussed with the consultative group[50] and with the supervisors from the university.

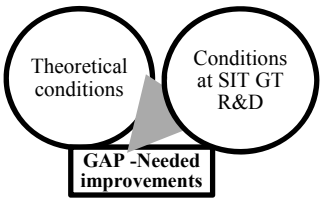

Figure 3 Illustration of the gap

2.2.4 Theoretical framework

Step two in the working process consisted of analyze of the current situation at SIT GT R&D matched with academic theory. It resulted in an identification of determinants that needed to be improved at SIT GT R&D in order to improve the work with innovations. Furthermore, the theory was matched with the empiric findings, mainly from SIT GT R&D but also with input from SCA and Alfa Laval, with the purpose to generate new theory.[51] It resulted in a theoretical development of the framework by Martins and Terblanche, which describes those cultural determinants that influence creativity and innovation at SIT GT R&D and comparable companies.[52]

2.3 How to organize for innovation

Step three, *How to organize for innovation*, where made in order to answer the second part of the purpose; to construct a customized plan of action regarding how to improve the organizational culture for innovations. The determinants that in step two were identified as in need of improvement where in this step developed into recommendations. It resulted in a customized plan of action that is to be used in order to improve the work with innovations.

2.3.1 Development of recommendations

The results from theoretical development of the framework by Martins and Terblanche, which describes those cultural determinants that influence creativity and

[50] Including Niklas Lundin, Peter Ringstad, Gunnel Sundberg and Sven Gunnar Sundkvist
[51] Yin, p. 181
[52] See Figure 4 on page 22

innovation at SIT GT R&D and comparable companies where used as a base when developing the recommendations. Those cultural determinants that were identified as in need of improvement where prioritized in a descending scale, according to the recommended chronological order for implementation.

2.3.2 Finalized recommendations

Interviews were made in order to complement the previous empiric findings and to secure that the recommendations were accurate and adequate for SIT GT R&D. The interviews were semi-structured and the respondents were chosen by the authors, from the same respondents that had been interviewed previously. The respondents were asked to give their opinions of the suggested recommendations.

2.3.3 Customized plan of action

The purpose in this step was to develop recommendations regarding how SIT GT R&D should improve their work with innovation. It resulted in an action plan customized for SIT GT R&D and to comparable companies.[53] The action plan aims to, when implemented, improve the work with innovations. To verify the action plan, meetings were held with the consultative group[54] every second week, in order to verify and secure that the recommendations of the action plan were accurate and adequate.

2.4 Method evaluation

This is only one case study, therefore the findings provides no statistical generalization. Although, it is an analytical generalization and cannot thereby be dismissed solely because it is just one.[55] The method in this thesis is limited to a case study at one company. To verify the generic extent of the recommendation, a broader approach, involving more case companies, would be needed. If a larger number of companies had been studied, the more generic would the action plan have been. However, what would have been gained in terms of generic level would have been lost in terms of customization for SIT GT R&D. The plan of action should be seen as generic in the sense that those characteristic factors, which apply for companies operating in a mature industry, regarding how to create an organizational culture that promotes innovations are pointed out.

The theory used in this thesis has had a general approach, regarding business and industries. The authors have not found theory that specifically approaches mature industries and how they will improve their work with innovation. Therefore, there could be a risk that the recommendations are not specific enough for mature industries. Due to the limited resource of time, a trade-off has been done. From SIT's point of view, they found knowledge within the innovation area more important than to introduce the authors in details about gas turbine and their processes. Even though it is unavoidable, this could be seen as a weakness in the method.

[53] See Figure 9 on page 56
[54] Including Niklas Lundin, Peter Ringstad, Gunnel Sundberg and Sven Gunnar Sundkvist
[55] Yin, p. 53

3 What is innovation?

The word innovation is widely used by organizations; both in the purpose of describing the character of the organization as of today, as well as in the purpose of expose what the organization is aiming for. Rarely the actual meaning of innovation is elaborated on and often many different things are described as innovation. The word has in many ways become generic, which is shown in the literature as well.[56]

3.1 Definition of the word innovation

The word innovation is originating from the two Latin words; *i'nnovo* meaning "renew" or "achieve something new", and *no'vus,* meaning "new".[57] In the literature the meaning of innovation are contextual and are referring to different phenomena, behavior, outcomes etcetera.[58] The meaning ranges over a broad scale starting with a macro approach[59], e.g. innovation is changes within "*the process by which an organization transform labor, capital, material, and information into products and services of greater value"*[60] or innovation is "*strategic investment in new businesses"*[61]*,* to a more narrow definition focusing on a more specific type of innovation and the implantation of ideas. [62] The Oslo Manual, an OECD publication, has a broad definition and states that:

> *"An innovation is the implementation of a new or significantly improved product (good or service), or process, a new market method, or a new organizational method in business practice, workplace organization or external relation."*[63]

The Oslo Manual further conclude that for something to be considered an innovation it at least has to be "*new (or significantly improved) to the firm*".[64] The definition is similar to what West and King define as an innovation:

> *"The intentional introduction and application within a role, group or organization of ideas, processes, product and procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society."*[65]

Furthermore, West, Hirst, Richter and Shipton conclude that innovations at least have to fulfill three minimum requirements, saying that:

[56] Dobni, p. 540
[57] Swedish National Encyclopedia
[58] Dobni, p. 540
[59] Martins et al., p. 67
[60] Christensen, p. xvi.
[61] Muller, Välikangas & Merlyn, p. 39
[62] Martins et al., p. 67
[63] OECD & Eurostat, p. 46
[64] Ibid.
[65] King & West., p. 6

> *"Innovation […] is intentional, designed to benefit and new to the unit of adoption. If a change incorporates these three elements, according to the definition, it is innovation; if any is missing, it is not."*[66]

Martins and Terblanche emphasize that innovation starts with an idea when they define innovation as:

> *"Innovation can be defined as the implementation of a new and possible problem-solving idea, practice or material artifact (e.g. a product) which is regarded as new by the relevant unit of adoption and through which change is brought about".*[67]

The keyword in the definition above is that to be considered an innovation an implementation of the idea needs to have taken place, which is in line of what the Oslo Manual states. Although, West et al. points out that an innovation is designed to benefit. Amabile, Conti, Coon, Lazenby and Herron also argue that innovation is about adding value and state that: "*successful implementation of creative ideas within an organization*". According to them, *creative ideas* are "*novel and useful ideas"*[68] and, compared to the other stated definitions of innovations, *ideas* are not further elaborated on.

Innovations are shaped as "*ideas, process, product or procedure*"[69], it has at least to be new to the organization[70], add value[71] and be implemented.[72] With that in mind, the definition that will be used in this thesis is a combination of the definitions above and states that: *Innovation is an implemented idea, process, product or procedure that adds value and is, at least, new to the organization.*

The word *implemented* is here referring to where the idea, process, product or procedure is realized within the company. The implementation is followed by the market introduction, which is when the innovation is introduced to the market.[73] After market introduction it becomes clear whether the innovation is a success or not. An innovation might be unsuccessful on the market and might bring a negative net result along. Although, it can still add value in the form of learning or in the shape of new technology that can lead to new innovations, that in turn become market successes.

3.2 Different types of innovation

The Oslo Manual identifies four different types of innovation; product innovation, process innovation, marketing innovation and organizational innovation.[74] Tidd, Bessant and Pavitt points out the same four types, although they call "market innovation" for "position innovation" and "organizational innovation" for "paradigm

[66] West, Hirst, Richter & Shipton, p. 271
[67] Martins et al., p. 67
[68] Amabile, Conti, Coon, Lazenby, & Herron, p.1154
[69] OECD & Eurostat, King et al. and Martins et al.
[70] King et al. and Martins et al.
[71] King et al., Amabile et al. (1996) and Sjölander
[72] OECD & Eurostat, King et al., Martins et al., Tushman & Andersson, Amabile et al. (1996)
[73] Weyrich, p. 8
[74] OECD & Eurostat, p. 49 – 51.

innovation".[75] The term "product" refers to both goods and services. Product innovations are described as the introduction of a product that is new or significantly improved. The improvement may include technical specifications, material, components or any other functional characteristics. Process innovation is described as innovation regarding production or delivery methods. Marketing innovations are associated with marketing methods such as packaging, placement, promotion and pricing. Finally, organizational innovation is considered related to business practice, workplace organization or external relations.[76]

Traditionally have innovations in the literature been divided into either incremental or radical.[77] Between incremental and radical are the so called semi-radical innovations.[78] In order to being able to perform innovations, the company needs to be clear on which kind of innovations that is to be aimed for.[79] Generally a company has a need for all of the three different types of innovation. However, the balance between the three differs between different companies.[80]

3.2.1 Incremental innovations

Incremental innovation is relatively minor changes in already existing products. They can be described as derivates of existing products.[81] Incremental innovation consists of application of current technology at existing products and is therefore rarely patentable.[82] It might seem like the incremental innovations are of a minor significance, which often is not the case. Incremental innovations are often about bringing as much as possible out of existing products and getting the most possible value without having to make heavy investments. It is the most common type of innovation and the major part of the total cost of investment is often allocated to incremental innovations. By constantly making incremental innovations the company might be able to protect its market share, for example by frequently improving the quality of existing products.[83]

Incremental innovations are often associated with lower risk taking, since they usually are more predictable compared to the more radical ones. However, it is easy to be tempted to only focus on incremental innovations, partly because incremental innovations are not associated with making changes in the business model, since the target market are still the same. Yet, when a company develops a habit to incremental innovations the risk is that more radical and perhaps more valuable innovations are crowded out.[84] The real danger appears when the company becomes stuck in a situation when only smaller changes are accepted and allowed. Being stuck with solely incremental innovations is a major danger for the long term survival of the company.[85]

[75] Tid, Bessant & Pavitt, p. 10
[76] OECD & Eurostat, p. 49 – 51.
[77] Henderson & Clark, p. 9
[78] Davil, Epstein & Shelton, p. 42
[79] The Boston Consulting Group
[80] Davila et al., p. 58 and Tidd, Bessant and Pavit, p. 14
[81] Davila p. 41
[82] Abetti, p. 209
[83] Davila et al., p. 42 - 43
[84] Ibid. p. 45 - 46
[85] Davila et al., p. 46 and Ekvall (1990), p. 13

3.2.2 Semi-radical innovations

Between incremental and radical are the so called semi-radical innovations which are characterized with significant changes in existing products, e.g. new generations of products.[86] They are new products that are produced with proprietary technology.[87] Semi-radical innovations are never that radical that it brings along needs for major changes regarding the business model. Although semi-radical innovations will affect the business model since it will mean changes regarding what the customer are offered.[88]

Henderson and Clark bring up an additional definition of semi-radical innovations, architectural innovation, which is described as innovations that reconfigures already existing technologies.[89]

3.2.3 Radical innovations

Radical innovations on the other hand are those that are based on new principles of engineering and science. The highly radical ones are unique and will outdate existing products.[90] They are radical new products and are often major breakthroughs.[91] Major investments in R&D are often needed. The slightly less radical innovations are, compared to the highly radical ones, new products that possess significantly expanded capabilities, but are necessarily not making the old technology obsolete.[92] Successful radical innovations often lead to new markets[93] and completely new offers to the customers. Therefore, radical innovations often call for changes regarding the business model.[94] The radical innovations are often characterized with significant higher cost of investment, compared to the incremental ones.[95] At the same time, it is harder to predict the outcome and an exaggerated and unrealistic belief in radical innovations might lead to dangerous effects. The key is to keep a balanced portfolio of incremental, semi-radical and radical innovations that does not jeopardize of the future of the company.[96]

Close to de definition of radical innovations is the discontinuous innovations. These are called upon when completely new technology emerges, technology that brings along significantly new functions.[97] Discontinuous innovations can, in its most extreme shape, be characterized as what Schumpeter refers to as *creative destruction*.[98]

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[86] Davila et al., p. 42
[87] Abetti, p. 209
[88] Davila et al., p. 47 and Välikangas & Gibbert, p. 59
[89] Henderson et al., p. 9
[90] Abetti, p. 209
[91] Davila et al., p. 41
[92] Abetti, p. 209
[93] Henderson et al., p. 9
[94] Davila et al., p. 51 and Välikangas & Gibbert, p. 59
[95] Davila et al., p. 42
[96] Ibid., p. 55
[97] Bessant, Lamming, Noke, & Phillips, p. 1367
[98] Bessant et al., p. 1367. "*Creative destruction*" refers to the market entrance of new innovations that completely destroy the value of established companies, but leads to long term economic growth as existing technologies where replaced with new ones. For further reading see *Capitalism, Socialism and Democracy* by J. Schumpeter, 1942.

4 Innovative organizations

Innovation is not something that "just happens" without explanation. The capability to produce innovations is determined by how the organization chose to organize and arrange for innovation.[99] The culture of the organization influences how and what the organization perform,[100] as well as the capability of generating innovations.[101] As stated in chapter 3.1, innovation demands a capability of bringing up ideas. It is a process that involves both creativity and the capability to implement the idea,[102] capabilities that lie in the culture of the organization.[103]

4.1 Organization culture and innovation

The culture of the organization has a significant influence on the success or failure of the organization.[104] The culture can contribute to the short term success as well as the long term failure. It may prevent the organization from the ability to undergo changes and innovations necessary to provide competitive advantages.[105] A successfully managed organizational culture is according to Tushman and O´Reilly "*perhaps the most demanding aspect of the management of strategic innovation and change".*[106] The organizational culture, especially the one at the department of research and development within the organization, is the key factor for the ability to generate innovations.[107] Voûte actually defines the word innovation as: "*the process by which an organization renews its assets and structure, processes and products to be able to survive or fulfill its mission."*[108]

Organization culture is often referred to as something that explains nearly everything that is taking place within an organization.[109] However, the actual definition is seldom coherent in the literature and many different definitions exist.[110] Organization culture is often referred to as the deep-rooted values, traditions, beliefs and expectations of the organization.[111] The culture consists of historic and long-established factors that have risen from management styles, experiences and lessons learned. The historic factors have resulted in working procedures, responses and regulation based on experiences the organization has been going through.[112]

To innovate is often about conducting changes and changes are about taking risks.[113] There lies in the human nature a need to feel safe and having a sense of stability in

[99] Davila et al., p. 9
[100] Tushman & O´Reilly, p. 35
[101] Davila et al., p. 9
[102] Tushman et al. (2004), p 235 and Shattow, p. 44
[103] Judge, Fryxell & Dooley, p. 73 and Xu & Liang, p. 571
[104] Tushman et al. (2002), p. 35
[105] Ibid.
[106] Ibid.
[107] Judge et al., p. 73
[108] Voûte, p. 351
[109] Johnson, p. 28
[110] Martins et al., p. 65
[111] Sopow, p. 14 and O´Reilly, p. 12
[112] Sopow, p. 14
[113] Davila et al., p. 23

one's life.[114] Given that, willingness from management to make the company undergo changes may be met with resistance within the organization.[115] One can expect that the resistance will be greater in companies that have experienced success for a long time. Although, there are never any guarantees that those things that have brought success along in the past will keep doing that in the future. Therefore an innovation friendly culture is one that is open to questioning the current state and to debates regarding how and why things are the way they are. The culture must allow and even encourage risk taking, otherwise there is a great risk that a status quo will be developed.[116]

In the business environment of today, knowledge and creativity are key assets. No machine will ever be able to find and solve complex problems like a human, since complex problem solving demands creativity. Hence, the challenge for managers is to construct a culture that promotes creativity.

4.2 Organization culture and creativity

Siegel and Kaemmerer claim that an innovative organization is defined as *"one that fosters the creative functioning of its members"*.[117] West, Hirst, Richer and Shipton also state that creativity is an essential ingredient in the creation of innovation and state:

> *"Creativity is the development of ideas, while innovation is the development and application of ideas in practice (e.g., for new and improved products, service or way of working). Creativity is simply a part of the innovation process."*[118]

Flynn and Chatman bring up the value of ability to adopting new knowhow and emphasize the importance of creativity when they define innovation as:

> *"The combination of two processes: (1) creativity, or the generation of new ideas; and (2) implementation, or the actual introduction of change."*[119]

According to Morden "creativity" differs from "innovation" as "*creativity is thinking up things [and] innovation is doing new things*".[120] Amabile, Conti, Coon, Lazenby and Herron explain creativity "*as the production of novel and useful ideas in any domain"*.[121] They argue that the difference between "*creativity*" and "*innovation*" is the part with implementation, which innovation has to go through. It is clear that "creativity" is not synonymous with innovation, but instead an important ingredient when it comes to performing innovations.[122] The creativity potential of an organization is the ability to bring up valuable idea and also be able to handle and

[114] Sopow, p. 15
[115] Ekvall (1990), p. 12
[116] Davila et al., p. 23
[117] Siegel & Kaemmerer, p. 554
[118] West et al., p. 271
[119] Tushman et al. (2004) p. 235
[120] Morden, p. 7
[121] Amabile et al., (1996) p. 1154
[122] Amabile et al. (1996), p. 1154 and Xu et al., p. 571

harvest the ideas sufficient.[123] In this thesis the word creativity will be defined as "*bringing up valuable ideas"*.

Even though creative individuals are an essential asset when generating innovations, just bringing such individuals together is not sufficient in order to constrain creative organization.[124] The organization must also provide the accurate circumstances, e.g. structure regarding how knowledge is exchanged between the individuals. Unless the individuals are provided the right conditions, they will not continue being creative.[125] The factors that influence creative behavior are embedded in the norms of the organization, i.e. the culture. Shaping a culture that promotes creativity of the individuals is the first step in order to produce innovations. The following step is to also make sure that the individuals are provided with the abilities to bring the ideas further to implementation, i.e. produce innovations. A study conducted at 29 high-technology American companies has shown that when organizations that possess these two circumstances, creativity and ability for implementations are most likely to generate innovations.[126]

An innovation friendly culture is not synonymous with chaos, anarchy and a "loose structure". Instead, an organization culture that promotes creativity and innovation possess certain cultural determinants. These determinants are presented in the following chapter.

[123] DiLiello & Houghton, p. 37
[124] Woodman, Sawyer & Griffin, p. 302
[125] Tushman et al. (2002), p. 111
[126] Ibid.

5 Determinants that influence innovation

The capability to produce innovations lies in different elements of the organizational culture[127]. Many studies have attempted to map *which* cultural factors that influence the capability of one organization to generate innovations.[128] In addition to studies, the academic theory also states different points of view regarding which factors that are of importance, there is no given answer about which factors that are of importance and which are not.

Martins and Terblanche have made a study of the academic literature in an attempt to map those factors *within* the organization culture that influence creativity and innovation.[129] The study resulted in a framework, see Figure 4 on the following page, which starts with declaring those dimension that describes the culture of the organization, presented in the box with the gray frame. Then, the framework moves on to declaring *which* determinants of organizational culture that influence creativity and innovation. These cultural determinants are described in this chapter, each expanded with a theory that discusses respective factors within the determinants.

The framework, by Martins and Terblanche, has been compared to five studies that were made at different companies in a wide range of businesses and aimed to outline the cultural factors that influence innovation. The framework has also been compared to academic theory that discusses cultural factors of the organization that influence innovation. In Appendix I: Theoretical map of the cultural factors of the organization that influences innovation, the benchmark with the five studies and other academic theory is shown. All factors that Martins and Terblanche bring up, except "information technology" are pointed out as important to generate creativity and innovation in the studies and/or the theory. Although, there are four factors that according to one of the studies and/or some of the academic theory is considered of importance that are not mentioned by Martins and Terblanche; "system for measurement", "budget", "playfulness/humor" and "positive role models". These four will be presented in the last subchapter.

