NTNU – Trondheim
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Promoting Green Value Creation in project management through green purchasing in construction projects

Case :Faveo Prosjektledelse AS

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Oppgavetekst/Problembeskrivelse
Purpose: The purpose of the study is to gain understanding of the GVC ambitions in project management and to develop indicators to enable project managers to purchase greener building products and services.   Content: 1.Give a literature overview of concepts related to green value creation, supply chain management, purchasing and green purchasing.   2.Perform interviews and surveys on the ambitions related to Green Value Creation of the project managers at Faveo Prosjektledelse AS   3.Develop relevant indicators for greener purchasing   4.Provide recommendations for better purchasing practices

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1 uke ekstra p.g.a påske.

i

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Partene er gjort kjent med avtalens vilkår, samt kapitlene i studiehåndboken om generelle regler og aktuell studieplan for masterstudiet.

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Preface

This master thesis was completed as a requirement to achieve the international Master of Science degree in Industrial Ecology, with the Department of Industrial Economics and Technology Management (IØT) at the Norwegian University of Science and Technology (NTNU). This thesis is continuation of the project report from the fall of 2013, with the same case company, Faveo Prosjektledelse AS in Trondheim.

Abstract (English)

The goal of the study is to gain understanding of the Green Value Creation (GVC) ambitions in project management and to develop indicators to enable project managers to purchase greener building materials and contracts. To understand GVC, a definition was developed combining concepts such as value creation, the triple-bottom line, and Green Economy. The research questions were made to achieve the main goal. The qualitative and quantitative analysis performed with Faveo Prosjektledelse AS has the purpose to answer these research questions. Both the qualitative and quantitative analysis reveals that the GVC ambitions amongst the project managers are from moderate to low, in addition to the purchasing competences amongst the project managers needs to be elevated in order to promote Green Purchasing and the environmental demands is also from moderate to low. The study reveals that the criteria time, cost and quality from traditional project management can be considered to be a major obstacle to increasing GVC ambitions amongst project managers in Faveo and their customers. Therefore there is a need to move beyond traditional project management frameworks and include environmental perspectives in order to achieve GVC. Green Purchasing indicator set and indicator model is developed to enable the project managers to evaluate the environmental performance of building materials and contracts. With the greener purchasing in construction project the chances to promote GVC increases significantly.

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List of Abbreviations

AHP   Analytical Hieratical Process

CSR   Corporate Social Responsibility

EMS   Environmental Management Systems

EPD   Environmental Product Declarations

IPMA   International Project Management Association

GE   Green Economy

GP   Green Purchasing

GVC   Green value Creation

LCA   Life Cycle Assessment

PMI   Project Management Institute

SCM   Supply Chain Management

SSCM   Strategic Supply Chain Management

TBL   Triple Bottom Line

1 Introduction

The traditional project management frameworks applied by the project managers at Faveo Prosjektledelse AS does not have a significant environmental profile and for this reason there is a lack of environmental awareness and competence in projects. Project management consultancies have the capacity to impact the society and the environment both negatively and positively and the purpose of master thesis is therefore to promote Green Value Creation (GVC) in project management with green purchasing in construction projects. With the implementation of green purchasing the project managers can increase the environmental performance of their project, and at the same time increase the GVC ambitions in project management.

1.1 Background

Building materials use extensive resources, and therefore the construction of buildings causes large environmental impacts. The construction sector is responsible for a significant consumption of material and energy in industrial societies. This industry accounts for one-sixth of the withdrawals of fresh water in the world, in addition to one-quarter of the wood harvest and two-fifths of the earth's material and energy flows (Guggemose and Horvath 2005). According to the IPCC (2014) human activities can be proven to have an effect on the climate system of the earth. The fifth assessment working group report II from the IPCC reports, climate changes has causes impacts on natural and human systems on all continents and across all oceans. The climate change impacts are the strongest and most comprehensive on the natural systems. Changing precipitation, melting snow and ice is observed in many regions and they are altering the hydrological system and affecting water resources in terms of quantity and quality. The Millennium Ecosystem Assessment (2005) concludes that the world's ecosystems have been degrading the last 50 years due to human activities. Over 24 ecosystems have been assessed, and the results indicate that over 15 ecosystems have undergone serious damage, while only four were improved and five remained stable. The range of industry sectors in which Faveo, as a project management consultancy operate enables the potential to influence the development a sustainable society. Through Green Value Creation and Green Purchasing in construction projects, the project managers in Faveo Prosjektledelse AS can contribute to reduce climate change and eco systems impacts.

1.2 Scope and Goal

The scope in this thesis covers the project managers in Faveo working within the construction sector, the green purchasing indicators are therefore customised for purchasing in construction projects. The interviews and questionnaires are done with respondents working mostly with construction projects. The scope of the theories in this thesis covers the theoretical concepts related to Green Value Creation, Supply Chain Management, Purchasing, Green purchasing, Project management and Environmental demands. The theories are chosen based on the relevance to the study.