[127] Davila et al., p. 9
[128] Martins et al., Cadwell & O`Reilly, O´Reilly, Dobni, Siegel et al. and Ekvall (1990)
[129] Martins et al., p. 70

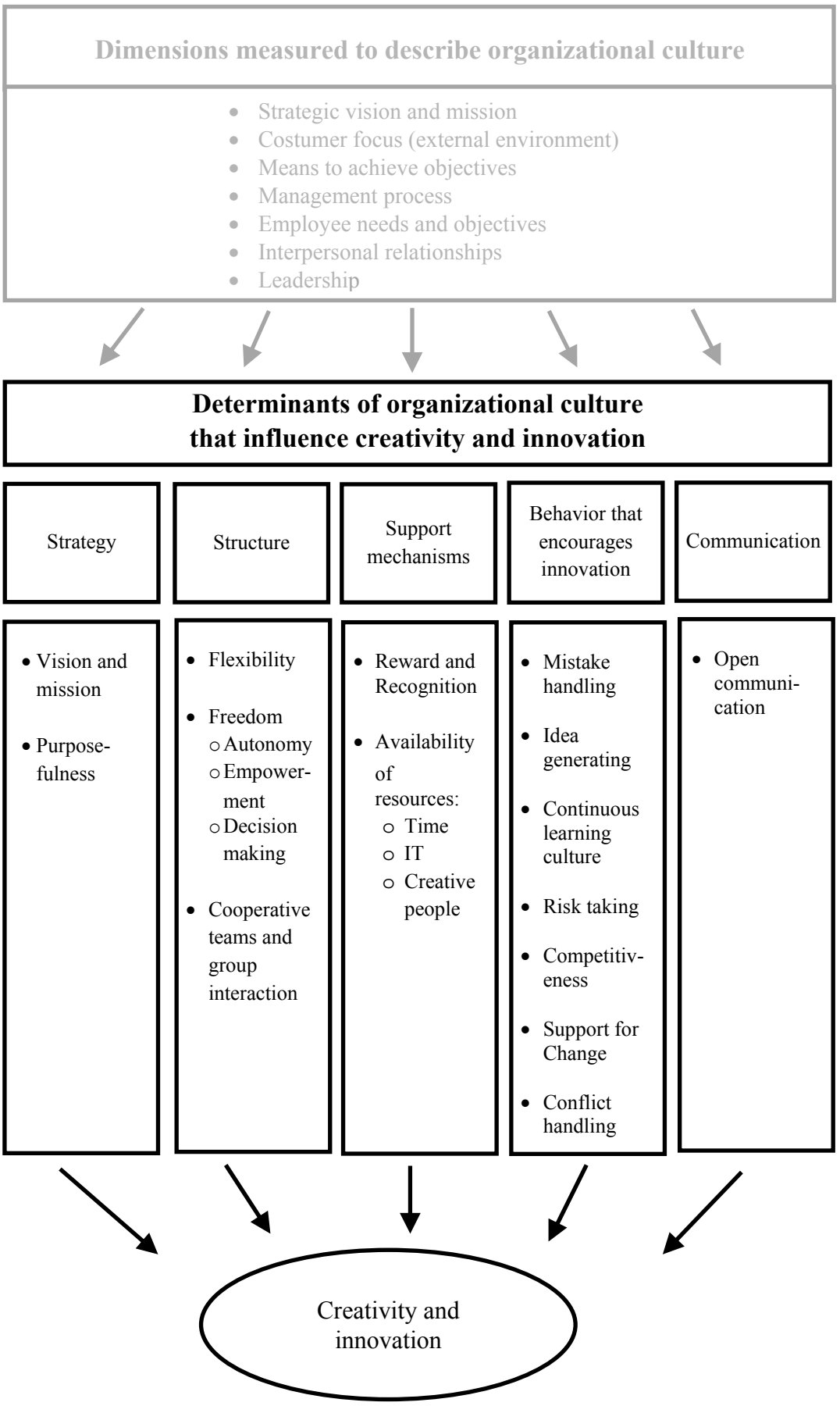

Figure 4 Influence of organizational culture on creativity and innovation by Martins and Terblanche.

5.1 Strategy

To be able to generate innovation, the overall business strategy of the company must include, or at least match, the strategy for innovation.[130] Innovation is not something that happens randomly, neither by luck. Instead innovation takes place when a company plans, organizes and conducts strategies on how to innovate. The business model tells how the company intends to beat its competitors, in contrast to a strategy for innovation that tells how the long term success will be fulfilled.[131] Voûte actually claims that innovation is all about fulfilling the mission of the company saying that: *"Innovation is the process by which an organization renews its assets and structure, processes and products to be able to survive and fulfill its mission."*[132] Martins and Terblanche do not consider the overall business strategy being equal to the innovation strategy. Instead, they state that *"an innovation strategy is a strategy that promotes the development and implementation of new products and services"*.[133]

Moreover, a strategy for innovation includes a statement of *why* the company actually aims to generate innovation. It could be for financial reasons, such as an increased sales turnover, improved return on investment, higher profit margins etcetera. It could also be for the purpose of increasing market growth, taking market shares from competitors etcetera. Further, the strategy for innovation should also include a statement regarding which innovation output the company striving for, such as product innovations, process innovation, marketing innovation or organizational innovation.[134]

Further, management and the employees must have commitment to the innovation strategy, meaning that there not only an understanding and an acceptance for the innovation strategy but also motivation and enthusiasm for producing innovations.[135]

5.1.1 Play-to-win strategy

The so called play-to-win strategy is one type of innovation strategy. "Play-to-win" refers to a strategy that aims for a market-leading position. Therefore, the play-to-win strategy is most suitable for a company that wants to generate semi-radical and radical innovations. Play-to-win strategies are typically practiced by high-technology startups that aim to develop new technologies. It is no secret that those companies more than seldom go bankrupt. The reason is that they depend too heavily on trying to develop one single radical innovation and by that having to deal with high risks. Instead, they should balance their radical innovations with more incremental ones.[136]

5.1.2 Play-not-to-loose strategy

"Play-not-to-loose" on the other hand is about producing more incremental innovations, it means not taking any larger risks and being sure of always moving ahead, although with smaller steps. It is not about imitating the work by others, it is about producing incremental innovations. The play-not-to-loose strategy is more

[130] Davila et al., p. 59, Whittington, p. 74
[131] Davila et al., p. 59
[132] Voûte, p. 351
[133] Martins & Terblanche, p. 69
[134] Kalling (2009)
[135] Tidd et al., p. 471
[136] Davila et al., p. 60 - 61

often used by companies acting in mature industries where the work is focused on creating as much value as possible from the existing products. If a company does not know how to master value creation it might neither be able to create a sufficient cash-flow in order to stay in the long term competition.[137] The risk with a play-not-to-loose strategy is that the company oversees the semi-radical and radical innovations that instead are generated by competitors.[138] The risk occurs especially for companies working with mature technology, since once the technology becomes obsolete there will be no future unless the company has the capability of switching over to new technology.[139] Therefore, it is essential to be able to deal with different types of innovations, i.e. possess an innovation portfolio, and hold both a play-to-win and a play-not-to-loose strategy in order to be able to keep up with the market conditions.[140]

5.1.3 Innovation portfolio

Furthermore, a strategy for innovations mostly includes statements regarding how the company intends to balance its innovation portfolio.[141] The strategy need to state the innovation-goals the company is aiming for.[142] The first task when constructing an innovation strategy is therefore to decide which types of innovations the company intends to generate[143] and, more specifically, how the different types of innovations should be balanced internally, i.e. the innovation portfolio. It is easy to be tempted to focus on only incremental innovations. However, a strategy like that may bring along a lock-in effect that arises when the company focus to strong on the existing issues and forgets to prepare for its long term survival.[144]

Different times demands different strategies for innovation. Internal factors as well as external factors affect which kind of strategy to choose. Internal factors are; technical capabilities, organizational capabilities, success of the current business model etcetera. External factors are industry structure, competitors, rate of technology change etcetera.[145] Innovation strategy is about possessing a balanced innovation portfolio with a mix of incremental, semi-radical and radical innovations that are answering to the current needs, influenced from internal as well as external factors.[146] Innovations will not take place just because the organization talks about it. Instead, it is the focus the organization will maintain that will actually matter. This in the framework is mentioned as “purposefulness”.

5.2 Structure

A common misunderstanding is that structure and control hinders creativity and innovation. However, the key is to organize and structure in a way that supports creativity and value creation, since both of them support innovation in different

[137] Davila et al., p. 63
[138] Ibid., p. 66
[139] Christensen, p. 45
[140] Davila et al., p. 66
[141] Ibid., p. 86
[142] The Boston Consulting Group
[143] See chapter 3.2 “Different types of innovation” for further elaboration regarding the different types of innovation
[144] Ekvall (1990), p. 13
[145] Davila et al., p. 75
[146] Ibid., p. 69

ways.[147] Value creation is about making sure that the existing products are profitable, which requires a strategy that promotes incremental innovations[148]. The process for creativity consists of a strategy that includes incremental, semi-radical and radical innovations. A balance of creativity and value creation requires flexibility, autonomy, decision making and team interaction.[149]

5.2.1 Flexibility

Flexibility refers to the conditions of the control systems of the organization.[150] Every organization uses some kind of control system, to make sure that tasks are performed in the right way. The most apparent control systems are formal ones, such as budgets, financial planning systems etcetera.[151] The formal control systems are generally measuring the behavior of the employees intermittently.[152] Just as the formal control systems influence the culture of the organization, in turn the norms of the culture makes up the social control system. Too much formal control will make the employees feel locked-in, that they are not trusted and just a cog in the machine.[153] Formal over controlling inhibit the possibilities of producing innovations since it makes the employees unmotivated.[154] If the budget allows funding for innovation only once a year, instead of answer great idea when they arise, it will hold back innovations.[155] Good ideas do not follow the financial planning year. In order to balance creativity and value creation the formal control systems needs to be flexible.[156] Companies working in mature industries; with technology that has reached a level of maturity and number of innovations declines[157], tend to focus more on value capture and too little on creativity.[158] The cure is to make sure that the formal control systems are not that rigid that creativity is inhibited and, therefore, innovations.[159] Formal control systems are able to be constructed such a way that innovations are promoted, but a social control system is, when managed right, the most efficient for promoting innovation.[160]

5.2.2 Autonomy

Social control proceed in the best way when the employees are provided with the freedom to set one's own agenda, i.e. strategic autonomy and the freedom to work on arisen problems, i.e. operational autonomy.[161] Studies have shown a correlation between an existence of autonomy and empowerment and a capability to produce

[147] Davila et al., p. p. 89
[148] Davila et al., p. 90, see chapter 3.2.1 for further elaboration regarding incremental innovations
[149] Davila et al, p. 90
[150] Martins et al., p. 70
[151] Tushman et al. (2002), p. 103
[152] O´Reilly, p. 12
[153] Tushman et al. (2002), p. 103
[154] Tushman et al. (2002), p. 107, Amabile, p. 81 and Johannessen, Olaisen & Olsen, p. 126
[155] Davila et al., p. 95
[156] Ibid., p. 90
[157] Weiwei & Bo, p. 1436
[158] Davila et al., p. 93
[159] Davila et al., p. 99 and Shattow, p. 46
[160] Tushman et al. (2002), p. 109
[161] Judge et al., p. 77

innovations.[162] Autonomy is when employees not only possess the ability to take action but also are expected to do so.[163] The capability of acting autonomous requires that the employees have the empowerment by given the right to make decision.[164]

5.2.3 Empowerment

Innovative organizations are working goal-directed[165], meaning that strategic objectives are stated by management and the employees are given the freedom to choose by themselves how to reach the goals. When using a goal-directed working method there less need to control the task that the employees are performing, and more about empowering them to reach the goals in ways they decide for themselves.[166] The level of motivation, and thus creativity, increases when the employees are provided with goals, and then given the freedom to decide how to achieve them.[167] Clear and well communicated goals also have the benefit of ease communication between employees that represent different expertise. The shared goals and the improved communication enhance the efforts of the employees and improve the level of creativity[168], which in turn lays the ground for possible generation of innovations. Since R&D projects often involve employees with different backgrounds that regularly is expected to deliver innovations, working goal-directed becomes even more important. Hewlett Packard has a philosophy of providing the employees with defined goals and then gives them the freedom to reach the goal in a way the employees find the best.[169] Providing the employees with empowerment also has the benefit of making changes easier, when the employees are involved and have an impact on the process of change, they will more likely support it instead of working against it.[170]

5.2.4 Decision making

The ability to generate innovations is also correlated to the extent to which the employees participate in the decision-making.[171] Generating innovation is about getting things done and handling speed.[172] Innovation requires initiative, which in turn comes when the employees have the power to make decision.[173] Unless the employees are given the authority to make the decision on their own, they need to receive quick go/no-go decisions from management, given that speed is considered important for the business in quest. Otherwise the level of motivation might shrink and the number of innovations to.[174]

[162] Judge et al., p. 77, Siegel et al., p. 554, Tushman et al. (2002), p. 117, Forcadell et al., p. 168 and Shattow, p. 46
[163] Tushman et al. (2002), p. 119
[164] Siegel et al., p. 554
[165] Judge et al., p. 76 and Davila et al., p. 207
[166] Judge et al., p. 77
[167] Amabile (1998), p. 76
[168] Chen, Chang & Hung, p. 26
[169] Tushman et al. (2002), p. 119
[170] Ekvall (1990), p. 12
[171] Siegel et al., p. 554, Burningham & West, p. 115, Forcadell et al., p. 168 and Shattow, p. 46
[172] Tushman et al. (2002), p. 117 and Davila et al., p. 121
[173] Tushman et al. (2002), p. 117, Burningham et al., p. 115 and Morden p. 13
[174] Tushman et al. (2002), p. 118

5.2.5 Cooperative teams and group interaction

Creativity and innovation are rarely a result of one man's work.[175] Instead, it is often a result of team-work and, more specifically, productive group interaction.[176] When individuals with different expertise are brought together holistic creativity are promoted.[177] Teams that encourage diversity and individual expertise promote innovations.[178] Cross-functionality and complementing knowledge are the basic of teams that are to generate innovations.[179] Although, there is also needs for democratic leadership and cohesiveness, which, contributes to trust between the team members.[180] The team needs to share the same goals and expectations and also be able to communicate efficiently.[181] Finally, just as the individual employee needs to be provided with autonomy and empowerment, the team needs to be too.[182]

5.3 Support mechanisms

The organization needs to possess support mechanisms in the purpose of creating a culture that that will promote creativity and innovation.

5.3.1 Reward and recognition

The motivation of individuals depends on their want for recognition, the passion they feel about the activity, the vision and purpose associated with the activity and the expected incentives. All these factors need to be taken into account when designing a proper reward system.[183] There are two types of rewards, the extrinsic one such as salary, bonuses and stock options and the intrinsic ones such as recognition, increased autonomy and promotion.[184] One of the best ways to motivate creativity among the employees is to recognize them for being creative, reward them with greater autonomy and the possibility of professional development.[185] It has been proved that intrinsic rewards are far better than the extrinsic ones when it comes to promoting creativity and innovation.[186] Organizations that succeed in their work with innovations are using intrinsic rewards in a much larger extent than the less innovative organizations. Instead, the less innovative organizations are more relying on the extrinsic rewards.[187] This fact is most evident when it comes to promoting semi-radical and radical innovations, where the intrinsic rewards are more effective than the extrinsic ones.[188]

[175] Janssen, Vliert & West, p. 134
[176] Martins et al., p. 71
[177] Woodman et al., p. 302
[178] Janssen et al., p. 135
[179] Martins et al., p. 71
[180] Janssen et al., p. 135 and Woodman et al., p. 313
[181] Tushman et al. (2002), p. 117, West et al. p. 275
[182] West et al., p. 275
[183] Davila et al., p. 181
[184] Judge et al., p. 78
[185] Shattow, p. 47 and Tushman et al. (2002)., p. 113
[186] Judge et al., p. 79, Tushman et al. (2002), p. 113, Woodman et al., p. 306 and Amabile (1998), p. 78
[187] Judge et al., p. 79 and Davila et al., p. 205
[188] Davila et al., p. 183

5.3.2 Availability of time

The availability of resources is not to forget when it comes to promote creativity and innovations. Resources are not only referred to those needed to execute pre-assigned projects and task, resources also need to enable initiation of new project.[189]

The amount of time the employees have allocated to work on ideas are crucial when it comes to promoting creativity.[190] Good ideas do not follow the budget year[191], neither are they scheduled. When the employees have every minute booked and specified they are enforced to follow planned routines and have no time to work on new ideas, unless "idea-time" are scheduled repeatedly.[192] 3M provide their employees with 15 percent "free-time" when the employees are expected to work on their own ideas. Google goes one step further and allow 20 percent. The companies claim that their survival is depending on the free time the employees are given.[193] Although, too much of free time is not good either and studies have shown that some time pressure promotes creativity. The balance between too little and too much time is explained by separate excessive workload pressure from challenge. The first have a negative impact on creativity, whilst the second one has a positive influence.[194]

5.3.3 Availability of information technology

Access to information allows employees to gain relevant knowledge that is needed to generate creativity.[195] Without adequate knowledge the employees will not have the possibility to move further with ideas.[196] Information technology tools can be used as a way of storing and sharing ideas and knowledge.[197]

5.3.4 Availability of creative people

Creative people are an important asset in an organization that aims to generate innovations.[198] Creativity is not promoted when individuals are free from process and structure to do "whatever they like". Instead, creativity is spurred by the right structures and processes.[199] It is also untrue that creativity is a character that one is either born with or not.[200] Instead, the creative potential of the employee is contextual.[201] Individual creativity is depending on three factors; expertise, creative thinking skills and motivation. All of these three can be developed and influenced.[202] When encouraging creativity the employee needs to be motivated and challenged, and he or she needs to possess knowledge within the field of expertise.[203] Also, the culture

[189] Shattow, p. 46
[190] Ekvall (1996), p. 108, Amabile (1998), p. 81 and Shattow, p. 46
[191] Davila et al., p. 95
[192] Ekvall (1996), p. 108
[193] Davila et al., p. 237
[194] Amabile et al. (1996), p. 1154
[195] Khalil, p. 33
[196] West et al., p. 278
[197] Khalil, p. 33 and Shattow, p. 48
[198] Dobni, p. 551, Siegel et al., p. 554
[199] Davila et al., p. 63
[200] Woodman et al. p. 302
[201] Woodman et al., p. 302, Amabile et al. (1996), p. 1154
[202] Amabile (1998), p. 88
[203] Woodman et al., p. 302 and Amabile (1998), p. 77

of the organization needs to provide a tolerance for making mistakes and support for risk taking as well as changes.[204] The employees must feel that they are allowed to make mistake, as long as the mistakes leads to new knowhow and learning.[205]

Even though creative individuals are an essential asset when generating innovations, just bring such individuals together are not sufficient in order to constrain creative organizations. The organization must also provide the accurate circumstances, e.g. structure regarding how knowledge is exchanged between the individuals.[206] They must be provided with resources, especially time, to develop the ideas.[207] There is also a need for diversity of the individuals in the group, meaning that individuals with different expertise will when working together increase their combined level of creativity.[208] Also the social structure and how the individuals interact on both formal and informal basis will influence the level of creativity.[209]

5.4 Behavior that encourage innovation

The culture of the organization will shape the behavior that may, or may not, promote creativity and innovation.

5.4.1 Mistake handling

Allowing mistake and failure is an important element for an innovative organization.[210] As stated above, creativity and innovation is connected to taking risks and sometimes the work fails. If making mistakes are not allowed and the employees have bad experience from failing, such as negative responses from management, they will lose their motivation for acting creative.[211] Unless the employees are encouraged to take risks and perhaps fail, they will never succeed.[212]

5.4.2 Idea generation

Companies and their divisions that consists of employees that possess both knowledge and expertise rarely have a lack of ideas[213], the problem is instead how the organization chooses to handle and act with the ideas.[214] Good ideas may come both from inside as well as outside of the company. The so called “not invented here”-syndrome, referring to the behavior of dismissing every idea that comes outside of the organization/division, are dangerous.[215] It is not easy to construct a system for handling ideas, but when managed ideas flow from outside the organization, between divisions and departments, within departments and are both focused on improving the

[204] Davila et al., p. 113, Woodman et al., p. 313 and Amabile et al. (1996), p. 1158
[205] Shattow, p. 46
[206] Woodman et al., p. 303
[207] Shattow, p. 46
[208] Woodman et al., p. 304, Amabile (1998), p. 81 and Shattow, p. 46
[209] Woodman et al., p. 304
[210] Tushman et al. (2002), p. 115, Forcadell et al., p. 169, Cormican., K. & O’Sullivan, p. 826, Amabile, p. 83 and Morden, p. 13
[211] Amabile, p. 83
[212] Tushman et al. (2002), p. 115 and Morden, p. 13
[213] Ekvall (1990), p. 12 and Davila et al., p. 128
[214] Ekvall (1990), p. 12
[215] Välikangas et al., p. 60 and Abetti, p. 213

current products as well as future development projects.[216] A study made by McKinsey & Co in 1980 of 37 innovative companies found that all of them possessed channels for dealing with ideas.[217] The companies were also open to external ideas and encouraged individual incentives.

Example of a system for handling ideas is the one used at 3M, a company known for being innovative.[218] They allocate 15 percent of the R&D budget to funds from which the employees can apply for recourses to work on new ideas.[219] The funds are managed by the different departments and are constructed so that the ideas can pass through three different stages. At stage one the criteria for being granted funding is that the idea is new to 3M, the possible funding is limited at this stage. At stage two a few criteria are added and the possible funding is a larger amount than in stage one. At stage three there are no limitation regarding possible funding and this is also the stage where the management decides whether the idea should be incorporated into the daily operational work or not.[220]

To be able to handle new ideas effectively it is important to have buffer resources, both time and financial funding, for when good ideas rises. Extra resources that can be used when needed decreases the time for development and increases motivation.[221] Moreover, it is dangerous to kill ideas to early since it will both decrease motivation, the possibility for spin-off effect as well as the possibility for learning[222]

Since innovation is about conducting changes, a culture that encourages continuous learning, among individuals as well as organizational learning, is crucial.[223] The education provided to the employees should be aligned with the innovation objectives.[224] Also should the organization be aware of the fact that organizational learning is just as important, especially when it comes to know-what, i.e. the ability to transform the knowhow of the employees into operation.[225]

5.4.3 Continuous learning culture

There are two types of learning; "learning to act" and "learning to learn"[226], also known as single-loop and double-loop learning. Learning to act is about taking the current strategic objectives and the existing business model for granted. It is about generating incremental innovations. "Learning to learn" on the other hand is about questioning the current strategic objectives and the existing models. For example, the engineers are not "just" trying to improve what is already done, but instead they question why it has been done in a certain way before and whether this should be changed. This kind of behavior increases the chances for developing new technologies, and therefore the ability to generate radical innovations. By questioning

[216] Sjölander, p. 26
[217] Ibid., p. 27
[218] Ibid.
[219] Ibid., p. 30
[220] Ibid., p. 27
[221] Sjölander, p. 35, Judge et al., p. 81 and Kalling (2007), p. 81
[222] Sjölander, p. 35
[223] Davila et al., p. 211 and Shipton, Fay, West, Pattersson & Birdi, p. 120
[224] Dobni, 551
[225] Brown & Duguid, p. 93
[226] Davila et al., p. 213

how processes are conducted there will be more openness for new ideas as well as taking risks,[227] hence more radical innovations will be generated.

5.4.4 Risk taking

In an organization that intends to promote innovations, the management as well as the employees must have the willingness to take risks.[228] Management often uses formal control system in order to handle risks. Although, too much of formal control will have a negative impact on creativity and innovation.[229] Both in the sense that formal control per definition often is about reducing risks[230], as well as the fact that formal control system reduces the level of the empowerment and autonomy of the employees, which have a negative impact in creativity and innovation.[231] Therefore, management must allow freedom and autonomy and also taking risks of their own, as well as encourage the employees to take risks.

One way of dealing with risk taking is to not only focus on expected pay-back, return on investment or net present value regarding new innovation projects. But instead look at possibilities like future growth, a stronger market position or beating competitors.[232] Due to the fact that their often high level of uncertainty involved regarding new ideas and in the early phase of the innovation project, it is seldom a good idea to rely in return on investment or net present value for evaluation. Instead other approaches need to be taken. Evaluation of ideas may be seen as weather forecasting. The best way to evaluate the weather an hour from now is to simply step out and look, the best way for a day ahead is to use computer systems and the best way to forecast ten years ahead is to look at the climate of the whole world. The point is that financial results may be able to predict and analyze late on in the innovation project, when the level of uncertainty have decreased. The evaluation in the early phases should be based on strategic possibilities, i.e. those strategic innovations goals that are stated in the innovation strategy.[233]

Support for risk taking is also about encouraging and recognizing those employees which take initiatives, the focus should be on the effort the employee puts in, instead of the eventual failure.[234] The reason why innovation is closely connected to risk taking is often due to a limited access to information.[235] Therefore, communication is essential in order to handle the uncertainty that often is associated with innovations.[236] As the level of information increases, the level of uncertainty will decrease and the development of the innovation progresses.

[227] Davila et al., p. 214
[228] Tushman et al. (2002), p. 113, Sjölander, p. 127, Johannessen et al., p. 126 and Kalling (2007), p. 81
[229] Judge et al., p. 78, Woodman et al., p. 312 and Ekvall (1990), p. 71
[230] Judge et al., p. 78
[231] Tushman et al. (2002), p. 107 and Amabile (1998), p. 81
[232] Tidd et al., p. 471
[233] Goffin & Mitchell, p. 10
[234] Tushman et al. (2002), p. 113 and Martins et al., p. 72
[235] Sjölander, p. 70
[236] Ibid., p. 69

5.4.5 Competiveness

Competitiveness is a source for motivation that may stimulate ideas and willingness to adopt of new knowledge, factors that are both needed in order to generate innovation.[237] Competiveness refers to a culture that encourage debating of ideas and constructive conflicts, which in turn leads to knowledge and information transfer.[238]

5.4.6 Support for change

As discussed previously, generating innovations is about handling changes; product changes, process changes, business model changes, organizational changes etcetera. Therefore the culture must possess a support for change. Both employees and management must know how "learning to learn", i.e. look for new and improved ways for working, and hold a positive attitude toward changes.[239]

The need for feeling safe and having a sense of stability in one's life is the nature of the human.[240] Given that, changes may be met with resistance. However, it might not have to be like that. Instead the culture must support changes.[241] The key is to know what to change and what not to, and act thereafter.[242]

Support for changes is about questioning how things are done and being able to change how the *core ideology* of the company is fulfilled. The core ideology tells why the company exists and what it stands for. This will always be the same and never change. The core ideology represents the identity of the company and consists of the *core values* and the *core purpose*. The core values are intrinsic and are of importance for the people inside the organization. An example of a core value is the one of Walt Disney that includes; creativity, dreams and imagination, no cynicism and preservation and control of the Disney Magic.[243] The core values contribute to a sense of stability as the organization grows, expands, decentralizes etcetera. The core purpose tells why the organization exists. This is not the same as business strategies. It is, just as the core values, intrinsic and should inspire to change, but not change itself. The core purpose of Walt Disney is "To make people happy".[244] One would think that the core purpose of any company is "to maximize shareholder wealth". However, unless the owners are willing to sell the company for a fair price to a buyer that buys only to be able to completely close down the organization, the core purpose is not to maximize shareholder wealth, which instead is a part of the business strategy.[245]

The *envisioned future* of the company, on the other hand, is the one that changes during time.[246] It has the purpose of fulfilling the core ideology and, oppose to the core ideology it looks only on the nearest future, i.e. the nearest three to five years. It is often quantitative, such as increasing sales by a certain percent.

[237] Martins et al., p. 72 and Anderson & King, p. 21
[238] Martins et al., p. 72
[239] Ibid.
[240] Sopow, p. 15
[241] Davila et al., p. 23, Collins & Porras, p. 206 and Tushman et al. (2002), p. 114
[242] Collins et al., p. 206
[243] Ibid., p. 207
[244] Ibid., p. 209
[245] Ibid., p. 211
[246] Ibid., p. 213

The core ideology for could for example be; "To produce world leading turbines through innovative solutions" or "To be a player on the world market of turbines to count on". The envisioned future could for example be the roadmaps a company uses. These are the plans for the nearest future, which often not stretches more than over the coming three years. As the world and the market conditions changes, the roadmaps might also need to be in need for changes, for example from a focus of "producing medium sized turbines running on gas" to "producing turbines running on solar energy".

The behavior of questioning the current way of working is what support for changes is all about. This applies on not only larger strategic questions, e.g. witch fuel the turbines should run on, but also smaller questions like how to increase the efficiency on the existing turbines, i.e. how incremental innovation are produced.

5.4.7 Conflict handling

The ability to generate innovations requires team work and a diverse expertise, this means a risk for conflicts. Although, as long as the culture allows different opinions, constructive conflicts and debates the ability to generate innovations are improved.[247] The difference between destructive and constructive conflicts is whether the employees like each other or not. Conflicting ideas that lead to debates are, when they are dealt with by people that like and respect each other, constructive. On the other hand, when people dislike each other negative tension is created.[248] Intel Corporation has a policy of telling the employees to accept conflicts; they are also trained to deal with them in a constructive way.[249]

5.5 Communication

Communication takes place between employees, both vertical as well as horizontal within the organization, between departments and between the organization and external parts. Since innovation is closely connected to taking risks, often due to limited access to information,[250] these three levels of communication need to work in order to stimulate creativity and innovation.

Communication between individuals is for exchanging ideas, knowledge and information, but also to handle the uncertainty that often are associated with innovations.[251] As the level of information increases, the level of uncertainty will decrease and the development of the innovation progresses. An American study of 600 innovations concluded that there are three factors that initiate new innovations. Firstly, access to *new* information, secondly, access to information that is public known and, thirdly, personal communication. The key information needed in the innovation project is often publicly known and communication is the most essential source for ideas that leads to innovations. Moreover, more than 50 percent of the innovations were triggered by information outside of the organization.[252] Generally,

[247] Ekvall (1990) , p. 25, West et al., p. 279 and Woodman et al., p. 306
[248] Ekvall (1996), p. 108
[249] O´Reilly, p. 14
[250] Sjölander, p. 70
[251] Ibid., p. 69
[252] Sjölander, p. 71

external information is more important in the early stage of the innovation process, whilst internal information is more important later on.[253]

The need for access to external information has increased during the last decades as the mobility of knowledge among workers has increased.[254] The rapid changes of the business environment of today have increased the need for knowledge and expertise. However, it is no longer possible to gather all necessary information and knowledge under the same roof. Instead the company has to find ways to access external knowledge and knowhow.[255]

Successful development projects are often a result of intensive communication both within the project, as well as the communication with other departments and parts of the organization, other levels of the organizational hierarchy and external parts outside of the organization.[256] The importance of communicating between departments especially concerns the department of R&D. Unless R&D is able to communicate sufficient with other departments, sufficient information will not reach product development and the whole organization will eventually suffer.[257] Moreover, successful R&D projects are often a result of intensive communication with the department for market analyses.[258]

5.6 Other determinants not mentioned by Martins and Terblanche

The four factors that according to other studies and academic theory[259] are considered important and are not mentioned by Martins and Terblanche is presented in this subchapter.

5.6.1 Budget

Budgets are a tool for managing, control and create structure. However, when it comes to promoting creativity there is a need for flexibility, as mentioned above. Ideas do not follow the calendar. Therefore, when a company use budget as a management system it is of importance to make sure that funding for innovation not are strictly tied to it.[260] Instead, funding should be available in regular intervals or, even better, when ideas arises.[261] A possible solution is to allocate a buffer of funding, an "idea budget" that are used when ideas arises. Ideas are not be able to follow schedules, but it is possible to plan for creativity by allocating a "resource budget", instead of just planning for pre-scheduled investments. By doing this, the budget will promote innovation, not prevent it.[262] 3M budget for innovations by allocating 15

[253] Sjölander, p. 72
[254] Chesbrough, p. 36
[255] Ibid., p. 38
[256] Sjölander, p. 74
[257] Kalling (2007), p. 81
[258] Sjölander, p. 74
[259] See Appendix I: Theoretical map of the cultural factors of the organization that influences innovation for a review over those studies and academic theory that discusses determinants not mentioned by Martins and Terblanche.
[260] Davila et al., p. 95
[261] Davila et al., p. 95 and Kalling (2007), p. 81
[262] Kalling (2007), p. 81

percent of the R&D budget to funds from which the employees can apply for recourses to work on new ideas.[263] Similar, Volvo Cars allocate 15 percent of their R&D budget to innovations that are undefined at the start of a product development project but expected to arise as the project proceeds.

Funding and creativity are correlated just like time and creativity, too much than necessary will not increase creativity, too little will definitely decrease it. A common mistake from management is to keep a tight budget and believe that it will result in an increased level of creativity. This is often a useless method of trying to increase creativity since it will only result in employees using their time, energy and creativity trying to gain more funding, instead of working on innovations.[264]

5.6.2 System for measuring innovation

One often says that "what gets measured gets down" and there are no doubt that many companies consider that one of the keys to achieve competitive advantage is the ability to generate innovations.[265] The ability to generate innovations is the engine of growth.[266] Yet, very few companies actually have a sufficient system for measuring innovation.[267] Hence the agreement that innovation is important but difficult to measure.[268] One of the explanations of why innovation is difficult to measure lies in the fact that the strategy for innovation rarely is clearly defined, or expressed in the overall business strategy.[269] In general, measurement systems not only provide management with information but also let the employees know what the company considers of importance. It might be difficult to measure innovations, although not impossible, and unless it is measured the employees will neither believe it to be of importance to the management.[270] As a result accurate measurement is one of the most important factors when generating innovations.[271] Counting the number of granted patent applications is one way of measuring, annual R&D budget as a percentage of annual sales are another common way of measuring. Although, this is not nearly sufficient, it does not cover the overall innovation capability of the company and leaves out many other important measurements.[272]

Accurate measurement is to make sure that the system matches the innovation goals[273], e.g. the innovation portfolio. There are four different views from which innovation may be measured, that may be seen as a scorecard for innovation.[274] The first, the resource view, measure the inputs and the outputs. Examples of

[263] Sjölander., p. 30
[264] Amabile (1998), p. 81
[265] Davila et al., p. 145, Frigo, p. 6 and Dobni, p. 540
[266] Muller et al., p. 38
[267] The Boston Consulting Group state that companies in general consider that it is important to measure but rarely have a system for it and does who actually have a system consider it poor and inaccurate. A survey conducted by Frigo in 2002 reviled that 60% of the questioned companies considered that innovation was of importance, but only 8% sad that they possessed a well-working system.
[268] Frigo, p. 7
[269] Ibid.
[270] Davila et al., p. 144
[271] Davila et al, p. 178 and Muller et al., p. 37
[272] Davila et al, p. 172-173 and Muller et al., p. 38
[273] Davila et al., p. 178
[274] Muller et al., 40

measurements are; time dedicated to innovation, budget percent allocated to innovation efforts.[275] The second view, the capability view, refers to the competence for innovation the company possesses. Examples of measurements are; number of innovations tool available to employees, percentage of employees that have received training in innovation.[276] The third view, the leadership view, refers to the degree which the management of the company support innovations. Examples of measurement are; percentage of time allocated to planning for innovation, percentage of management that have received training within management tools for innovation.[277] The fourth view, the process view, refers to the structure of the company. Examples of measurement are; the level of innovation integration across business units and functions, success of ideas passing through selection and execution process,[278] the ratio between arisen ideas and ideas submitted.

The system for measurement needs to be adjusted to the individual company and the four views all need to be taken into consideration, no single one will cover the whole pictures. If using just or two metrics the company may be lured into focusing too heavily on allocating more resources to innovation, for example, whilst the problem instead may lie in the fourth view, how the processes are conducted.[279]

5.6.3 Playfulness and positive role models

The meaning of possessing positive role models and a culture characterized by playfulness in order to promote innovations have only been found in one theoretical study for each factor.[280] Due to the fact that there is so little theory about these two factors, they are both combined in this subchapter.

According to Ekvall, a culture characterized by playfulness and humor and an easygoing atmosphere are more likely to encourage innovations. This is, says Ekvall, due to the fact that in a culture like this crazy ideas are allowed and creativity will be promoted.[281]

Cadwell and O`Reilly argues that, according to a study conducted in 1995, positive role models is important when promoting innovation within R&D divisions.[282]

[275] Davila et al., p. 172-173
[276] Muller et al. p. 39
[277] Ibid.
[278] Davila et al., p. 172-173.
[279] Muller et al., p. 41
[280] See Appendix I: Theoretical map of the cultural factors of the organization that influences innovation for the theoretical study.
[281] Ekvall (1990), p. 25
[282] Tushman et al. (2002), p. 112

6 Case study: SIT GT R&D

The exploratory case study in this thesis is made at SIT GT R&D in Finspång and the empiric results as well as corporate information are presented in this chapter. To make the case study comparable with the theory the outline from the framework by Martins and Terblanche are used. Like in chapter 0, other determinants that not are mentioned in the framework are presented in the end of this chapter. Empiric findings from the interviews with Alfa Laval and SCA are added to respectively determinant.

6.1 Organization

The R&D department is divided organizationally in different sectors and employs approximately 350 people, an overview of the organization is illustrated in Figure 5 below. The sector illustrated as *core components in gas turbines* includes parts related to the different core components that turbines consists; combustor, turbine and compressor. One sector answers for auxiliary system of the turbine and one that is responsible for measurement and testing. These sectors are operating vertically. The product development sector that includes all four products and the new platform operates cross-functional, horizontal, over the sectors. Also Future Technology, managing the technology development is operating horizontal. There is a sector that develops and supports the processes that are used in the organization. This makes the R&D department to a matrix organization. According to Kalling[283], this is the good way of organize a R&D department, especially when it comes to generate innovations. At SIT GT R&D there are four careers chooses in; manager, product manager, project manager or specialist. The product managers have the responsibility of their respective products and since SIT GT sell four different gas turbines there are four different product managers. The specialists are experts in their respective areas, e.g. specialist within life cycle analyzing. There are approximately 20 specialists employed. At SIT GT R&D managers and project owners have a weekly meeting to follow up the projects. With a follow up they can identify risks with projects, allocate resources and communicate milestones. The projects run cross-functional over the sectors.

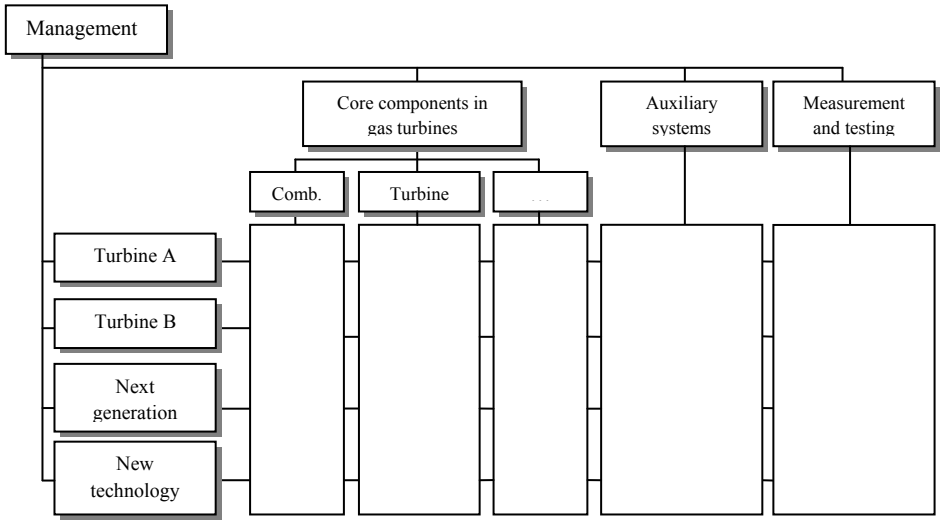

Figure 5 Illustration over the matrix organization at SIT GT R&D

[283] Kalling (2007)

The R&D manager in Finspång is also the R&D director of Lincoln, even though the sites belong to two different companies within the Siemens AG group. As mentioned before, middle size gas turbines in the range between 15 to 50 MW are manufactured in Finspång. Turbines up to 15 MW are however produced in Lincoln. The two sites also share financial resources for technology development. Future Technology is the sector at SIT GT R&D that is managing the technology development projects in the organization. Even though they engage employees from other sectors are they consisting of two full times and one part time employee. Except from managing the technology development projects, the sector has a responsibility for coordinating external contacts as well as the patent application process. They are also responsible of monitoring technologies that competing with existing ones, also to monitor the technology of the competitors. Monitoring other technologies or competitive companies is not something that is prioritized at Future Technology, due to limited resources.

6.2 Innovation

The technology of the gas turbines is the core competence of SIT GT and frankly, it is kind of strange that the Future Technology is such a small sector comparing to the other sectors within in the organization. What Future Technology performs, and is responsible for, is not something that every one of employees in the organization are aware of. From the survey, following comment was left:

> *"The biggest problem of GT R&D is that there is no department called Research with fixed budget and a fixed number of persons working with future solutions. Therefore there is NO innovation work possible which means, no innovation implemented in our newest products."*

The four types of gas turbines are; SGT-500, SGT-600, SGT-700 and SGT-800. The turbines from SIT have its core value in quality and sturdiness.