The goal of the study is to gain understanding of the GVC ambitions in project management and to develop indicators to enable project managers to purchase greener building materials and contracts. The research questions Q1, Q2 and Q3 addresses the first part of the main goal related to Green Value Creation ambitions, while Q4 addresses the second part related to purchasing greener in construction projects. The research questions are:

- Q1: What are the Green value creation ambitions of project managers at Faveo Prosjektledelse AS?
- Q2: How does the project manager function as a purchaser in projects?
- Q3: What are the environmental demands from customers of Faveo?
- Q4: How can green purchasing be adopted in construction projects?

The goal and research questions are addressed through a qualitative analysis, with semi-structured interviews and a quantitative analysis through self-completion questionnaires. The reasoning behind both a qualitative and quantitative analysis is to both gain rich and deep data, but at the same time provide results that could be generalized to larger population of project managers at Faveo.

1.3 Case Company

Faveo Management is the largest company independently working within project management in Scandinavia. They offer project management, project development and specialist services for both small and large projects across different sectors including both private and public. Faveo assists their customers with all kinds of projects and alteration processes. The case chosen for this study is the Norwegian branch of this company, Faveo Prosjektledelse AS. The interviews are performed in the offices of Faveo in Trondheim, while the self-completion questionnaires were sent out to project managers in several Faveo offices in Norway, further information regarding the case company is provided in chapter 4.

1.4 Challenges

There were some challenges that occurred during this study, such as gaining an acceptable response rate on the self-completion questionnaire that was sent out. To increase the response rate, this was dealt with by sending out a reminder one week after the first deadline expired to the respondents that had not replied yet. This reminder increased the response rate to an acceptable rate. Another challenge was to develop the questions for the semi-structured interviews and self-completion questionnaires, with the help of Bryman (2012), R&D director the questions for the interviews were made. The challenge with providing the questions for the questionnaire was solved by using the interviews and Bryman as a foundation. In other words, qualitative data provided as a basis for the quantitative analysis. Developing an indicator set and indicator model that could be applied for purchasing in construction projects was a challenge, but with the help of the project managers at Faveo the chances for proper indicator set and indicator model increased significantly.

1.5 Structure of thesis

The structure of the thesis is based on systems thinking, in which the whole thesis is considered to be the main system with different subsystems and elements that are interrelated. Figure 1 illustrates the structure of the thesis and shows the relationships between the different chapters or sub-systems.
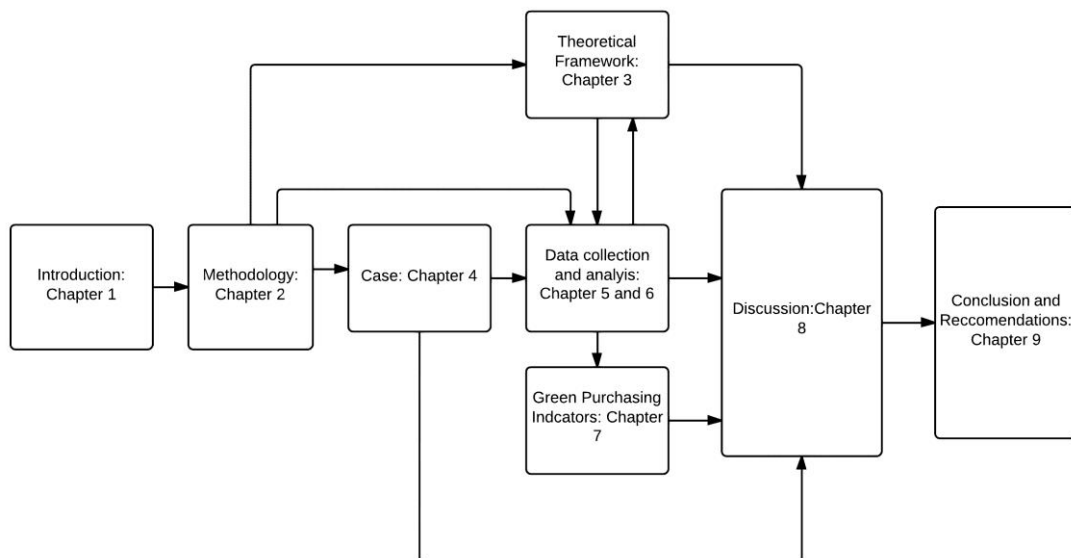
Figure 1 Structure of thesis

The introduction presents the background, goal and scope, case and the structure of the thesis. Chapter 2 contains methodologies applied in this thesis such as systems thinking, semi-

structured interviews, self-completion questionnaire, literature review, case study and indictor development is presented. The theoretical frameworks are found in chapter 3, presenting Green Value Creation, supply chain management, purchasing, green purchasing, project management theories. In chapter 4 the case company Faveo is presented. The qualitative and quantitative analysis is presented in chapter 5 and 6, The green purchasing indicator set and indicator model are found in chapter 7, which were developed as a result of the qualitative and quantitative analysis. The chapters 4, 5, 6 and 7 are the basis of the discussion found in chapter 8, in this chapter the research questions are discussed. Finally in chapter 9 the conclusion and recommendation to Faveo Prosjektledelse is provided.