Table 1 below illustrates definitions of different types of innovations from the academic theory's point of view, exemplified with products and technology developed at SIT GT R&D.

Table 1 Different types of innovation at SIT GT R&D

Type of innovation	Incremental	Semi-radical	Radical
Theoretical definition	Product development	New products that are based on new technology	New technology
Technology and products developed by SIT GT R&D	Upgrades of existing turbines for improved performance	Going from SGT - 600 to SGT - 700	The PFBC[284] technique in the 1980's.

[284] Pressurised Fluidised Bed Combustion, a technology for combustion of carbon that reduced the emission of carbon dioxide.

6.3 Overview

To give an overview, Figure 6 on next page illustrates in which direction different factors that influence the organizational culture according to innovation and creativity are pointed at. By stating that they are missing does not mean that they are completely none existent. They are just not sufficient from an innovation perspective. Although, to fully understand how the work with innovation proceeds at SIT GT R&D, the text in the sub-chapters needs to be read since the figure is not fully representative alone. Figure 6 are based on the figure shown in Appendix II: Results of survey and interviews.

			Missing	Existing
Strategy				
	Vision and mission		←	
	Pureposefulness		←	
Structure				
	Flexibility	*Non-bureaucratic structure*	←	
	Freedom	Autonomy	←	
		Empowerment	←	
		Decision making (quick feedback)	←	
	Cooperative teams and group interaction			→
Support mechanisms				
	Reward and recognitions	*Recognitions*		→
		Increased autonomy	←	
	Avability of resources	Time	←	
		Information technology		→
		Creative people		→
Behavior that encourages innovation				
	Mistake handling (acceptance for mistakes)			→
	Idea generation	*Generate ideas*		→
		Idea handling	←	
	Continuous learning culture		←	
	Risk taking		←	
	Competitiveness (constructive conflicts)			→
	Support for change		←	
	Conflict handling (few conflicts)			→
Communication				
	Open communication	*Interpersonal*		→
		Horizontal	←	
		Vertical	←	
		External		
Budget				→
	Budget that support creativity and innovation		←	
System for measuring innovatoin				
	System for measuring innovation		←	

Figure 6 Overview of results from the survey and interviews. Outline from the framework by Martins and Terblanche, cursive factors are added.

6.4 Strategy

As mentioned in chapter three, the word innovation is widely used by organizations. On Siemens AG's homepage the word is stated as one of the core values and at Siemens' Swedish homepage an innovation strategy is presented saying that Siemens are going to be "trendsetters", like IBM and Microsoft. The trendsetters' strategy argues that the companies have total control over the current situation and carefully avoids any kind of future traps. Yet, the homepage of SIT does not mention the word innovation at all. The top management, the R&D manager and the managers one step down in the hieratic structure, says that the overall strategy involves innovation in some way but no specific strategy for innovation exists. The top management also argues that SIT GT R&D needs to innovate, not only incremental or semi-radical innovations, but also radical innovations to survive in the future. The current strategy at SIT GT R&D is to be characterizes as a play-not-to-loose strategy, meaning that their main focus is on producing incremental innovations, i.e. improving their existing turbines, as well as semi-radical innovations, i.e. the next product generation.

The strategy for the R&D department, from top management point of view, is set on a global level and, from that, a more detailed strategy for the different products markets has been developed. This strategy is the foundation for the product strategy of each product. The long term strategy for the different products is still in the planning phase. Roadmaps for the technology development have recently been formed and guidelines for a *phantom* turbine are going to be shaped in the near future. This is are fictive turbine that not yet is on the drawing board but are expected to be developed in the next 15 to 20 years from now. The strategy for using the concept with the phantom turbine is not fully completed and therefore neither fully communicated. The top management has to deal with the trade-off of what should be communicated and what not. Knowhow is the core asset for an R&D organization and it is always a risk that something leaks outside of the organization and gets in the hands of the competitors.

From the employees' point of view, an innovation strategy is missing and particularly a long time strategy for the upcoming ten years. Even a longer time line for the innovation strategy, e.g. a roadmap for 20 or 25 years, is requested. Everyone knows that it is important to generate innovation but they cannot see the impact in the daily work. The vision and mission for innovation are not clarified which lead to an uncommitted strategy.

Recently there has been a workshop, Blue Sky, which aimed to identify the future directions for the strategy in a long time perspective. The current use of the workshop is vague, managers and employees does mention the session as some kind of long term strategy but they can not specify the outcome from it.

There is a common opinion that SIT GT R&D does not work sufficient with technology development to support innovation. In two of the interviews the respondents equalize the long time strategy with the goals for the technology development. Before the technology development was called "base development" and to avoid that their projects should be run like a "playground" a *phantom* turbine was developed. Goals for the phantom turbine were set on a roadmap and goals 15 years in the future were formed for this turbine. The project with the phantom turbine did not end up well but there are plans to renew the concept with phantom turbine again, as mentioned above.

According to Järrehult[285], companies in a mature industry in general only have an innovation strategy for the upcoming two till three years and a maximum of up to five years in rare cases. If a company has a longer time frame for their innovation strategy, they have a competitive advantage. Järrehult also pointed out that if you have a good culture, you also have a good strategy. Like he said: *"Culture eats strategy for breakfast, every day"*. Alfa Laval, for example, does not have any clearly defined innovation strategy.[286]

There is no common understanding of the word innovation at SIT GT R&D. This was stated by the survey as well as in the interviews, none of the respondents explained had the same explanation of the word. The majority of the employees believe that innovation is one of the core values within the organization.

In order to stimulate innovation, a clearly defined goal is most important factor for the employees at SIT GT R&D. 25 percent of the employees in the survey believe that defined goals are the most important factor to support innovation.[287] The opinion is that the daily work has no clear connection with any clearly defined goals

To summarize, the business strategy at SIT GT R&D includes those components that a strategy for innovation is about. Although, this is not clarified nor communicated to the employees and as a result the employees are not committed to the strategy.

6.5 Structure

That structure should hinder creativity is a myth, as mentioned in the theory. There is a need for a balance between structure, or value creation and creativity to generate ideas. The balance depends on the flexibility in the organization, the freedom to achieve decided goals and the decision making process as well as team work.

6.5.1 Flexibility

At SIT GT R&D the budget is the main control system, which is set on an annually. The budget has a short term focus, which varies from year to year. The budget is not only controlled by top management, every year the different sectors have the possibility to request funding for specific projects by a "wish list". According to more than 30 percent of the survey respondents, the bureaucratic structure is hindering the support for innovation. Although, when needed, funding may be relocated between projects in order to support higher prioritized ones.

In conclusion, the control system at SIT GT R&D is preventing the culture from supporting creativity and innovation within the organization. This is the general opinion by the employees, whilst the managers found it easier to change the budget if so needed.

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[285] Professor in Innovative Packaging Logistics at Faculty of Engineering, Lund University, with a long term experience of working with innovation and knowledge management within companies acting in mature industries.

[286] Bertilsson

[287] The employees graded three factors that they found most important to support innovation. The alternatives were: a. The allocation of financial resources, b. The allocation of time, b. The encouragement of risk taking, c. Clearly defined goals (management by objectives), d. A structured and well working process of gathering and evaluating of ideas, e. A well working patent application rewarding system, f. Encouragement from management

6.5.2 Autonomy

The level of autonomy is to which extent the employees can influence their own agenda, i.e. how much control they have over their own time. At SIT GT R&D the specialists have 20 percent of their time dedicated for something that advances their competence within the specialist area. This could be of great value in order to generate innovation in an organization, but the truth is that only 30 percent of the specialists are using their dedicated 20 percent. 20 percent of the specialists answered that they never use their specialist time. There definitely exits an opportunity to act autonomic at SIT GT R&D but there are no time for doing that.

The employees are asking for more autonomy since they believe that autonomy together with goal-direction will support innovation. Therefore, the autonomy at SIT GT R&D could be improved.

6.5.3 Empowerment

Empowerment is the permission and/or power to do something. Clear defined goals combined with empowered employees support innovation. Autonomy and empowerment are seen as important factors to generate innovation in the theory, which explains the level of freedom in the organization. The level of motivation, and thus creativity, increases when the employees are provided with goals, and then given the freedom to decide how to achieve them. 50 percent of the employees mention that they are trusted to judge when they want to be innovative. Although, the employees are asking for a more goal directed way of working, saying that they want a larger level of freedom to choose by them self *how* to reach the goals. Further, the fact that the employees are asking for clearer defined goals indicates that they are asking for more empowerment.

6.5.4 Decision making

Quick feedback from managers is important in an innovative organization and when the employees were asked if new ideas get a quick go/no-go there a room for improvement. At SIT GT R&D decisions are not correlated with quick go/no-go. At Alfa Laval the employees sometimes avoided asking managers and continued to work, this not to force the managers to make a decision because then the answer probably should be a no-go.

6.5.5 Cooperative teams and group interaction

Today many companies have noticed the benefits of working in cross-functional teams[288], this is also the case at SIT GT R&D, SCA and Alfa Laval. At SCA they have experienced that sometimes it is difficult to integrate demands from the market in different projects. When teams are composed at Alfa Laval, they give personal skills huge attention to generate the optimal team.

Between the different sectors within R&D, the team interaction is good and works out well. The employees are very pleasant of how different competences and expertise are involved when groups are created. SIT GT R&D has a good way of working with team interaction, which is good when it comes to promoting innovations.

[288] Järrehult

6.6 Support mechanisms

Support mechanisms for innovation, i.e. availability of resources and reward and recognition, are, according to the theory, important possessions.

6.6.1 Reward and recognition

Rewards and recognition is about getting the employees motivated to act in a more innovative way. The employees feel that they, when they are trying to be innovative, are recognized and encouraged. Intrinsic reward is also about being rewarded with increased autonomy and promotion. If you are acting innovatively at SIT GT R&D, you are not given increased autonomy or promotion, you only get recognized.

6.6.2 Availability of time

Time is, according to the responses from the interviews, a limited resource. The employees do not have time to do something outside their prioritized work and, according to the employees, innovation project are not prioritized. It is not easy to get time to develop new ideas, but it is not impossible. One employee mention:

> *"There are rarely any possibilities to continue on those more long term innovative idea that does not fit in to the current product development projects (but might do in the coming five to ten years). In order to continue on those innovative ideas, one has to act "pirate" and "hijack" time and money that were meant for other use. It is both more preferable as well as easier than the alternative, to risk causing a disagreement with the project leader/manager."*

As mentioned above, the specialists have time dedicated for themselves but the majority is not using it. Only 30 percent of the specialists state that they use their dedicated 20 percent. 20 percent of the specialists answered that they never use their specialist time.

Since SIT GT R&D are missing a sufficient system for handling and dealing with ideas, there are neither any time to allocate for those ideas that occurs within existing projects, but not specifically belongs to the project in question.

6.6.3 Availability of information technology

The employees are well familiar with information-technology tools to share and store information. No internet based forum to discuss or exchange ideas exists, but the employees do not believe that this will stimulate the number of innovations. They prefer meeting with co-workers face to face.

6.6.4 Availability of creative people

As mentioned in the introduction, the employees at SIT GT R&D are highly educated. They are also creative in their work, 60 percent of the employees consider themselves to be individuals with many ideas. According to the theory, this is an important resource in the innovative organization. SIT GT R&D has succeeded to hire the right, highly skilled employees. 80 percent are satisfied or very satisfied with their work

and almost 20 percent are partly satisfied[289], which improve the possibility to be innovative. In conclusion, the availability of creative people at SIT GT R&D is very good.

6.7 Behavior that encourage innovation

Behaviors that encourage innovation are represented by different factors. The idea generation, stated by Martins and Terblanche, is divided into idea generation and idea handling.

6.7.1 Mistake handling

Allowing mistakes are important for innovative organization. At SIT GT R&D there exists a huge acceptance for mistakes. The employees feel that there is an acceptance for making mistakes and not just from managers' point of view. Lack of acceptance for mistakes negates innovation. For German companies in general, the acceptance for mistakes is poor. Tasks should be solved right the first time and there is not room for mistakes or a second chance. The conclusion is that there is an acceptance for mistakes is valuable in order to improve innovation[290].

6.7.2 Idea generation

The presence of creative employees increases the number of generated ideas and, further, the right conditions for bringing up ideas also exist. The idea generation is working out well, the problem is to handle and take care of the ideas in a structured way.

Ideas are handled informal at SIT GT R&D. To get further with an idea it is important to "sell" the idea to co-workers and managers. A positive with this informal way of handling ideas is that the ideas are discussed with co-workers and thus exchanged. This informal system replaces the missing formal system and therefore there are no guarantees that the good ideas will ever be used. As a result, innovations may be lost.

However, there exist a virtual "suggestion box". A couple of years from now the suggestion box was implemented, following an initiative from Siemens AG. The system aims to stimulate employees to nominate improvements and is known under the name 3i, standing for *idea, innovation and initiative.* When asking the 3i team there was only 24 suggestions from GT R&D during 2007/2008[291]. The common opinion at R&D is that the system has defects and is not working out well.

In conclusion, idea generation exists but a system for handling and taking care of the ideas are missing.

6.7.3 Continuous learning culture

The employees at SIT GT R&D feel that they have a responsibility to develop new skills, capabilities and knowledge toward supporting innovation. "Learning to learn" is mentioned in the theory as a way of questioning the current strategic objectives and the existing models in order to improve new ideas and hopefully generate radical

[289] Gustafsson
[290] Järrehult
[291] Söderberg

innovations. At SIT GT R&D things are done in the way they always been done, nearly no one is questioning it. But you get recognized if you acting in a new way and not just do things like they always have been done. However, the employees were questioning some of the statements in the survey and they took the chance to leave free comments in the survey. This indicates that the employees do not accept everything and speak out their thoughts.

When fault is reported to the R&D department the problem are often solved in a very innovative way. The employees have short time to solve a specific problem, and this is done in a structured and an innovative way. But they are not applying this way of working and handle problems in order to develop new products and technologies. There are differences in solving problem that are specified and solve problems connected with future goals.

To summarize, the organizational culture is more characterized by learning "learning to act" than "learning to learn" and are object for improvement.

6.7.4 Risk taking

When talking about risks at SIT GT R&D the employees mention financial risk as well as individual and risk connected to the quality of the products. There is no encouragement for taking risks. The product development process has improved the quality of the products but it is possible that the process could be hindering innovation. When looking at new products and new solutions, return on investment has a huge influence on decisions and investments. The risks associated with innovation are correlated with a lack of information as well as the difficulties of calculating return on investment, due to the fact that the results are often difficult to foreseen.

6.7.5 Competiveness

Competiveness refers to a culture that encourage debating of ideas and constructive conflicts, which in turn leads to knowledge and information transfer.

Few conflicts exists at SIT GT R&D, and those that exists are of a constructive nature. The employees are willing to collaborate, which are seen as a healthy attitude. Further, ideas are often exchanged between the employees, at least on an informal basis in the daily work, and informal meetings and discussions are encouraged.

6.7.6 Support for change

Support for changes is about questioning how things are done and being able to change how the vision for innovation is fulfilled, this goes for both larger strategic decisions as well as dealing with problems on a more day to day basis. In order to support change the management and the employees need to look at new solutions. Management at SIT GT R&D is, according to the employees, not known for seeking new opportunities and new solutions. The management is not characterized by taking brave decisions. It is of importance that the management proceeds with a good example to motivate the employees.

6.8 Communication

Open and honest, that is the nature of the communication. The culture encourages the employees to exchange ideas and have spontaneous daily talk. Informal meeting exist and there is a lot of essential information that is shared in the communication between colleagues. The interpersonal communication works well, it is natural for the employees to have daily discussions and communicate different ideas, problems and thoughts.

From interviews, the horizontal communication between the business development, at SIT GT, and R&D was identified as a weak link. The R&D department is not getting sufficient of information about the customers' demands, which are delivered from the Business Development department. On the other hand, the Business Development is not pleased with directives from R&D. Business Development is asking for clearer directions regarding which technological areas they are to monitor. Employees from other departments than R&D need to be involved in ongoing projects to a larger extent, which is something that is asked for at both R&D as well as Business Development.

During the interviews there were no question directed to the co-operation with the business development, the respondents mentioned spontaneously that the communication was unsatisfying. There was huge attention focused on the fact that customer drives the innovation at SIT GT R&D. With that in mind, customers' demands and requirements are of importance.

The horizontal communication includes the co-operation with Lincoln. Decisions, regarding to the technology development are going to be made in an interaction between Finspång and Lincoln. The collaboration between Finspång and Lincoln are not working sufficient.

SIT GT R&D is investing in different research programs involving universities and scientist for example. Today there are involved in four research programs and one project looking at renewable energy. In addition, they are involved in a couple of smaller programs and projects. One employee at SIT GT R&D is almost working fulltime with coordinating external contacts, placed in the Future Technology sector. The personnel at Alfa Laval believe that external communication is important in the future. In view of the rapid information flow that takes place in this environment, it is important to take in information externally.

The interpersonal communication between employees is working sufficient, so to the horizontal communication between the sectors within SIT GT R&D. However the communication, horizontal between the departments outside R&D, is not running out well. Unsatisfying are also the communications with Lincoln that are seen as horizontal communication. The vertical communication is somehow weak to, especially when it comes to convey the strategy for innovation.

6.9 Other determinants not mentioned by Martins and Terblanche

The four factors that according to other studies and academic theory[292] are considered of importance and that are not mentioned by Martins and Terblanche is presented in this subchapter.

6.9.1 Budget

As mentioned before, the budget has a short term focus, which varies from year to year. The employees consider that the budget does not support any long term focus or objectives. If there is a priority at one project one year, the following year the priority might be on something else. Financial resources dedicated on technology are, according to the employees, also the budget which is dedicated to "think of new things".

6.9.2 System for measuring innovation

At SIT GT R&D no system for measuring innovation exists but there is a willingness to introduce some kind of system to measure innovation. Generally the employees believe that innovation is measured by the number of patents. Filing for patent protection is just about making sure that competitors are not able to use the invention in question. This is not a sufficient way of measuring innovations.

6.9.3 Playfulness and Positive role models

The meaning of possessing positive role models and a culture characterized by playfulness in order to promote innovations have only been found in one theoretical study for each factor.[293] Due to the fact that there are few studies made on these factors, they have only been tested at SIT GT R&D to a minor extent.

According to Ekvall, a culture characterized by playfulness and humor and an easygoing atmosphere is more likely to encourage innovations. The employees at SIT GT R&D are satisfied with their work. This indicates that they enjoy their work.

Cadwell and O`Reilly argues that positive role models are important when promoting innovation within R&D divisions. At SIT GT R&D there is the possibility to make a career as a specialist within an area of expertise, for example life cycle analyzes, there are approximately 20 specialists employed. This may indicate that positive role models exist at SIT GT R&D.

[292] See Appendix I: Theoretical map of the cultural factors of the organization that influences innovation for a review over those studies and academic theory that discusses determinants not mentioned by Martins and Terblanche.
[293] See Appendix I: Theoretical map of the cultural factors of the organization that influences innovation for the theoretical study.

7 Empiric findings matched with theory

The empiric findings have been matched with theory due to three reasons. Firstly, to find out if there is a risk that SIT GT R&D is on the way of ending up in a performance trap. Secondly, to examine whether the framework by Martins and Terblanche, presented in Figure 4 on page 22, are sufficient in order to describe those cultural determinants that influence creativity at SIT GT R&D and comparable companies. Third and finally, if the framework is found insufficient, adjust and customize it for SIT GT R&D and comparable companies.

7.1 Possible a performance trap

The performance trap refers to companies that are performing well and experience sufficient growth, but forgets to strive for innovations, especially the semi-radical and radical innovations. SIT GT R&D is mainly focusing on the next three to five years, which is common for companies acting in mature industries. Furthermore, they are allocating most of the time and the financial resources to the current products as well as the next product generation, which undeniably are currently successful products on the market. This behavior is indeed common for companies that have experienced a successful past, like SIT GT R&D, which leads to a lost in focus of the semi-radical and radical innovations. The reason why they may end up in a performance trap is because they are too busy focusing on the present and thereby partly looses the attention for innovations. They are in need of improvements regarding certain cultural determinants, which are elaborated on in the following subchapter.

7.2 Extended theoretical framework

When matching the empiric findings with the theory it is shown that the framework by Martins and Terblanche presented in chapter 5 on page 22, are insufficient in order to describe those cultural determinants that influence creativity at SIT GT R&D and comparable companies. Six cultural factors are, due to the empiric findings presented in chapter 6, as well as other studies and other theory beside Martins and Terblanche[294], already fulfilled by SIT GT R&D. Those six that are fulfilled, because they already exist at SIT GT R&D and therefore not in need of any further improvement, have been crossed over in the extended theoretical framework, based on the framework by Martins and Terblanche, that is presented in Figure 7 on the following pages.

The fact that these six factors have been crossed over does not mean that they are unimportant when it comes to promote innovations. Further, it does certainly not mean that SIT GT R&D could get rid of them and do fine without them. They have most likely a lot to do with the successful history of SIT GT R&D. They all contribute, but they are not relevant when it comes to list the determinant of organizational culture at SIT GT R&D that influence creativity and innovation. They are just as relevant as saying that "educated engineers", "access to office building", "access to computers" and "funding for payrolls" are needed in order to generate innovations, i.e. to SIT GT R&D they are considered too be basic needs in order to

[294] "Other studies and theory" refers to those that is listed in "Appendix I: Theoretical map of the cultural factors of the organization that influences innovation" and elaborated on in chapter 5.6.

operate. Therefore, they do not contribute to an understanding regarding those cultural determinates that influence creativity and innovation.

Further, two determinants have been added to the framework by Martins and Terblanche, "Budget" and "System for measurement", which are highlighted with a crosshatched lined box in Figure 7 on the following page. They have been added due to the fact that the empiric findings as well as other studies and other theory beside Martins and Terblanche[295] indicate that they are of importance.

Those determinants that the extended framework, in Figure 7, consists of are in no way prioritized or weighted in between. The extended framework simply states that the remaining determinants, that have not been crossed over, in combination with the two added on describe those cultural determinants that influence creativity at SIT GT R&D and comparable companies.

[295] "Other studies and theory" refers to those that is listed in "Appendix I: Theoretical map of the cultural factors of the organization that influences innovation" and elaborated on in chapter 5.6.

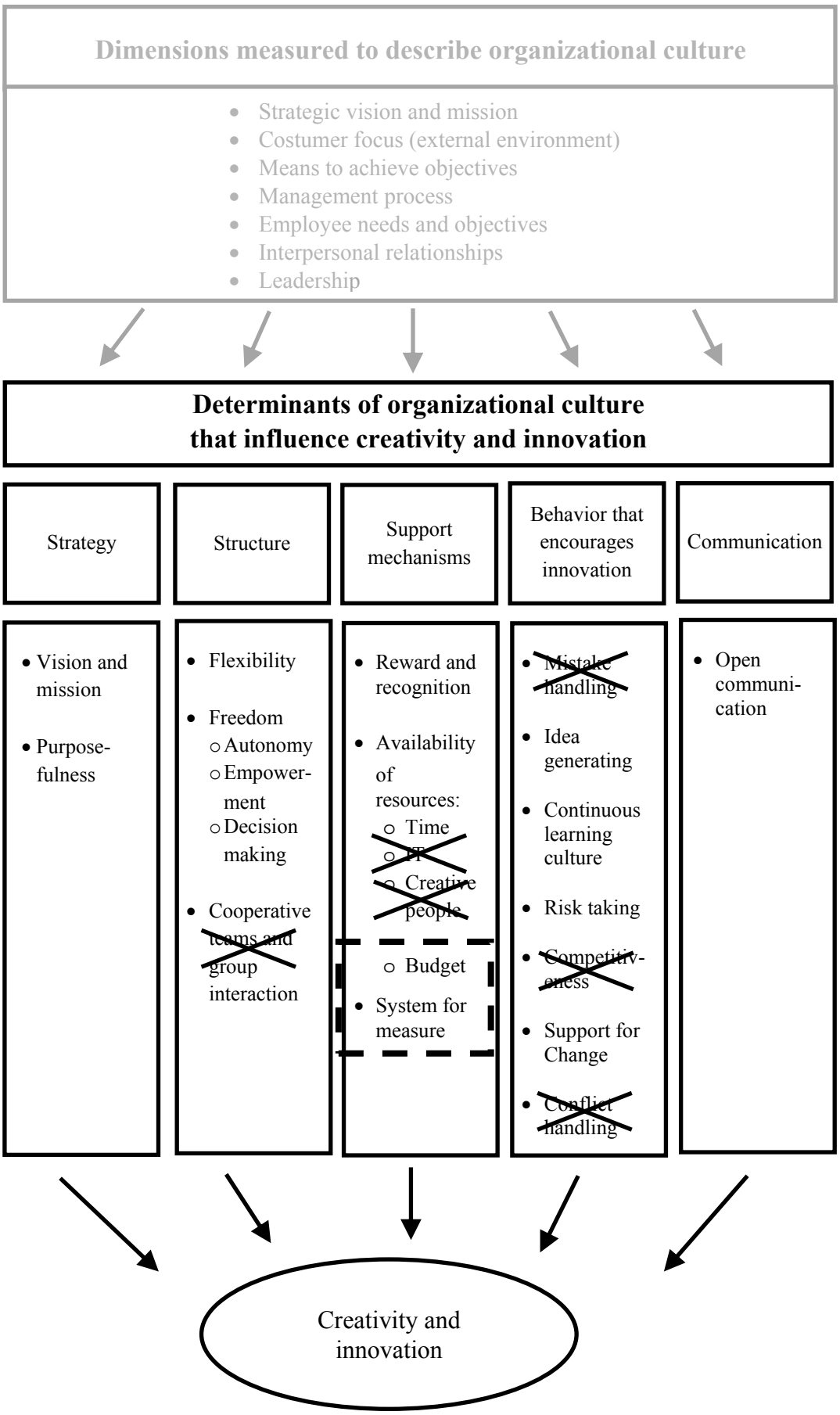

Figure 7 "Influence of organizational culture on creativity and innovation" by Martins and Terblanche, adjusted as a consequence of the result from the empiric findings

Following determinants have been crossed over because they already exist at SIT GT R&D and therefore not in need of any further improvement.

- "Coorporative teams and group interaction" listed under "structure" refers to the importance of teams characterized by cross-functionality and complementing knowledge when promoting innovations. There need to be a trust between the team members,[296] the team needs to share the same goals and expectations and also be able to communicate efficiently.[297] The empiric findings have shown that this is fulfilled within SIT GT R&D. Note that only the team interaction within SIT GT R&D has been taken into account here, not the cross-functionality between R&D and other department since that are handled under "communication".
- "Information technology", listed under "Support mechanisms". None of the conducted studies have pinpointed this specific determinant, neither have any theory, that been studied, claimed this to be of importance. Martin and Terblanche argue that access to information is necessary when dealing with innovations. However, the employees at SIT GT R&D are familiar with using IT and further, they believe that virtual places for exchanging ideas would not contribute to the work with innovations.
- "Creative people", listed under "Support mechanisms", are also by other studies and other theory considered important. People are acting creative when following circumstances are provided; allowance for mistake, working in team, encouragement to discuss problems and exchange ideas with co-workers and, furthermore, when they possess expertise and are motivated in their tasks. The empiric findings have shown that the employees are highly educated and possess a lot of expertise, they are motivated and often communicate well, they work in team and are allowed making mistakes. Therefore, the individuals employed at SIT GT R&D are to be classified as creative people. Further, SIT GT R&D is not unique in having creative people employed since that is common for many Swedish companies.[298] The problem are not a need for creative people, it is how the companies handle the ideas.[299]
- "Mistake handling", listed under "Behavior that encourages innovation", are also by other studies and other theory considered being of importance. The empiric findings have shown that employees consider that they are allowed to make mistake and will not have bad experiences when failing.
- "Competitiveness", listed under "Behavior that encourages innovation". None of the conducted studies have pinpointed this to be a specific determinant, neither have any theory that we have studied claimed this to be important. Martins and Terblanche argue that some level of competitiveness between the employees will encourage innovations. Competiveness refers to a culture that encourage debating of ideas and constructive conflicts, which in turn leads to knowledge and information transfer. The empiric findings have shown that

[296] Janssen et al., p. 135 and Woodman et al., p. 313
[297] Tushman et al. (2002), p. 117, West et al. p. 275
[298] Sjölander, p. 12
[299] Ibid.

ideas are often exchanged between the employees, at least on an informal basis in the daily work, and that informal meetings and discussions are encouraged. Therefore, "competitiveness" is already fulfilled and there is no reason to believe that a higher level will lead to more innovations.

- "Conflict handling" listed under "Behavior that encourage innovation", are also by other studies and other theory considered being of importance. The empiric findings at SIT GT R&D have shown that there is a low level of conflicts. At the same time, the culture encourages discussion and the employees are often exchanging ideas and discuss problems between themselves.

In addition to the framework by Martins and Terblanche, following two determinants have been added:

- "Budget" is according to other studies and other theory, besides Martins and Terblanche, considered to influent the cultural aspects of innovation. Budget is often uses as a formal control system[300] and it is used at SIT GT R&D. The formal control systems influence the culture of the organization[301] and the empiric findings have shown that the construction of the budget has an impact on the work with innovations. The empiric findings combined with other theory, besides the framework by Martins and Terblanche, states that the budget is a cultural determinant that influence creativity and innovation. Martins and Terblanche list "availability of resources" under "support mechanisms" and therefore "budget" has been added to their list.
- "System for measurement" is according to other theory, besides Martins and Terblanche, considered to influent the cultural aspects of innovation. Being able to measure innovation is not just a tool for management. It also has the function of telling the employees what counts, i.e. management measure those things that matters and as often said; "what is measured gets done". In other words, by measuring innovation management communicate to the employees that they value innovations. The empiric findings have shown that there is a demand for systems for measurement at SIT GT R&D.

Those two factors that where only brought up as important by one study, i.e. "playfulness/humor and positive role models", have not been taken further into consideration since no other source have mentioned them and therefore they are not elaborated on.

7.3 Theoretical contribution

The extended theoretical framework have shown that the framework by Martin and Terblanche and which have been used as the theoretical foundation of this thesis, are not sufficient in order to describe those determinants of the organizational culture that influence creativity and innovation at SIT GT R&D and comparable companies. The theoretical contribution of this thesis are given by an adjustment of the framework by Martin and Terblanche in order to customize it for SIT GT R&D and comparable companies in the sense that they are manufacturing companies with a successful past, high level of educated employees and operating in at mature industry with a mature

[300] Tushman et al. (2002), p. 103
[301] Ibid.

technology. The adjustment have been done by firstly eliminating does six cultural determinants that, due to empiric findings, have been found to be fulfilled and, secondly, by adding those two determinants that, according to empiric findings as well as other studies and other theory beside Martins and Terblanche[302] are influencing creativity and innovation. The theoretical contribution is illustrated in Figure 8 below.

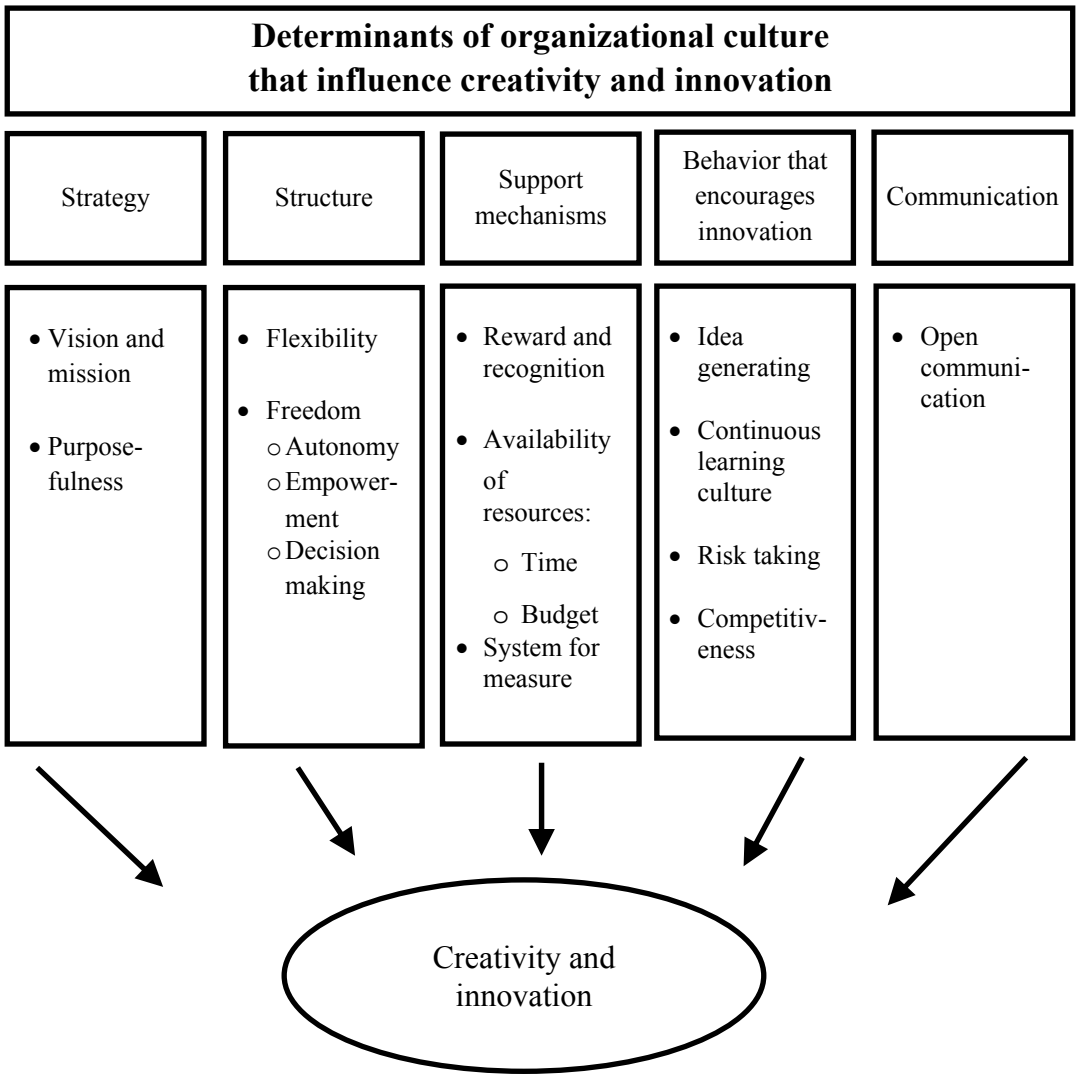

Figure 8 Theoretical contribution based on the framework by Martin and Terblanche

[302] "Other studies and theory" refers to those that is listed in "Appendix I: Theoretical map of the cultural factors of the organization that influences innovation" and elaborated on in chapter 0.

8 Plan of action

Those cultural determinants, in Figure 7 on page 51, that are not crossed over are, combined with the two added, in the crosshatched lined box, of importance for the capacity of SIT GT R&D to generate innovations. Although the framework in Figure 7 provides an understanding of the current situation at SIT GT R&D and an illustration of those conditions that are needed to be improved, it still does not say anything regarding how to change those cultural determinants that are in need of improvements. Hence, a customized plan of action has been developed; see Figure 9 on page 56, that answering how to actually create an organizational culture that promotes creativity and innovation.

8.1 How to promote innovations at SIT GT R&D

The theoretical study has pinpointed cultural determinants that are essential to possess in order to generate innovations. The empiric findings, which were primarily gathered from SIT GT R&D, through interviews and a survey, but also from SCA and Alfa Laval, have highlighted determinants that are of importance for manufacturing companies with a successful past, high level of educated employees and operating in at mature industry with a mature technology.

The empiric findings have confirmed that some of the determinants that are mentioned in the theory already are fulfilled, whilst other are in need of improvement. In order to handle and improve those cultural determinants that are needed, a plan of action has been developed; see Figure 9. The plan of action takes in-to account the fact that changing cultural factors are never done easy and quick, even though it most certainly is possible to perform. The most easy and effective way to go is to start by changing one or a few factors, instead of trying to change all at once.[303] Therefore, the plan of action should be viewed with four different steps that all need to be handled and managed in order to shape a culture that promotes innovations. The cultural determinants in the plan of action are all interdependent,[304] but, they need to be handled sequentially in the order they are presented. Notice that the plan of action is not a checklist that can be implemented once and then left unattended, since the culture of the organization is not static. Instead, once implemented it needs to be continuously monitored. The recommendations are in no way covering or dealing with all of the possible improvements regarding the work with innovations at SIT GT R&D. The recommendations cover those areas that are in most need of improvement and give examples of how the recommendations may be implemented. Further elaboration on the four different steps is done in the following pages of this chapter.

[303] Sjölander, p. 68
[304] Martins & Terblanche, p. 67

PLAN OF ACTION

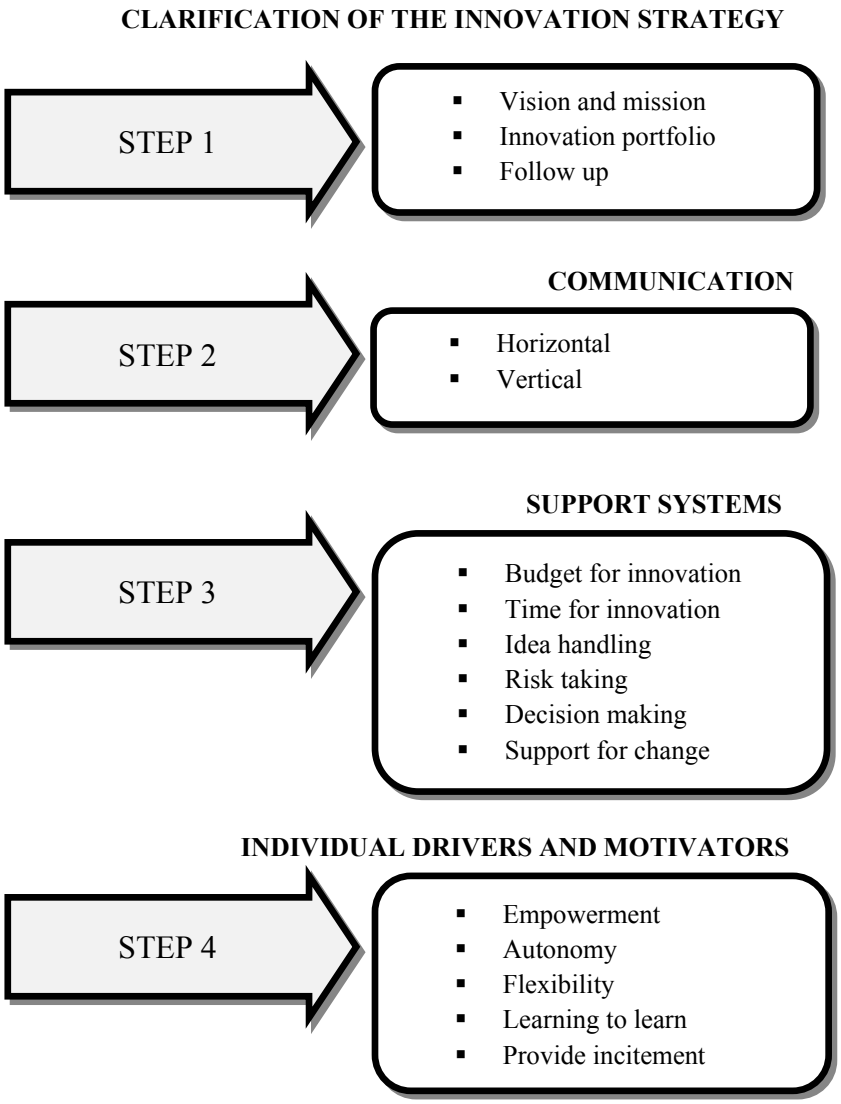

Figure 9 How to promote innovations at SIT GT R&D, a customized plan of action

8.2 How to implement the plan of action

This subchapter gives recommendations regarding how the four different steps in plan of action are to be implemented at SIT GT R&D. As mentioned previously, this only provides examples of how the recommendations may be implemented. There are most likely different ways of implementation, regarding the different recommendations, besides those that are brought up here.