2 Methodology

The methodologies applied in this study are systems thinking, semi-structured interviews, self-completion questionnaire, modified case study and literature review. Systems' thinking is the framework for the structure of the thesis and the definition of Green value creation. This study applies semi-structured interviews and self-completion questionnaire as methodology for the qualitative and quantitative analysis. The validity and the reliability of the qualitative and quantitative research are also mentioned. Case study research methodology is presented. Finally how the literature review and the development of the indicators are explained.

2.1 Systems thinking

System's thinking is the methodology used to understand Green Value Creation as a system with interacting elements. System's thinking involves understanding systems from a holistic perspective, in which subsystems and element are interdependent in order to function properly (Haskins 2006). System's thinking is applied in the definition of GVC in this thesis, with GVC considered to be the main system, with connecting sub systems such as **Green economy**, **Sustainability** and **Financial value creation**. Together these three sub-systems make the Green Value Creation system. The thesis is also structured after the principles of systems thinking, the figure 1 from section 1.5 illustrates how the thesis is organized as a system consisting of sub systems.

2.2 Qualitative Research

Qualitative research is more occupied with applying words to analyse social life compared to quantitative research. In this kind of research the participant's point of view is important and the researcher is more involved with the people being investigated. Theories and concepts emerge out of the data collected. According to Bryman (2012) qualitative research is more dynamic and processual, in other words the method is depicted as being aware of the unfolding of events over time. The data collection in qualitative methods is invariably unstructured, which makes getting the actor's meanings and concepts rising out of data collection is enhanced. Qualitative research requires a contextual understanding, rich and deep data and natural setting.

2.2.1 Semi-structured interviews

The semi-structured interview methodology is based on theory from Alan Bryman (2012). This interview methodology allows a list of questions based on specific topics or research questions considered interesting for the researcher to explore. The interview guide should have specific questions that need to be answered, but the interviewees are given a great

leeway in how to reply. The questions should allow the respondents to give answers that are elaborate without any time pressure. The respondents is also given freedom to talk as long as they feel necessary to uncover as much of information as possible. The advantages with the qualitative interview are the possibility of asking probing question, greater breath of coverage, and more rich and deep data. The semi-structured interview has some disadvantages related to small sample, difficulty of generalization and sensitivity of context. Another disadvantage is occurrence of the effect the interviewer might have on the respondents, which could affect the answers.

The semi-structured interviews should be recorded. Recording the interviews can give benefits related to quotation of the respondents if necessary, and also enables the opportunity to hear the interview multiple times, this could uncover new information that were overlooked earlier. Bryman (2012) claims that some respondents may be disconcert by the use of a recorder, and they might become self-conscious or alarmed due to their words being preserved. It is therefore beneficial to make sure that the recording equipment is functioning properly to avoid any unnecessary stops or distraction that might make the respondent unsecure and uneasy. The proper measures to secure the respondents trust and relaxation during the interviews can be accomplished through transparency and careful explanation of the purpose of the study.

The recordings can be transcribed, which means that the researchers listen to the recordings and writes down every word that is uttered in the interview. Bryman (2012) argues, it is beneficial to allow around five-six hours for transcription for every hour of speech. The advantages with transcriptions are the possibilities of quotations from the respondents, keeping intact the words uttered, and it can enhance the analysis. The disadvantages are that it is time consuming, and requires some training to master.

2.3 Quantitative Research

Quantitative research differs from qualitative by being preoccupied with numbers, and applying measurement procedures to social life. It is the researcher's point of view that is in the driving seat and it is the researcher's preferences that structure the investigation. In quantitative research theories and concepts are tested in research, and theoretical work precedes data collection. The social reality is depicted more static, with emphasis on the relationships between the variables. Quantitative research is often highly structured and the researchers want the findings to be generalizable to the relevant population. Quantitative

research is interested in hard, reliable data and often collects their data in an artificial setting (Bryman 2012).

2.3.1 Self-completion questionnaire

The self-completion questionnaire is based on Bryman (2012), the questionnaire allows the respondents answer questions by completing it themselves. This questionnaire method can come in multiple different formats, and the most prominent of these is the postal or mail questionnaire, such as the name implies is sent through the post to the respondents. The advantages with this kind of questionnaire are it is cheaper and quicker to administer than other methodologies, there is an absence of the interviewer affecting the respondent and finally it is more convenient for the respondents. Some disadvantages are lack of opportunity to probing questions, greater risk of missing data, lower response rate and more challenging to ask the right questions.