8.2.1 Clarification of the innovation strategy

Step 1 highlights the importance of possessing a clarified strategy for innovations that both the top management as well as the employees are committed to. A strategy for innovation, which its existence everyone in the organization are aware of and committed to, is essential, since it is about making a statement of why the company actually aims to generate innovation, i.e. the mission and vision. The reason for being innovative could be for a strategic reason, such as sustaining in the competition, producing world-leading turbines, producing the next generation of turbines etcetera. It could also be for financial reasons.

In conclusion, the strategy for innovation provides the foundation for the innovative company. The following three steps in the plan of action, i.e. communication, support systems and the providing of individual drivers and motivators, are about executing the strategy for innovations and this step needs to come first.

Given the empirics findings, they show that the overall business strategy that involves those factors that a strategy for innovations consists of, since the business strategy more or less consist of somewhat clear roadmaps for the future research and development. However, there is a lack of commitment of the innovation strategy among the employees and also a doubt of its mere existence. In order to promote innovations clarified goals are, according to the theory needed, the same applies for the employees at SIT GT R&D. Figure 10 on next page shows how the innovation strategy, step 2, 3 and 4 in the figure, is incorporated into the current working process.[305] It is not about creating an additional strategy it is rather about clarifying the vision and mission for innovation in the current business strategy. A clarified strategy for innovation will send out the message to the employees that SIT GT R&D actually aims for innovations, and not only uses the word as a hip buzzword on the homepage. The strategy also provides the employees with the strategic goals that are needed in the goal-directed innovative company.

The more the employees are involved in the innovation strategy the better. Therefore, involving them in the construction of the strategy is the best way of getting their acceptance. The reason for making a clear statement regarding why R&D want to produce innovations, step 2 in Figure 10 on next page, about declaring that *innovation* is not just a word, it is a mission and vision. The reason for generating innovations could for example be; sustaining in the competition, producing world leading turbines, producing the next generation of turbines and etcetera.

[305] PDP, shown in the last row in Figure 10 is the product development process. TDP is the technology development process.

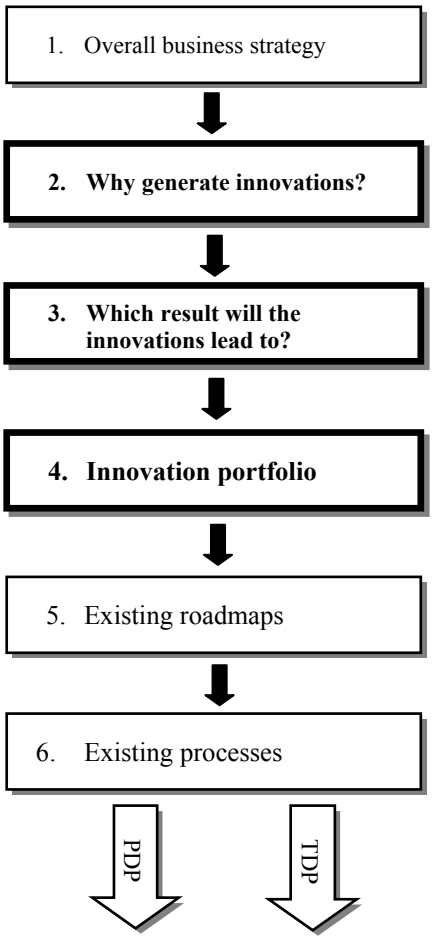

Figure 10 Implementation of innovation strategy

Moreover must the innovation strategy declare which results the strategy will lead to, step 3 in Figure 10. The results to aim for could for example be; increased sales turnover, growth, improved profit, reduced $/kW, improved power etcetera.

Commitment to the innovation strategy takes place when the employees accept and understand the strategy for innovation. In order to do that the strategy for innovation must provide the employees with goals of where SIT GT R&D aims to be in the future. Directions for the future should be pointed out by an innovation portfolio, step 4 in Figure 10. The innovation portfolio will work as a way of monitoring that a proper number of innovation projects for each different type of innovation, i.e. incremental, semi-radical and radical, are taking place as needed and make sure that no type of innovations are foreseen. The balance of the innovation portfolio needs to be equal to the future innovation goals of SIT GT R&D, i.e. if the goal is to increase the number of radical innovations, then the portfolio needs to be balanced towards the radical innovations. Example of a balance could be that X percent of the expected innovations should be incremental, Y percent semi-radical and Z percent radical. Further, resources like budget and people are then allocated according to the balance of the portfolio and the number of different innovations projects are responding to the balance of the portfolio.

The innovation portfolio also needs to reflect what SIT GT R&D considers to be an innovation, and what is considered to be an incremental, semi-radical and radical innovation. The definitions in the theory and the examples stated in chapter 6 could be used for classifying innovations. Since the portfolio comprises from the incremental to the radical innovations it also stretches over time, the incremental innovations are usually implemented in the upcoming two to three years whilst the radical ones are more distant, up to ten or even up to 20 years. Furthermore, once the different types of innovations are clarified, it is also possible to follow-up the benefits, such as improved product performance or cost reduced as a result of the specific innovation.

The portfolio should interact with the existing roadmaps, step 5 in Figure 10, of what innovations SIT GT R&D aims for. The roadmaps are the existing, more detailed, plans for the present as well as upcoming turbines. The roadmaps will work as a way of delegating the decision making how the planned innovations are to be developed. For example, a roadmap might state that the innovation in question aims at reducing the cost in terms of $/kW for a certain turbine, then the project team is given the

responsibility and trust to fulfill the goal. This is the foundation for providing the employees with the autonomy and empowerment that are needed in order to generate innovations.[306] The roadmaps are executed through the Product Development Process (PDP) as well as the future planned use of Technology Development Process (TDP).

Table 2 below illustrates the weaknesses in the overall business strategy at SIT GT R&D, seen in the left column. The actions that are needed are given in the column second to the left, whereas the more specifically which arrangements that are needed are given in the column second to the right. Finally, those effects, on the organizational culture in order to generate innovation, that are the actions and arrangements will lead to are given in the right column.

Table 2 Clarified innovation strategy

Step 1 Clarified the innovation strategy			
Weakness	*Action needed*	*Arrangement in detail*	*Effect on innovation work*
Lack of commitment to innovation	Support from management, define the meaning of innovation and clarify short and long term goals	Involve and delegate through goal directed work	Empowerment and autonomy
Lack of support for innovation from management	Statement of why innovation is needed and what for	Quantitative and qualitative goals on short and long term	Empowerment and autonomy. Way of measure
Unclear innovation goals	Classify different projects into the innovation portfolio	Connect roadmaps to the innovation portfolio	Goal-directed work
No system for follow up of innovation	Clarified innovation portfolio	Monitor the scope of different projects and pre-studies	Secure that the plan for innovation are fulfilled

The lack of commitment to innovation among the employees will be handled by; making clear from management that they support innovation (illustrated as a weakness on the first row in Table 2), defining the meaning of innovation and by stating the short and long term goals. The short and long term goals are provided by the innovation portfolio and the roadmaps. When planning the innovation portfolio employees from different expertise need to be involved, such as specialists, employees from Business Development (BD), product managers and others. The innovation portfolio will fill the need for a more goal-directed way of working at SIT GT R&D, meaning that strategic objectives are stated and the employees are given the empowerment and autonomy to decide *how* to reach the goals. A goal-directed way of working is one of the characteristics for an innovative organization.

[306] Judge et al., p. 77, Siegel et al., p. 554, Tushman et al. (2002), p. 117, Forcadell et al., p. 168 and Shattow, p. 46

According to the employees, there is a lack of support for innovation from management. This should be handled with by management making clear *why* innovations is needed and, moreover, *which results are expected*. This is illustrated in step 2 and 3 in Figure 10 above.

The missing unclear innovation goals are also fulfilled through the innovation portfolio. The quantitative and qualitative goals that are provided by the portfolio give the message of importance to the employees. It also brings along innovation through empowerment and autonomy through the goal-directed work.

A system for following up of innovation could be monitoring the number of pre-studies compared to projects that have been started up, the scope of innovation project referred to the different types of innovation. By doing this it becomes clear whether the strategy for innovation is followed and it is also possible to keep track from year to year. Clarifying the different types of innovation also makes it possible to follow up the benefits of the different innovations, such as improved product performance or cost reduced as a result of the specific innovation

Unless the three circumstances, clearer goals, larger commitment and better support for innovation from management, are fulfilled, it will not be a strategy for innovation, simply a regular business strategy.

8.2.2 Improve communication

Step 2 brings up the significance of communication, both vertically as well as horizontally within the organization. As mentioned before, the communication between employees, in an interpersonal perspective, is working more than sufficient at SIT GT R&D, it is open and honest. Communication brings along information, which in turn are the fuel for innovation. For the department of R&D especially, the communication with other departments within the organization is of huge importance. Unless R&D is able to communicate sufficient with other departments, sufficient information will not reach product development and the whole organization will eventually suffer.[307] Moreover, successful R&D projects are often a result of intensive communication with the department for market analyzes.[308] The access to information and the capability to share it within the organization are the foundation of a successful work with innovation. Information is what triggers innovations and therefore this makes up for step two in the plan of action. As the level of information increases, the level of uncertainty will decrease and the development of the innovation progresses. Information needs to flow from all directions in order to improve innovations.

The employees at SIT GT R&D express a need for more information about the demands of the costumers. The horizontal communication between R&D and the BD department needs to be improved. Table 3 on the following page presents different ways of improving the communication with BD and, thereby, improving input from the market. The market analyzes are performed by BD and the results, including the demands of the customers, are handed over to R&D. BD presents the results from the market analyzes in a document consisting of requested specifications, called TRS or

[307] Kalling (2007), p. 81
[308] Sjölander, p. 74

PRS[309], depending if the specification concern technology development or product development. The specifications are further "tested" by R&D, in order to verify whether they are possible to fulfill, and the TDS/PDS[310] are stated. To clarify the process in short; the TRS/PRS are stated in the beginning of the projects and the TDS/PDS are stated after the feasibility study, which is early in the project, but after that different concepts are discussed.

Table 3 Horizontal communication

Step 2 Horizontal communication			
Weakness	*Action needed*	*Arrangement in detail*	*Effect on innovation work*
Customer input	Involve BD	R&D and BD could have workshops together under the construction of PRS	Communication
Customer input	Involve BD	Workshop with R&D and BD under construction of TRS	Communication
Losing customers demands and missing restrictions from product development	Involve BD in PDR	Review and prioritize PRS in collaboration with BD	Key-information. Decreased risk level
Losing customers demands and missing restrictions from technology development	Involve BD in TDR	Review and prioritize TRS in collaboration with BD	Key-information. Decreased risk level
Observe competitors from a technology perspective	Involve BD	Future Technology provides BD with guidelines regarding technology	Input from the competitors. Decreased risk level

By having workshops where both BD and R&D participate under the construction of the TRS and the PRS, pointed out on the first and the second row in Table 3 above, it is possible to meet customers' demands as well as requirements on technology and products. TRS and PRS are about specifying customers requirements, from a technical and a product perspective. Preferably is that project managers, specialists and other with technical expertise are participating in these workshops with BD. The effect at R&D will not only be an increased knowhow about the customer but also a decreased level of risk, due to increased information. Moreover, this will also benefit BD in the way that they will increase their knowhow about the problems and challenges R&D is dealing with.

The current way of acting with the PRS brings along ways for improvement. The different criteria regarding market demands, which the PRS consists of, are not prioritized and, therefore, they need to be reviewed as the product development

[309] TRS standing for Technology Requirement Specification and PRS for Product Requirement Specification
[310] TDS standing for Technology Design and PRS for Product Design Specification

process proceeds, for example during the gate meetings. The reviews of the PRS need to be done in collaboration between BD and R&D in order to keep the criteria updated both according to information about the technology, known by R&D, as well as information about the market, known by BD. The reviews will reduce the risk of R&D missing market information, as well as the risk of R&D wasting time and money trying to fulfill criteria that are less prioritized by the customer. The same reasoning goes for the TDS where the collaboration between R&D and BD needs to be strengthened in order to make sure that both the knowledge about the customer demands as well as the technological presumptions are taken in to account.

The generation of ideas, and further innovations, may be improved by input from competitors and particularly to observe the technology they use. Currently, there are no routines for doing this. R&D has the expertise of observing the technology they find important. BD, on the other hand, has information about the competitors but do not know which technology they are to observe. Collaboration between R&D and BD in order to control and follow every step the competitor takes will give positive impact to generate innovation.

Recommendations regarding how to improve the vertical communication are presented in Table 4 below.

Table 4 Vertical communication

Step 2 Vertical communication			
Weakness	*Action needed*	*Arrangement in detail*	*Effect on innovation work*
The strategy for innovation are not communicated	Clarify the strategy	Communicate to managers, project leaders and specialist, face-to-face	Goal-direction
Hesitation for communication of classified information	Trade-off between positive effect on innovation and prioritizing confidentiality	Communication innovation strategy face to face and by handouts	Commitment to innovation strategy
Uncertainty in innovation goals	Delegate the trust and authority to state sub-goals	Specify and clarify sub- goals	Empowerment and autonomy
Lack of input from the employees to the roadmaps	Communicate the specified and clarified sub-goals to management	Review and adjust the roadmaps according to the sub-goals	Commitment to the innovation strategy

Once the strategy for innovation has been clarified, as recommended in step 1 of the plan of action in Figure 9, the next step will be to communicate it, to the employees in general and the managers, project managers as well as the specialists in particular. The purpose of communicating is to fulfill the need for goal-direction; something the

employees ask for and also believe will promote the number of innovations. Working goal-directed increases the empowerment and autonomy of the employees, this in turn promotes innovation.

Management at SIT GT R&D have a hesitation of distributing the overall strategy to the employees, partly due to the fact that there are risks involved when distributing information that could be of strategically important knowledge for the competitors, e.g. confidential information. There is a trade-off between not communicating information to the employees, and thereby secure that no information is passed on to the competitors, or to give the employees the goals and directives that, according to the theory, are needed in order to promote innovations. From an innovation point of view, it is clear that an innovation strategy, that the employees understand and accept, is essential when promoting innovations.

The current situation where the employees experience uncertainty regarding the goals for innovation is dealt with by delegating the trust and authority to state sub-goals of the roadmaps, since the roadmaps are about executing the innovation portfolio. The employees in general and the managers and project managers in particular should have the authority and the trust from management to specify and clarify sub-goals. No matter how much effort there is put in-to the construction of the innovation portfolio, sub-goals will still have to be stated in order to fulfill the goals.

Just as the top-down communication, from management to the employees, needs to be improved as well does the bottom-up communication. Given that management delegates the trust and authority to the employees to specify and clarify sub-goals, the stated sub-goals in turn needs to be communicated to management. The purpose of doing this is that it brings along the possibility for reviews and adjustments of the roadmaps, since the roadmaps are about executing the innovation portfolio. The result will be more accurate roadmaps that fulfill the specified and clarified sub-goals. This will improve the commitment to the innovation strategy.

8.2.3 Implement support systems

Step 3 presents those support systems that are needed when organizing for innovation. The strategy in step 1 where to decide why to be innovative, step 2 was in the purpose to make sure that access to information are secured. This third step is to concretize the strategy and making sure that the organization is structured for innovation.

A strategy for innovation is, combined with efficient ways of communication, the first way to go in order to improve the work with innovations. However, also supporting systems for innovation needs to exist. This to make sure that the strategy for innovation is fulfilled. Table 5 on the next page illustrates the existing weaknesses and actions that needs be taken.

Table 5 Support systems

Step 3 Support systems			
Weakness	*Action needed*	*Arrangement in detail*	*Effect on innovation work*
Existing budget are not correlated with the innovation portfolio[311]	Connect innovation portfolio with the budget	Budget, prioritize and allocate according to innovation portfolio	Secure that the plan for innovation are fulfilled
Lack of a buffer for innovation in the budget	Allocate X % of the R&D budget to arising ideas	Use the buffer to evaluation of the ideas	Availability of resource to arising ideas
Lack of time	Prioritize according to the innovation portfolio	Allocate people according to the prioritizing	Secure that the plan for innovation are fulfilled
Specialist time not used	Make sure the specialists are able to use their dedicated 20 percent	Results matched with the strategy for innovation	Improved idea generation
Lack of system for handling ideas	Matching ideas with the innovation strategy	Evaluate the ideas, put in feasibility (PDP) or in the innovation portfolio	Decision making of ideas
Insufficient level of feedback for ideas	System for handling ideas	Quick feedback and handling risk taking	Improved idea generation
Insufficient level of handling risk taking	Strategy for innovation including both qualitative and quantitative goals	Evaluate early ideas against qualitative goals, involve quantitative goals later on	Play-to-win-strategy
Insufficient level of support for change	Questioning the current state of mind	Questioning existing goals	Learning to learn

[311] An explicit innovation portfolio does not yet exist at SIT GT R&D, but this step are following the construction of the innovations strategy and are therefore based on an hypothetic innovation portfolio. It is brought up as a weakness since the correlation is of importance and cannot be highlighted enough.

The innovation portfolio, stated in the innovation strategy, will also support the budget planning. Projects and future goals for innovations that are prioritized in the portfolio needs also to bee prioritized in the budget. Therefore, planning of the budget needs to be connected, prioritized and allocated according to innovation portfolio. By doing that SIT GT R&D are able to secure that the plan for innovation are fulfilled.

SIT GT R&D is lacking a "buffer" for innovation, meaning that there is no buffer in the budget that allows funding for arising ideas. Considering that good ideas do not follow the financial planning year a possible solution is to allow a budget for innovation that are used when ideas arises. The buffer for innovation will be used to evaluate ideas, which in turn are done by using the system for idea handling, see Figure 12 on the following page. The buffer will further be used to verify the ideas and their potential. The procedure of how to conduct the verification are further discussed later on in the recommendations about idea handling. The buffer for innovation is not the same as the budget for technology but the ideas may later be used in the technology development or the product development, although with financial from the regular budget. To have a buffer for innovation in the budget and, thereby, making the development of ideas possible will increase the availability of recourses.

Time is a limited resource at SIT GT R&D and the ideas needs to be prioritized. This is done according to the innovations portfolio since the portfolio states which innovations SIT GT R&D are currently working on as well as intend to do in the future. It is of importance that projects prioritized in the innovation portfolio also are prioritized in reality.

The availability of "free" time for specialists could improve the number of innovation if it was more widely used. Currently only 30 percent of the specialists state that they use their dedicated 20 percent and the first step will be to make sure that they are able to actually use their dedicated 20 percent. Every year the specialists report what they have used their dedicated time for. If these reports are matched with the strategy for innovation, valuable ideas could be found and then evaluated with support from the buffer for innovation in the budget.