According to Ringdal (2007) the variables in quantitative research can be classified in four levels of measurement; nominal scale, ordinal scale, interval scale and ratio scale. In the nominal scale the variables values are exhaustive and mutually excluding categories. If the variables can be meaningfully ranked it is an ordinal scale variable. The distance between variable values in the interval scale can be measured. The ratio scale entails that measurement is the estimation of the ratio between a magnitude of a continuous quantity and a unit magnitude of the same kind. It possesses a meaningful zero value.

2.4 Validity and Reliability

According to Bryman (2012:389) validity refers to whether *"you are observing, identifying or measuring what you say you are"*. Bryman divides validity in qualitative research into internal validity and external validity, internal validity involves whether there is a good match between researcher's observations and the theoretical ideas they develop. External validity involves the degree of which the findings can be generalized across the social setting. The problem in qualitative research related to external validity is the tendency to employ case studies and small samples. Bryman claims that reliability in qualitative research can be divided in internal and external reliability similar to validity. Internal reliability concerns itself with situation where there is more than one observer, whether the members of the research team have an agreement about what they see and hear. External reliability is depended on the degree of which the study can be replicated. The critique of qualitative research is the difficulty to replicate these kinds of studies and therefore a difficult criterion to meet (2012).

Bryman (2012:171) argues validity in quantitative research *"refers to the issue of whether an indicators (or set of indicators) that is devised to gauge a concept really measures that concept"* and divides validity into the following categories: face validity, concurrent validity, predictive validity, construct validity and convergent validity. Face validity involves that the measures allegedly reflects the content of the concept in question. This can be done by asking other persons if the measure applied seems to be getting at the concept which is the focus of the research. Concurrent validity is established by employing a criterion on which cases are known to be different and that is relevant to the concept in question. Predictive validity is when the researcher applies a future criterion measure, instead of a contemporary one. Construct validity encourages the researcher to deduce hypotheses from a theory that is relevant to the concept. Finally convergent validity involves a measure that should be assessed by comparing it to measures of the same concept developed through other methodologies.

Reliability *"refers to the consistency of a measure of a concept"* (Bryman 2012:169) and reliability in quantitative research involves three prominent factors to consider whether a measure is reliable. These are stability, internal reliability and inter-observer consistency. Stability entails whether a measure is stable over time, in order to be confident that the results relating to that measure for a sample of respondents does not oscillate. Internal reliability refers to whether the indicators that make up the scale or index are consistent. Inter-observer consistency entails research including more than one observer or researcher, and that one should consider the possibility of that there might be a lack of consistency in their decisions.

2.5 Literature review

Most of the literature review to gain an overview of the concepts and theories compatible with Green Value Creation were performed in the project report from the fall of 2013. This method is very useful to obtain an overview of the latest developments in Green Value Creation. Most of the journal articles are found through resources given by the NTNU database, and their library. An objective was to use articles that was scientifically approved and published. It was also important to use articles that were recognized to have a high quality and published in serious and professional journals. Literature was also found through recommendations from the supervisor and fellow students. The use of search engines Google Scholar and Scopus was capable to provide an extensive range of scientific literature. Some of the literature are from the late 90's, which might be considered to be old, but the articles are from recognized authors and journals and therefore acceptable. Some of the information about the case

company, Faveo, was collected through unstructured interviews with the director of research and development Ole Jonny Klakegg. The interviews with Klakegg could also be considered as conversations, with some pre-made topics developed before the meetings. The annual report and the website of Faveo was also an important source of data.

2.6 Case study

There is no specific formula for using cast study research, and the choices depend on the research questions of the study. The more that the research questions pursue to explain present circumstances, the more this method becomes relevant. If the research questions needs extensive and in-depth description of a social phenomenon the caste study also becomes more relevant. Yin (2009) provides a twofold technical definition of case studies:

> "1. A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. 2. The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one results relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior developments of theoretical propositions to guide data collection and analysis. (2009:19) "

This definition indicates how case study research entails an all-encompassing-method, with the coverage of design, data collection, and approaches to data analysis.

2.7 Development of Indicators

Andersen and Fagerhaug (2002:88) provide steps for developing performance indicators. Through five steps they explain sub steps for developing performance indicators. These steps are:

1. Establish the responsible for developing indicators
2. Teach the various indicator design teams how to develop performance indicators
3. Organize a brainstorming session to generate performance indicators
4. Define control limits and target values for each performance indicator
5. Compile the resulting set of developed indicators.

According to Andersen and Fagerhaug (2002) the development of indicators is a creative process and should be tailored to the specific needs of the organization. It is therefore difficult to develop and provide generalized guidelines on how to develop performance indicators. Andersen and Fagerhaug advice the involvement of the people that knows the processes that

is to be measured in detail. According to the United Nations Environmental Program (UNEP) indicators are *"measures that can be used to illustrate and communicate complex phenomena in a simple way, including trends and progress over time"* (UNEP 2012:53).

3 Theoretical Framework

The theoretical framework is developed to reinforce the research questions and discussion. Theoretical ground work for Green Value Creation is provided first in this chapter. Supply chain management, purchasing and Green Purchasing provides the necessary theoretical background. The traditional project management frameworks applied by Faveo from the Project Management Institute and the International Project Management Association are covered in this chapter. Newer perspectives on project management are also included, in order to provide the study proper basis for discussion. The chapter ends with theories from Berry and Rondinelli regarding environmental demands and the Analytical Hieratical Process (AHP) model from Handfield et al.

3.1 Green Value Creation

A necessary step before defining and understanding GVC is to understand the concept of value creation. According to Bowman and Ambrosini (2000), value has two main components. This includes perceived use value and exchange value. Perceived use value is subjective, defined by the customers and is based upon the perceptions of the customers in terms of the usefulness of the product or service. The 'total monetary value' is based on the amount the purchaser is willing to pay for the product or service. The other component, called exchange value, is realized when the product is sold. It is the amount paid by the customer to the producer. Bowman and Ambrosini argue that value creation can be defined as

> "Inanimate resources purchased as inputs to the production process, whether they be machines, buildings, steel, computers, or flour, are incapable of transforming themselves into anything other than what they are. They need to be activated, worked on before they can contribute to the production of new use values"(Bowman and Ambrosini 2000:5).

Value creation occurs when a firm uses and shapes the resources they have available to develop a product or service that the customers perceives to be valuable for them. This does not mean the inanimate resources have no value; in fact, it has a value for the manager that decided to purchase these items on behalf of the firm (Bowman and Ambrosini 2000). Lepak et al., (2007) introduce three aspects of value creation that is created in three levels; individual, societal and organizational level. These are all important sources of value creation and create values of different scales. At the individual level, individuals create value by developing new and proper tasks, services, product or other contributions that the target user (such as employer, client or customer) perceives to be of value relative to the target user's needs. The monetary amount gained for this service is larger than what might be gained from

alternative sources producing the similar services, tasks and products. . *"The value created may be from any new task, service, or job that provides greater utility or lower unit costs for the user over the closest alternative"* (2007:183).

Value creation at the societal level can be seen in terms of programs and incentives for entrepreneurship and innovation. These programs are developed in the interest of encouraging existing organizations and new entrepreneurships to develop, innovate and broaden the values in their organization to society and its inhabitants. In the organizational level, value is created when the company uses or develops new technologies and methods to develop their product or services. Another form of value creation from companies is creating new advantages as the existing ones are worn away due to the changes of the surrounding environment (Lepak et al., 2007). According to Porter (1990), the government creates value by developing laws, regulations and services that establish support, frameworks and guarantees of quality, lawful behavior and the support of the nation.

> "The central goal of government policy toward the economy is to deploy a nation's resources (labor and capital) with high and rising levels of productivity ... productivity is the root cause of a nation's standard of living. To achieve productivity growth, an economy must be continually up grading. This requires relentless improvement and innovation "(Porter 1990: 617).

Lepak et al., argues further views: value creation is to some extent subjective and has multiple levels, value creation also depends on the attributes of the stakeholders, whether it is individuals, society or organizations (2007).

3.1.1 Introducing Sustainable Value

According to Chris Laszlo (2003) there is a need to move beyond financial value creation. Sustainable value creation expands the boundaries of value creation to include all the stakeholders of a business, meaning that it not only economic aspects but also social and environmental concerns. Laszlo criticizes the negative and positive stakeholder value created by financial value creation. The negative stakeholder values involve the negative impacts a firm has on the well-being of its stakeholders; in contrast the positive stakeholder value is when the firm has added to the well-being of its stakeholders. In this case, the positive value creation is not created at the expense of financial value creation.

Sustainable value creation involves developing relationships and collaborations with stakeholders to foster mutual benefits. (A stakeholder in this case is anyone who is affected by the economic activities of a certain company such as neighbors, the local community,