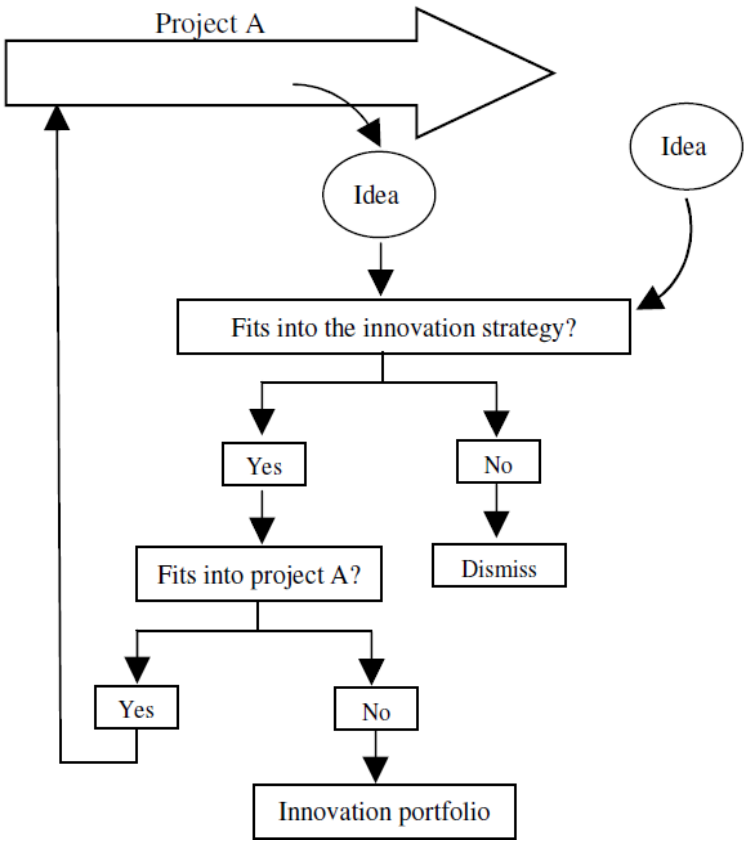

Figure 11 System for handling ideas

No formal system for handling ideas exists at SIT GT R&D. When ideas arise they need be evaluated and taken care of. To make the evaluation process or the ranking of the ideas possible a team needs to be engaged, preferably are both some BD as well as people with relevant technological expertise, e.g. specialists, represented in this team. The team should meet on either a regular, pre-scheduled basis or when ideas have occurred that need to be taken decision on, depending on which works best for SIT GT R&D. Ideas are born at daily base and, since most of the work at R&D are conducted through the PDP, it is mostly within the PDP that ides are generated. Figure 11 above illustrates the way of decision how an idea should be handled. The idea needs to be evaluated against the strategy for innovation. When evaluating ideas, which are yet in the early stages and therefore fairly unclear, it is of importance to know how to handle risk, due to lack of information that new ideas often are associated with. How to evaluate ideas associated with risks are discussed later in this subchapter. The team, mentioned above, has to judge if an idea has the potential of becoming an innovation. If the team finds that the idea is in line with the strategy for innovation, it will be moved to next step, otherwise it is dismissed. It does not matter if the idea is generated through PDP or appears outside the PDP. From the moment when the idea is communicated, it needs to be taking care of and the financial resources for doing this are taken from the buffer for innovations, elaborated on previously. If the idea is in line with the strategy for innovation and it has been generated from a project, Project A, the team together with the project manager will evaluate if the idea is in line with the ongoing project. If the idea can improve Project A, it will be developed within the project, given that it can be done within the time

frame of the project. If the idea comes from Project A and is in line with the strategy but not related to Project A, the idea will be added to the innovation portfolio. The same goes if the idea is not possible to develop within the time frame of project A. It is of importance to decide if the idea is a potential incremental, semi-radical or radical innovation. When the idea is classified it will be developed and financed by the ordinary budget and no longer by the buffer for innovation.

The current way of giving feedback to ideas calls for improvement. This is probably due to the reason that no sufficient system for handling ideas exists. By implementing the idea handling system it will be possible to provide quick feedback and handling the risk taking that is associated with the uncertainty that new ideas often are connected to.

Innovations are often associated with taking risks, due to the level of uncertainty that exist in the early phase of the innovation process. When dealing with innovations, there is a need for an understanding that quantitative financial goals, e.g. return on investment and expected pay-back, are not possible to use in the early phases of the innovation process. Instead, one has to be able to look further into the future and focus on the qualitative, strategic goals. SIT GT R&D might, as elaborated on in chapter 7.1, be on their way of being caught in a performance trap. Hence, there must be a support for taking risks and, also, knowing how to handle and deal with risks. A way of dealing with risk taking, associated with innovations, is to not only focus on expected pay-back, return on investment or net present value but instead evaluate according to those strategic, qualitative goals that are stated in the innovation strategy, e.g. sustaining in the competition, producing world leading turbines, producing the next generation of turbines etcetera. Those strategic goals could be seen as focus areas for future innovations. Expected financial results may be able to predict and analyze later on in the development of a potential innovation, when the level of uncertainty have decreased.

The evaluation in the early phases of the innovation process should be based on strategic possibilities, i.e. those strategic innovations goals that are stated in the innovation strategy. It could be exemplified with the theory of portfolio analyzing, i.e. spreading the risks and chances for reward by investing some capital in projects associated with higher risk but also higher possible higher rewards, whilst other capital are invested in project with lower risk but also lower possible rewards. By allowing higher risks in the early phases of the innovation projects, the chances for higher rewards also increase. This is what the play-to-win-strategy is about, and this is something that SIT GT R&D may find favorable.

Support for changes is about questioning how things are done and being able to change how the vision for innovation is fulfilled. This is depending on the possessing of a consistent vision, which should be stated in the strategy for innovation, which in turn should inspire and motivate to work with roadmaps. The vision tells why to produce innovations and is not to be confused with the business strategies. The vision for SIT GT R&D could for example be; “To produce world leading turbines through innovative solutions” or “To be a player on the world market of turbines to count on”, i.e. the answer to why SIT GT R&D is to generate innovations, as is stated in the innovation strategy. The roadmaps on the other hand are the one that might need to be changed over time, as the world and the market conditions changes. The roadmaps for SIT GT R&D could for example be in need for changes in focus from “producing medium sized turbines running on gas” to “producing turbines running on solar

energy" in order to fulfill the vision. The behavior of questioning the current way of working is what support for changes is all about. This applies on not only larger strategic questions, e.g. which fuel the turbines should run on, but also smaller questions like how to increase the efficiency on the existing turbines, i.e. how incremental innovation are produced.

8.2.4 Individual drivers and motivators

Last, but not least, step four points out those individual presumptions that are required to promote creativity among the employees. In the best of cases, step four is realized when step three is implemented. Unless the employees are provided with these presumptions, an organizational culture that promotes innovation will never occur.

Even though the employees at SIT GT R&D possess personal expertise, they need to be given better opportunities to use their skills in order to improve the work with innovation and further generate more innovations. The organization must deliver the right individual presumptions for the employees to produce innovations. Table 6, below, illustrates the existing weaknesses of individual drivers and motivators as well as those actions that are needed. The action that are needed are mainly given by step 1, 2 and 3 in the plan of action, in Figure 9 on page 56 on page, and have therefore already been elaborated on.

Table 6 Individual drivers and motivators

Step 4 Individual drivers and motivators			
Weakness	*Action needed*	*Arrangement in detail*	*Effect on innovation*
Insufficient level of empowerment	Involve and delegate through goal-directed work.	Quantitative and qualitative goals on short and long term. Clarified innovation portfolio connected to the roadmaps	Empowered employees
Insufficient level of autonomy	Involve and delegate through goal-directed work.	Clarified innovation portfolio connected to the roadmaps	Increased autonomy for the employees
Insufficient level of flexibility	Support for change. Buffer for innovation in the budget	Use the buffer to evaluate to the ideas	Availability of resource to arising ideas.
Learning to act	Problem solving methods that questions the existing ways of solving problems	The TRIZ method	Learning to learn, continuous learning
Lack of reward and recognitions that supports innovation	Reward with increased empowerment and autonomy	Involve and delegate through goal-directed work.	Individual incitements will increase the creativity

An organizational culture that promotes innovation allows and provides the employees with the empowerment to find their own way of reaching goals and solving problems. The employees request clarified goals and also to have the empowerment to take decisions. This is provided through a goal-directed way of working. If the managers are given the mandate to take decision, goals could always be delivered to the employees. The goals are needed to be developed according to the innovation portfolio and, further, according to the roadmaps.

Autonomy and empowerment are strongly correlated with each other. The level of autonomy among the employees will be improved by using a more goal-directed way of working, given that this is combined with allowing the employees to have more control of their own agenda. This means a need for a clarification of the strategic goals with innovation and, further, clarified quantitative and qualitative goals. It will then be possible for the employees to reach the goals in the way they found most sufficient.

The flexibility within the organization depends on how well the support for changes are accepted and implemented in the organization. The flexibility will also be increased by the buffer for innovation in the budget, especially according to the current situation when the employees feel that they are hindered by a bureaucratic structure.

By questioning the existing ways of solving problems and questioning how things are performed the organization will change their “learning to act” mentality to “learning to learn”. By doing this the organizational culture will increase the number of innovations. One way of engaging the employees is to always ask for several concepts initially in the in product development process for examples. TRIZ is a method for solving problems that promotes a mindset of learning to and learn and, thereby, leads to a continuous learning culture. It is a Russian acronym for the "Theory of Inventive Problem Solving." *The 40 Principles of Problem Solving* is the most used “tool” of TRIZ. TRIZ is about eliminating contradictions, both technical as well as physical contradictions. Technical contradiction is the classic engineering trade-offs, e.g. the product gets stronger (good), but the weight increases (bad). Physical contradictions are when a product or system possesses opposite requirements, e.g. cell phones should have many features and applications, but still be easy and simple to learn. [312]

The employees feel that they are recognized when they are acting innovative. To improve the individual incitements for innovation, the employees need to be rewarded by increased autonomy and empowerment. By implementing a more goal-directed way of working and provide the employees with the empowerment and autonomy to choose *how* to fulfill the stated goals. The best way to reward and recognize good performance, from an innovation point of view, is to allow increased empowerment and autonomy.

8.3 Risks with the plan of action

Innovation is about taking risks and not use to much of formal control systems. Hence, the plan of action suggests an increased level of goal directed work and a

[312] Barry, Domb & Slocum.

reduced level of formal control system. Further, it suggests that ideas should, in the early stages, be evaluated according to strategic, qualitative goals supposed to quantitative, financial goal. This is obviously about taking risks and reducing the level of formal control. The trade-off is to choose a so called play-to-not-loose-strategy and minimize the risk taking and the possibility to generate innovations. Or to choose a play-to-win strategy, that involves taking risks and also increases the chances for generating innovations. The plan of action suggests a play-to-win strategy and therefore there risks level will increase. But, most importantly, it will improve the work with innovation and the chances for generating innovations will increase.

8.4 Generic use of plan of action

The recommendations presented above are customized for SIT GT R&D. The empiric findings are mainly from SIT but also from SCA and Alfa Laval, which have been interviewed in order to make the plan of action generic. Those determinants that are SIT's strengths are almost certainly also strengths at comparable companies. Swedish companies have employed skilled engineers, they have cross-functional teams, they allow mistakes etcetera. Also the weaknesses found at SIT GT R&D are more or less weakness at comparable companies. It is also possible to guess that comparable companies are close of being caught in a performance trap, and to survive in the future, need to change strategy and look at opportunities for future growth.

If companies clarify the strategy for innovation, improve the directions of communication, create support mechanism and give the individuals the right drivers and motivators they will develop their work with innovation. To get full effect of implementing the plan of action, a mapping of the current situation is preferable. The recommendation could then be customized and adjusted explicit for the organization with its products and processes. The four main steps in the plan of action are to be seen as generic. However, the implementation of the different steps needs to be customized for each individual company.

9 Conclusion

According to the academic theory of how to work with and support innovations, SIT GT R&D fulfills many factors that are essential to possess in order to promote innovation and creativity. The company has the necessary presumptions that are needed in order to generate innovations, but the presumptions are not sufficient enough and there is definitely room for improvement. SIT GT R&D, just like other companies in mature industries, faces the risk of being caught in a performance trap because they prioritize short time projects, with more immediate results and benefits, before the long term projects and solutions. Long term strategies are documented, but the employees are not aware of them and, therefore not committed to them. Therefore, the strategies are in reality not stretching more than two to three years in to the future. This is not sufficient in order to promote innovation, especially not for companies that, like SIT GT, operate with technology that have development time to reach mature technology of more than ten years.

SIT GT R&D is aware of the competitive advantage that innovation can lead to in the future but they are too busy focusing on the present situation, i.e. incremental development, increasing the power of their current turbines, cutting costs and the next year budget. Just like all companies on the way of being caught in the performance trap, the long term focus is never prioritized, which may result in the neglecting of future radical innovations. The companies are not only facing the risk by being caught in the performance trap, they are also satisfied by doing things like they always have been done and sticking to what is known to work. The principle of manufacturing gas turbines have mostly been done in the same way since the fifties, so why change a winning concept? To become a more innovative organization changes need to be adopted, since innovation does not occur by itself just because the company states that it wants to be innovative. A plan of action for innovation is needed. The fours step solution presented in this thesis includes the following; Step one, clarify and implement a strategy for innovation. Step two; secure communication for innovation, e.g. effective communication between R&D and the market department. Step three; implement support systems for innovation, e.g. budget for innovation. Step four; provide the individual drivers and motivators needed for innovation, e.g. providing the employees with empowerment and autonomy.

To clarify a strategy for innovation is about creating a common understanding for the meaning of the word innovation. It is also about stating why innovations are to be generated and which results the innovations should lead to.

Communication in all directions is important in an organization. From an innovation perspective, it is of importance to improve the vertical communication, together with top-down as well as bottom-up communication. Top management need to be aware of the daily work to manage the company with success, hence bottom-up communication is of importance. At the same time, is important that a willingness to be a part of the strategy and the future vision and mission exists among the employees and, for this reason, the top-down communication must work as well. It is not obvious, that the employees found roadmaps or a strategy significant for their daily work. To be frank, the employees at R&D departments are perhaps too busy focusing on their own specific area, e.g. a certain part of the gas turbine, and not the future survival of the whole organization. Therefore, just as management needs to have an

insight in the daily work, just as well do the employees need to have willingness and commitment of taking part of the strategy for innovation.

Supports systems is about allocating resources for innovations. It is also about budgeting for innovation. An innovation portfolio is a useful tool when budgeting and allocation for innovations. Support systems are also about possessing a support for change. By questioning existing strategies, goals, roadmaps, products or processes, the success will not just stay in the upcoming two to three years, the success will probably stay in a long term horizon. Hence, the way of doing things, that has been a winning concept in the past, will, if there is a support for change, develop into new winning concepts.

Individual motivators and drives are about providing the employees with individual presumptions needed for innovation, such as empowerment and autonomy.

Creating an organizational culture that promotes innovations is not about making large rearrangement of the organizational structure. It is about making a statement of why to promote innovations and, moreover, what for. By implementing those steps that are presented in the plan of action, the organization will develop those capabilities and assets that are needed to promote innovations and to avoid a performance trap. This will not only lay the foundation for future survival, but also bring along the potential of making the capability to generate innovations a signification competitive advantage, by producing the innovations of tomorrow.

9.1 Suggestions for further research

The theoretical contribution of this thesis, i.e. the adjustment of the framework by Martin and Terblanche in order to customize it for companies operating in mature industries, is mainly based on the empiric findings from SIT GT R&D, with input from two other companies. More research is needed in order to increase the understanding regarding which determinates of the organizational culture that influences creativity and innovations at companies like these. Therefore, the suggestions for further research is to further examine which cultural factors that influence innovation within companies that are operating in mature industries with mature technology.

The existing academic theory regarding how innovation is promoted is in many ways general and do not provide theory regarding specific industries. Therefore, more specified theory of how innovation is promoted, adjusted for different specific industries and business, are suggested as a further research.

10 Executive summary

The purpose of this thesis has been *to construct a customized plan of action regarding how to improve the organizational culture for innovations*. The word innovation has by the authors been defined as; *an implemented idea, process, product or procedure that adds value and is, at least, new to the organization*.

SIT GT is a successful company that operates in a mature industry developing world class gas turbines. The employees at SIT GT R&D are highly educated and creative individuals that enjoys and are satisfied with their work, which are important assets for an organization when it comes to promote innovations. Still, the organization believes that there is room for improvement regarding how they work with innovations. A theoretical map of those factors of organizational culture that influence creativity and innovation has been conducted and the resulting theoretical framework is mainly based on the framework by Martins and Terblanche. Other cultural factors were added to the framework, due to empiric and theoretical findings. Those factors of the organizational culture that are needed to posses in order to promote innovations are presented and briefly explained bellow.

Strategy
The overall business strategy of the company must include a strategy for innovation. The strategy for innovation will answer *why* the company actually aims to generate innovation and also state the goals for innovation. The goals should be quantitative and qualitative. Further, innovation strategy is about possessing a balanced innovation portfolio with incremental, semi-radical and radical innovations.

Structure
The key for the organization is to organize and structure in a way that supports innovation. A balance between securing that existing products are profitable and, at the same time, produce innovations requires flexibility, autonomy, decision making and team interaction.

Support mechanism
The organization needs to posses support mechanism in the purpose to create an organizational culture that will promote creativity and innovation. It is about motivating the employees with reward and recognition. It is also about allocating time and funding for innovation, as well as possessing creative employees and a system for measuring innovation.

Behavior that encourages innovation
The organization needs to allow mistakes and failures. There has to be a behavior of both generating as well as handling ideas. The culture in the organization should be characterized by learning to learn. This is about questioning the current way of doing things, which ranges from existing ways to solving problem to the existing strategic objectives. The organization also needs to have a willingness to take risks and also to have a system for how to deal with risks. There must be a support for change and conflicts have to be dealt with in a constructive way. Competitiveness must also exist.

Communication
Communication takes place between employees, both vertical as well as horizontal in the organization, between departments and between the organization and external parts. Since innovation is closely connected with taking risks, often due to limited access of information, the level of communication is important.

Budget
Budgeting is a tool for managing, controlling and creating structure. When a company use budget as a management system it is of importance to make sure that funding for innovation are not strictly tied to it. Ides do not follow the budget year but is possible to plan for creativity by allocation a buffer in the budget for upcoming ideas.

System for measuring innovation
Accurate measurement is to make sure that the system matches the innovation goals, e.g. the innovation portfolio. Innovation can be measured from different views, like measure inputs and outputs, time dedicated to innovation, budget percent allocated to innovation efforts.

Beside the theoretical study, interviews and a survey were made at SIT GT R&D in order to map the current situation and how the organization work with innovation. A benchmark was also made at two comparable companies, Alfa Laval and SCA by interviews to give the case study a broader approach. Findings from the interviews and survey was mapped and then matched with the theory. This analyze led to answer on the first objective;

- Find out if there is a risk that SIT GT R&D is on the way of ending up in a performance trap[313].

SIT GT R&D is mainly focusing on the nearest three to five years, which are common for companies operating with a mature technology. There is also a risk that the future strategy not includes enough semi-radical or radical innovations. To find out whether it is possible that they might end up in a performance trap the current organizational culture needs to be analyzed which led to the second objective.

- To find out how the current organizational culture at SIT GT R&D working when it comes to support innovation.

In many ways SIT GT R&D has an organizational culture that supports innovation, but there is also room for improvements. A short summarize of the current situation at SIT GT R&D are presented below.

[313] Describes what might be the case for a company that currently is performing well and experience sufficient growth, but is too occupied with its core business and forgets to search for those opportunities that will lead to future growth.

Strategy: A clearly extracted strategy for innovation is missing.
Structure: Team interaction works well, but not the flexibility of the organization or the freedom to act autonomous and have empowerment.
Support mechanism: There is an existing availability of IT and creative people, but not the availability of time. Reward and recognitions are, in some way, objectives for improvement.
Behavior that encourages innovation: There is an acceptance for mistakes and ideas are generated. The conflicts are handled well and the competitiveness improves innovation rather than hinder it. No system for handling ideas exists and the current way of dealing with risks calls for improvement. The support for change needs to be improved as well as the way of organizational learning, e.g. learning to learn.
Communication: The interpersonal and the external communication are accurate but the horizontal and the vertical are weak.
Budget: The budget hinders innovation and no buffer for innovation exists in the R&D budget.
System for measurement innovation: Innovations are not measured.

Six of those factors that the theory states that are of importance to possess, in order to promote innovation, have been found to be fulfilled by SIT GT R&D, i.e. team interaction, availability of IT and creative people, mistake handling, competitiveness and conflict handling. They are relevant in order to generate innovation and to SIT GT R&D they are considered too be basic needs in order to operate. There is still room for improvements for those factors that were identified as weaknesses at SIT GT R&D, and this will lead to the third objective in this thesis.

- Present what SIT GT R&D will need to do in order to improve their work with innovation.

To create an organizational culture that will promote innovation a customized plan of action has been developed, see Figure 12 on the following page. The plan of action includes four steps and they are to be implemented sequentially.