government and Non-Governmental Organizations). The environment is also considered an important stakeholder. Including sustainability in value creation can promote long term opportunities to reach the social, environmental and economic goals of the company. This can be achieved by exploring the company's value chain to uncover the areas where the different stakeholders are affected, both positively and negatively. Identifying these areas will create opportunities and value and eliminate issues that are not sustainable (Laszlo 2003).
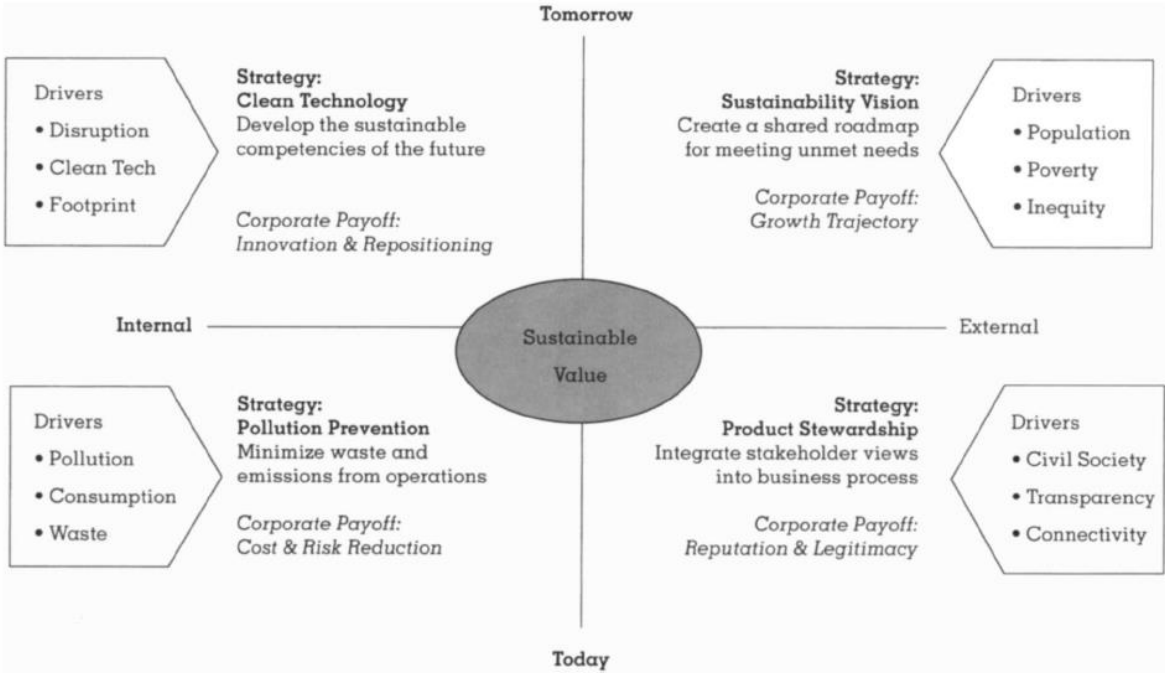
Figure 2 Sustainable Value Framework (Laszlo 2003)

According to Laszlo (2003) the figure 2 illustrates the framework of sustainable value and how sustainability can be a part of the value creation of a company. Figure 2 shows which strategies that should be implemented internally and externally, such as pollution prevention/clean technology (internal) and product stewardships/sustainability vision (external). It also shows the different drivers of these strategies. Finally the figure indicates a time aspect of what can be done today and what can be done in the future. According to Hart et al., (2003) there are many benefits of sustainable value for companies such as innovation, cost and risk reduction. Other potential benefits can include improving the company's reputation and increased legitimacy.

3.1.2 Sustainability and Green Economy

However, before one can give a proper definition and understanding of GVC, one needs to understand the concept of sustainability and what being "green" entails. While section

3.1.1often mentions sustainability, but does not give a proper definition of this term and how this thesis views sustainability. The definition that can be derived from the triple bottom line (TBL), which includes three different aspects of what being sustainable is, *A product or a service can be classified sustainable if social, environmental and economic factors are considered when developing the particular service or product (preliminary definition developed by the study).* TBL is emanated from the business world, and is used as framework to measure sustainability (Rogers and Ryan 2001). TBL can be seen as *"a concept of corporate accountability which goes beyond the traditional economic and financial aspects of a business entity. It is an auditing and reporting framework, which requires the measurement of economic, environmental and social performance"(2001:83).* Another definition of sustainability worth mentioning: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WBCSD 1987). This definition from the Brundtland report "Our Common Future" is more generic and is still relevant to this day.

As mentioned above, being sustainable means that social, economic and environmental aspects are of equal importance and these aspects are related to each other, meaning that none of them should be left out. What does being green involve? It may help to look at other terms and concepts that might help to define Green Value Creation. Green Economy (GE) is a concept that might be comparable to Green Value Creation. The definition of GE from UNEP is *"improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive" (UNEP 2011).* While the term sustainability has an equal focus on the three aspects mentioned above, it seems that the term "green" has its main focus on the environment.

3.1.3 Defining Green Value Creation (GVC)
Leading to this point, the thesis has discussed value creation, sustainable value, TBL and GE, and most of these terms are elements that fit into GVC. Sustainability is a term that can describe several systems and organizations without considering the environment, unless the definitions above are applied. A company can be economically sustainable, but not socially and environmentally sustainable. In this study the focus is more on the environment and economy, but social factors are included. For that reason the term used in this thesis is Green Value Creation, and not sustainable value creation. It is still worth mentioning that green and sustainability are terms that are very similar and can't always be differentiated since they

include many of the same concepts. The figure 3 gives an idea of how to define and understand GVC as a term. Green value creation, as it is understood in this thesis, includes elements from other concepts such as TBL, Green Economy, and financial value creation. In this figure, there are three main concepts connected to Green Value Creation, these are: Sustainability, Green Economy and Value creation. Each concept is connected to other elements such as the TBL (Social, Economy and Environment), resource efficiency, perceived use and exchange value. In other words, figure 3 shows the complexity of what GVC entails. It is worth mentioning, that this definition is based on value creation on the organizational level. With the help of the definitions and concepts mentioned earlier in this chapter, I suggest a of definition GVC could be *"when a firm uses and shapes the resources they have available to develop a product or service, by using tools and strategies that promotes social, environmental and economic benefits for all stakeholders involved, but with a stronger focus on the environment"*
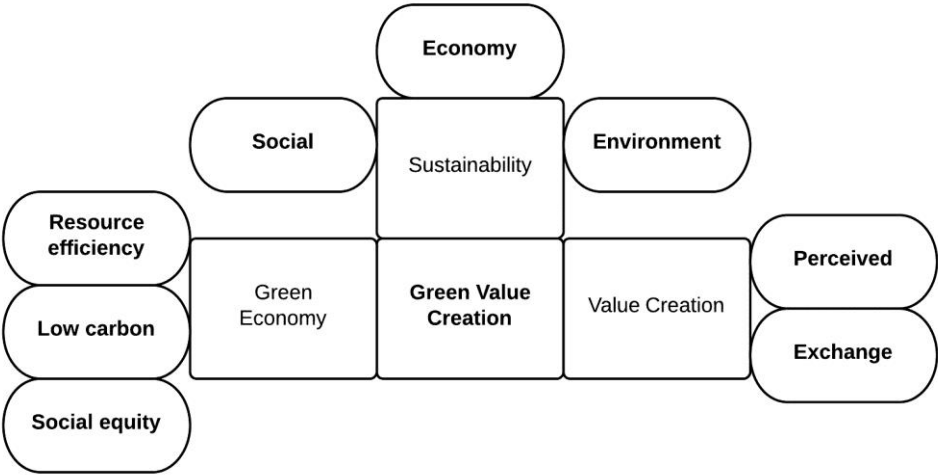
Figure 3 Concepts and Elements in GVC

3.2 Project Management

Theories from the Project Management Institute (PMI) and the International Project Management Association (IPMA) are presented due the use of this project management methodology in Faveo Prosjektledelse AS. Newer project management perspectives are provided to show other approaches to project management.

3.2.1 Project Management Institute (PMI)

"A project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists" (PMI 2008:5).

According to the Project Management Institute (PMI), temporary does not mean that the project has a short duration. The PMBOK guide is developed by the PMI to give guidelines and knowledge to project managers based on traditional project management approaches. PMI also offers certifications to project managers at different levels (PMI 2008). This guide is applicable for managing most types of projects across many different industries and is based on the project life cycle. This life cycle consists of four phases; (1) Starting the project, (2) Organizing and preparing, (3) Carrying out the project work and (4) Closing the project (PMI 2008:16).
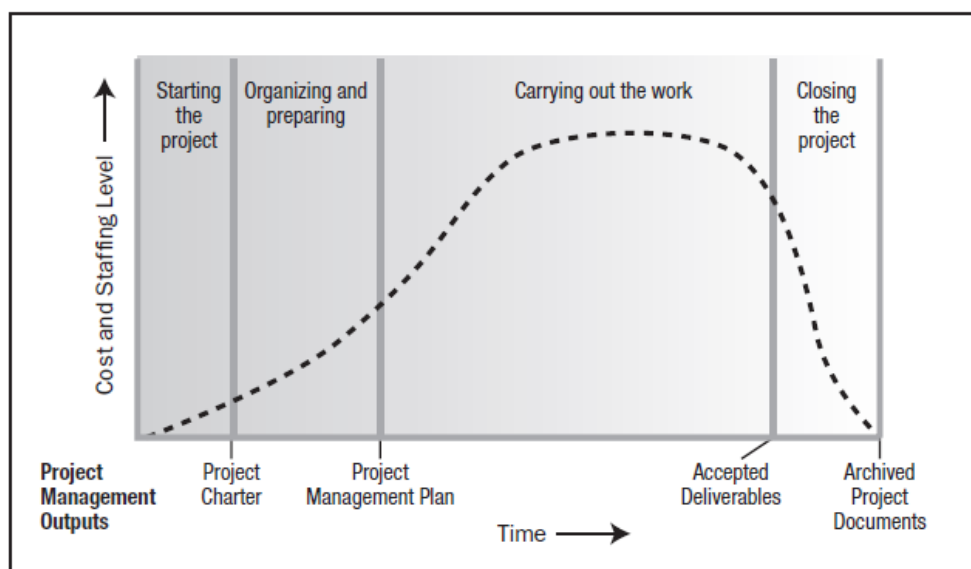
Figure 4 The life cycle of project (PMI 2008)

The figure 4 illustrates the cost and staffing level on each life cycle stage over time. The life stage cycle that seems to have the highest cost and staffing levels is the third stage of carrying out the work, which indicates that this stage requires the most effort.