PLAN OF ACTION

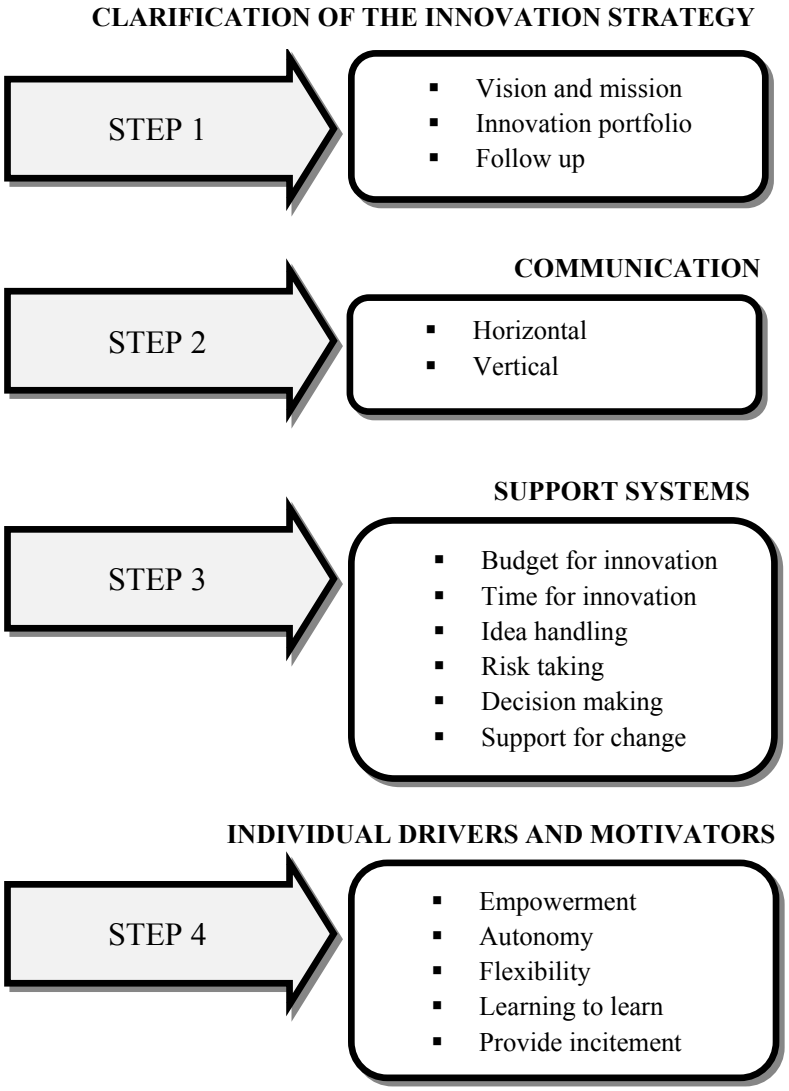

Figure 12 How to promote innovations at SIT GT R&D, a customized plan of action

The purpose of this thesis was *to construct a customized plan of action regarding how to improve the organizational culture for innovation*, which is fulfilled by this plan of action. The four different steps are explained in detail in the in chapter 8, where also recommendations regarding *how* to conduct the implementation are given. There is a risk that SIT GT R&D might end up in a performance trap but if they will implement the plan of action they have all opportunities to avoid the trap, and they will go from good to great in order to generate innovations in the future. The authors by this thesis believe that.

List of References

Literature

Abbeti, P. A., *Critical Success Factors for Radical Technical Innovation: A Five Case Study*, Creativity and Innovation Management, Vol. 9, No. 4, (2000), pp. 208-221.

Amabile, T. M., *How to kill creativity*, Harvard Business Review, Vol. 76, No. 5, (1998), pp. 76-87.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., and Herron, M., *Assessing the Work Environment for Creativity*, Academy of Management, Vol. 39, No. 3, (1996), pp. 1154-1184.

Anderson, N. & King, N., *Managing Innovation in Organisations*, Leadership and Organization Development Journal, Vol. 12, No. 4, (1991), pp. 17-21.

Bessant, J., Lamming, R., Noke, H. & Phillips, W., *Managing innovation beyond the steady state,* Technovation, Vol. 25, No. 12, (2005), pp. 1366-1376.

The Boston Consulting Group, Inc., *Measuring Innovation 2006,* Boston (2006).

Brown, J.S. & Duguid, P., *Organizing knowledge*, California Management Review, Vol. 40, No. 3, pp. 90-111.

Burninghamn, C. & West, M., *Individual, Climate, and Group Interaction Processes as Predictors of Work Team Innovation*, Small Group Research, Vol. 26, No. 1, (1995), pp. 106-117.

Chen, M-H., Chang, Y-C. & Hung, S-H., *Social Capital and creativity in R&D projects teams*, R&D Management, Vol. 38, No. 1, (2008), pp. 21-34.

Chesbrough, H., *The Era of Open Innovation*, MIT Sloan Management Review, Vol. 44, No. 3, (2003), pp. 35-41.

Chistensen, C., *The Innovation's Dilemma*, HarperBusiness, (2003).

Collins, J. & Porras, J., *Building Your Company's Vision*, published in Managing Strategic Innovation and Change, 2nd edition, Tushman, M., & Anderson, P., Oxford University Press, Inc., New York, (2004).

Cormican., K. & O'Sullivan, D., *Auditing best practice for effective product innovation management*, Technovation, Vol. 24, No. 10, (2004), pp. 819-829.

Davila T., Epstein, M. & Shelton, B., *Making Innovation Work – How to manage it, measure it, and profit from it,* 6th ed., Pearson Inc., New York, (2007).

DiLiello, T. & Houghton, J., *Creative Potential and Practiced Creativity: Identifying Untapped Creativity in Organizations*, Creativity and Innovation Management, Vol. 17, No. 6, (2008), pp. 37-46.

Dobni, B.C., *Measuring innovation culture in organizations – The development of a generalized innovation culture construct using exploratory factor analysis*. European Journal of Innovation Management, Vol. 11, No. 4, (2008), pp. 539-559.

Duane Ireland, R., Kuratko, D.F. & Morris, M.H., *A health audit for corporate entrepreneurship: innovation at all levels: part II*, Journal of Business Strategy, Vol. 27, No. 2, (2006), pp. 21-30.

Eisenhardt, K., *Building Theories from Case Study Research,* Academy of Management Review, Vol. 14, No. 4, (1989), pp. 532-550.

Ejvegård, R., *Vetenskaplig metod*, 3th ed., Studentlitteratur, Sweden, (2003).

Ekvall, G., *Idéer, organisationsklimat och ledningsfilosofi*, Nordsteds Förlag, Stockholm, (1990).

Ekvall, G., *Organizational Climate for Creativity and Innovation*, European Journal of Work and Organizational Psychology, Vol. 5. No. 1, (1996), pp. 105-123.

Forcadell, F. & Guadamillas, F., *A Case Study on the Implementation of a Knowledge Management Strategy Oriented to Innovation*, Knowledge and Process Management, Vol. 9, No. 3, (2002), pp. 162-171.

Frigo, M., *Strategy, Business Execution, and Performance Measures*, Strategic Finance, Vol. 83, No. 11, (2002), pp. 6-8.

Goffin, K & Mitchell, R., *Learning to avoid the net present value trap"*, Financial Times, FT Mastering Financial Management, May 2006, pp. 10-11.

Henderson, R. & Clark, K., *Architectual Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms*. Administrative Science Quarterly, Vol. 35, No. 1, (1990), pp. 9-31.

Janssen, O., Vliert, E. & West, M., *The bright and dark side of individual and group innovation: a Special Issue Introduction*, Journal of Organizational Behavior, Vol. 25, No. 2, (2004), pp. 129-145.

Johannessen, J-O., Olaisen, J. & Olsen, B., *Managing and organizing innovation in the knowledge economy*, European Journal of Innovation Management, Vol. 2, No. 3, (1999), pp. 116-128.

Johansson, L-G., *Introduktion till vetenskapsteorin*, Thales, Falun, (2000).

Johnson, G., *Managing Strategic Change – Strategy, Culture and Action*, Long Range Planning, Vol. 25, No. 1, (1992), pp. 28-36.

Judge, W., Fryxell, G. & Dooley, R., *The New Task of R&D Management: Creating Goal-Directed Communities for Innovation*, California Management Review, Vol. 39, No. 3, (1997), pp. 72-85.

Kalling, T., *The lure of simplicity: learning perspectives on innovation*, European Journal of Innovation Management, Vol. 10, No. 1, (2007), pp. 65-89.

Kim, B., *Managing the transition of technology life cycle*, Technovation, Vol. 23, No. 5, (2003), pp. 371-381.

King, N. & West, M., *Experiences of Innovation at work*, Journal of Managerial Psychology, Vol. 2, No. 3, (1987), pp. 6-11.

Krogh, G., Nonaka, I. & Aben, M., *Making the Most of Your Company's Knowledge: A strategic framework*, Long Range Planning, Vol. 34, No. 4, (2001), pp. 421-439.

Martins, E. C. & Terblanche, F., *Building organizational culture that stimulates creativity and innovation*, European Journal of Innovation Management, Vol. 6, No. 1, (2003), pp. 64-74.

Moore, G.A., *Darwin and the Demon – Innovating Within Established Enterprises*, Harvard Business Review, Vol. 82, No. 7-8, (2004), pp. 86-92.

Morden, T., *Innovation: People and Implementation*, Management Accounting, Vol. 27, No. 3, (1989), pp. 5-15.

Muller, A., Välikangas, L. & Merlyn, P., *Metrics for innovation: guidelines for developing a customized suit of innovation metrics,* Strategy & Leadership, Vol. 33, No. 1, (2005), pp. 37-45

OECD and Eurostat, *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd edition, a joint publication of OECD and Eurostat, OECD Publishing, (2005)

O´Reilly, C., *Corporations, Culture, and Commitment: Motivation and Social Control in Organizations*, published in Tushman, M., O´Reilly, C., & Nadler, D., Readings in the Management of Organizations: An Integrated Perspective, MA:Ballinger, Cambridge, (1989)

Patel, R. & Davidsson, B., *Forskningsmetodikens grunder – Att planera, genomföra och rapportera en undersökning*, 3th ed., Studentlitteratur, Sweden, (2003)

Shattow, M., *Out of the blue*, Electric Perspectives, Vol. 21, No. 2, (1996), pp. 44-54.

Shipton, H., Fay, D., West, M., Patterson, M. & Birdi, K., *Managing People to Promote Innovation*, Creativity and Innovation Management, Vol. 14, No. 2, pp. 118-128

Siegel, S. & Kaemmerer, W., *Measuring the Perceived Support for Innovation in Organizations*, Journal of Applied Psychology, Vol. 63, No. 5, (1978), pp. 553-562.

Sjölander, S., *Innovation och företagsförnyelse – idéutveckling och idéhantering i stora företag*, LiberFörlag, Malmö, (1983)

Sopow, E., *The impact of culture and climate on change programs – Distinguish between culture and climate to change the organization*, Strategic Communication Management, Vol. 10, No. 6, (Oct/Nov 2006), pp. 14-17.

Tidd, J., Bessant, J. & Pavitt, K., *Managing innovation: Integrating technological, market and organizational change,* 3rd edition, John Wiley & Sons, Ltd, Chichester, (2005)

Tushman, M. & Anderson, P., *Managing Strategic Innovation and Change – a collection of readings*, 2nd edition, Oxford University Press, Inc., New York, (2004)

Tushman, M. & O'Reilly, C., *Winning through Innovation – A Practical Guide to Leading Organizational Change and Renewals*, Harvard Business School Publishing, Boston, (2002)

Voûte, J. H., *Perspectives on innovation – a new TAO for business renewal & development*, Engineering Management Society, 2000. Proceedings of the 2000, (2000), pp. 351-356

Välikangas, L. & Gibbert, M. *Boundary-Setting Strategies for Escaping Innovation Traps*, MIT Sloan Management Review, Vol. 46, No. 3, (2005), pp. 57-65.

Weiwei, W. & Bo, Y., *The effect of Technology Life Cycle on Technology Management*, 2008 4th IEEE International Conference on Management of Innovation and Technology, (2008), pp. 1434-1438.

West, M., Hirst, G., Richter, A. & Shipton,H., *Twelve step to heaven: Successfully managing change through developing innovative teams*, European Journal of Work and Organizational Psychology, Vol. 13, No. 2, (2004), pp. 269-299.

Weyrich, C., *The Meaning of Innovation*, Electronic News (North America), Vol. 44, No. 2206, pp. 8-9, (1998)

Whittington, R., *What is Strategy – and does it matter?*, 2nd edition,Thomson Learning, (2006)

Woodman, R., Sawyer, J. & Griffin, R., *Torward a Theory of Organizational Creativity,* The Academy of Management Review, Vol. 18, No. 2, (1993), pp. 293-321.

Xu, Q. R. & Lian, X. R., *From Creativity to Success: The evolutionary Mechanism of Innovation – Case Study of Siemens*, 2004 IEEE International Engineering Management Conference (IEEE Cat. No. 04CH37574), Vol. 2, (2004), pp. 571-575.

Yin, R., *Fallstudier: Design och genomförande*, upplaga 1:1, Liber AB, Malmö, (2006)

Electronic sources

Siemens Industrial Turbomachinery, www.sit-ab.se.

Barry, K., Domb, E. & Slocum, M., *TRIZ – What is TRIZ?*, The TRIZ Journal, http://www.triz-journal.com/archives/what_is_triz, 13/05/09.

Interviews

Bertilsson, Klas, Concept and Innovation Manager, AlfaLaval, interviewed 17th of Mars, 2009.

Gustafsson Daniel, HR Consultant SIT GT R&D

Järrehult, Bengt, Director Innovation and Knowledge Management, SCA Global Hygiene Categories and SCA Packaging and professor in Innovative Packaging Logistics at Faculty of Engineering, Lund University, interviewed 17th of Mars, 2009.

Kalling, Thomas, Professor and Director, Lund Institute of Economic Research, interviewed 15th of April, 2009.

Söderberg, Ulrika, Team manager for 3i at SIT AB.

Consultant group at SIT GT R&D

Lundin, Niklas, Technology Manager, Future Technology, Product Development.

Ringstad, Peter, Manager Chief Engineers Office, Product Development.

Sundberg, Gunnel, Engineering and Packaging.

Sundkvist, Sven Gunnar, R&D Manager, Future Technology, Product Development.

Appendix I: Theoretical map of the cultural factors of the organization that influences innovation

The theoretical study was conducted with the framework by Martins and Terblanche, Figure 4 on page 22, as a starting point. It was compared to five studies that have analyzed innovative organizations with the purpose to map the cultural factors that influence innovation. The framework by Martins and Terblanche was further compared to academic theory that discusses factors of the organization that influence innovation. The benchmark is presented in the following pages. The cultural determinants that, according to the framework by Martins and Terblanche, influence creativity and innovation make up for the horizontal headlines on the top row. Those five studies that were used as a theoretical benchmark are presented in the left column. When the different studies are not using precisely the same word as the one Martins and Terblanche have used to describe a factor, but the meaning and context still are the same, the factor have been put into the box of that factor. The bottom row, representing the theoretical research, is showing the different authors that consider the respectively factor to be of importance, in the sense that they influence creativity and innovation.

The theoretical benchmark showed that there are four different factors that, according to other sources besides Martins and Terblanche, are considered to influence the organizational capability to generate innovations. These four are presented in the last four columns in the tables below, marked out as “not mentioned by Martins and Terblanche”.

Theoretical framework by Martins and Terblanche of determinants that influence creativity and innovation (2003)	Strategy	Structure						Support mechanism			
			Freedom						Avability of resources		
	Vision, misson and purposefulness	Flexibility	Autonomy	Empowerment	Decission Making	Team interaction	Reward and recognition	Time	IT	Creative People
Cadwell and O'Reilly (study conducted 1995 of more than 200 managers from 29 groups in high-technology firms in Silicon Valley - Norms for innovation regarding international R&D managers)					Involvement	Toleration of dissent	Rewards	Resources		
O'Reilly (Study conducted in 1989 of more than 500 managers from different companies acting in a wide range of business - norms of the culture that promotes innovation)	Common goals. Willingness to not focus on the short term.	Believe in action			Decentralize decision making. Quick decision making	Teamwork		Time		Bright people
		Flexibility in budget and structure. Minimize bureaucracy	Freedom to act. De-centralized procedures	Empower people						
Dobni (study conducted 2008 of interviews and survey-responses from 280 employees within the financial service industry - dimensions of innovation culture)	Invention intention			Creativity and empowerment				Innovation implementation		Creativity and empowerment
Siegel and Kaemmerer (study conducted in 1978 of 2200 survey responses, divided between "regular organizations" and organizations characterized as being innovative)			Ownership			Norm for diversity				Leadership that support creativity
			Decentralized leadership							
Ekvall (study conducted in 1990 of 27 companies acting in the Swedish industry, 8 of them where by the author classified as innovative, four of them were classified as stagnated and 15 as "normal")			Freedom							
			Challenge. Dynamism/Liveliness					Idea time		
Academic theory that discusses cultural factors of the organization that influence innovation	Davila et al. Voûte. Whittington. Amabile et al. Johannessen et al.	Davila et al. Voûte. Whittington. Amabile et al. Johannessen et al.	Tushman & O´Reilly. Judge et al. Forcadell et al. Shattow. Amabile et al. Kalling	Judge et al. Burningham et al. Forcadell et al. Shattow	Burningham et al. Forcadell et al.	Woodman, et al. Janssen et al. Tushman & O´Reilly. West, Hirst, Richter, & Shipton. Johannessen et al.	Tushman & O´Reilly. Davila et al. Judge et al. Shattow. Sjölander	Shattow. Davila et al. Amabile et al. Christensen. Johannessen et al.		Woodman et al. Davila et al.

	Behavior that encourage innovation							Communication	Not mentioned by Martins and Terblanche			
Theoretical framework by Martins and Terblanche of determinants that influence creativity and innovation (2003)	**Mistake handling**	**Idea generation**	**Countinious learning culture**	**Risk taking**	**Compet-itiveness**	**Support for change**	**Conflict handling**	**Open communication**	**Budget**	**System for measure innovation**	**Playfulness/humor**	**Positive role models**
Cadwell and O'Reilly (study conducted 1995 of more than 200 managers from 29 groups in high-technology firms in Silicon Valley - Norms for innovation regarding international R&D managers)	Freedom to fail			Risk taking				Listening	Resources			Positive role models
O'Reilly (Study conducted in 1989 of more than 500 managers from different companies acting in a wide range of business - norms of the culture that promotes innovation)	Acceptance of mistake. Freedom to try things and fail. No punishment for failure.	Ideas are valued	Continuous training	Risk taking		Positive attitudes about change. Rewards for change	Expect and accept conflicts	Open communication. Mutual respect and trust	Budget			
Dobni (study conducted 2008 of interviews and survey-responses from 280 employees within the financial service industry - dimensions of innovation culture)			Organizational learning					Innovation influence	Innovation implementation			
Siegel and Kaemmerer (study conducted in 1978 of 2200 survey responses, divided between "regular organizations" and organizations characterized as being innovative)		Leadership that support ideas										
Ekvall (study conducted in 1990 of 27 companies acting in the Swedish industry, 8 of them where by the author classified as innovative, four of them were classified as stagnated and 15 as "normal")		Idea support		Risk taking			Conflicts	Debates. Trust/openness			Playfulnes/ humor	
Academic theory that discusses cultural factors of the organization that influent innovation	Tushman & O´Reilly. Amabile et al. Cormican et al. Forcadell et al. Sjölander	Davila et al. Sjölander. Ekvall. Judge et al.	Brown et al. Davila et al. Shipton et al. Kalling	Judge et al. Morden. Sjölander. Johannessen et al. Kalling Tushman & O´Reilly. Amabile et al. Woodman et al.	Anderson et al.	Tushman & O´Reilly. Tushman & Anderson. Collins et al. Davila et al.	Woodman et al. West et al.	Davila et al. Sjölander. Tushman & O´Reilly. Kalling	Shattow. Davila et al. Amabile. Sjölander. Christensen. Kalling	Davila et al. Muller et al.		

Appendix II: Results of survey and interviews

The figure in chapter six is based on the figure below. Cursive factors are added by the authors.

1 = missing or not working sufficent, 5 = existing and working sufficent			1	2	3	4	5
Strategy							
	Vision and mission			●			
	Pureposefulness		●				
Structure							
	Flexibility	*Non-bureaucratic structure*		●			
	Freedom	Autonomy		●			
		Empowerment		●			
		Decision making (quick feedback)		●			
	Cooperative teams and group interaction					●	
Support mechanisms							
	Reward and recognitions	*Recognitions*				●	
		Increased autonomy		●			
	Avability of resources	Time		●			
		Information technology					●
		Creative people					●
Behavior that encourages innovation							
	Mistake handling (acceptance for mistakes)					●	
	Idea generation	*Generate*				●	
		Handling		●			
	Continuous learning culture			●			
	Risk taking			●			
	Competitiveness (constructive conflicts)					●	
	Support for change			●			
	Conflict handling (few conflicts)					●	
Communication							
	Open communication	*Interpersonal*					●
		Horizontal		●			
		Vertical		●			
		External				●	
Budget							
	Budget that support creativity and innovaton			●			
System for measuring innovatoin							
	System for measuring innovation		●				