According to the PMBOK guide, project management is the use of knowledge, skills, tools and techniques on project activities to meet the requirements of the project. Project Management consists of five process groups (PMI 2013:6);

- Initiating
- Planning
- Monitoring and Controlling
- Executing
- Closing

Managing a project typically includes identifying requirements and considering the stakeholders needs, concerns, and expectations as the project is planned and carried out. The project manager needs to be aware of the competing project constraints such as scope, quality, schedule, budget, resources and risk. According to PMBOK (PMI 2013) there are ten areas of knowledge, which is developed by PMI, that need to be considered in project management; Integration management, Scope management, Time management, Cost management, Quality management, Human resource management, Communication management, Risk management, Procurement management, and Stakeholder management.

3.2.2 International Project Management Association (IPMA)

The International Project Management Association (IPMA) is another leading project management organization that has its origins in Europe, with headquarters in Switzerland. In contrast to PMI, this is a non-profit association that functions as an authority on project, program and portfolio performance competence (IPMA 2013). IMPA has many functions and initiatives that can be applied to any company across industries.

The ICB (IPMA 2006) differs from the PMBOK guide by having more focus on project leadership than the project execution. The ICB is a framework that includes 46 competence elements, divided into three categories (behavioral competences, technical competences and contextual competences) whiles the PMBOK guide focuses on ten knowledge areas. The ICB claims, these 46 competence elements are important for a project manager to consider in project. This framework includes more aspects of what being a project manager entails. Figure 5 includes behavioral competences such as creativity, ethics and openness which the knowledge areas of the PMBOK guide do not include. There is more awareness of the project manager as a person instead of guidelines on how to execute the project in the ICB compared to the PMBOK. The different elements are not developed for specific companies, industries or countries, therefore making it possible to apply this framework on many different projects. Not only can it be tailored to fit specific project needs, but also on cultural differences (IPMA 2013). Figure 5 provides a complete list of the competences divided in three categories.

The Periodic Table of Project Management Competence Elements

IPMA PM Competence Element Groups
- Contextual Competence Elements
- Technical Competence Elements
- Behavioral Competence Elements

2.01 L — Leadership

3.01 P — Project orientation
3.02 Pg — Programme orientation
3.03 Pf — Portfolio orientation

2.02 M — Engagement & motivation
2.03 Sc — Self-control
2.04 As — Assertiveness
2.05 R — Relaxation
2.06 O — Openness

3.04 Pp — Project, program & portfolio implemen.
3.05 Po — Permanent organization
1.01 Ps — Project management success
1.02 Ip — Interested parties
1.03 Rq — Project requirements & objectives
1.04 Ri — Risk & opportunities
1.05 Q — Quality
2.07 Cy — Creativity
2.08 Ro — Results orientation
2.09 E — Efficiency

3.06 Bu — Business
3.07 Sa — Systems, products & technology
1.06 Po — Project organization
1.07 T — Teamwork
1.08 Pb — Problem resolution
1.09 Ps — Project structures
1.10 Sd — Scope & deliverables
2.10 Co — Consultation
2.11 Ne — Negotiation
2.12 Cc — Conflict & crisis

3.08 Pe — Personnel management
3.09 Hs — Health, security, safety, & environment
1.11 Tp — Time & project phases
1.12 Re — Resources
1.13 C — Cost & finance
1.14 Cn — Procurement & contract
1.15 Ch — Changes
2.13 Rl — Reliability
2.14 Va — Values appreciation

3.10 Fi — Finance
3.11 Le — Legal
1.16 Cr — Control & reports
1.17 In — Information & documentation
1.18 Ca — Communication
1.19 Su — Project startup
1.20 Cs — Project closeout
2.15 Et — Ethics

Based on IPMA's ICB® www.ipma.ch

Figure 5 the table of competence elements (IPMA 2013)

3.2.3 New perspectives on Project Management

According to Knut Samset (2008), there is a need of a new approach to project management and new criteria on what constitutes a successful project. He points out three perspectives on how to view a project for a project manager: the user perspective, the supplier perspective and the project owner perspective. The supplier perspective is the view that the project manager and the contractor have on the project, which is based on time, cost and quality (Iron triangle). Samset argues that this is the narrowest view of evaluating a project, and this limits the evaluation of the result of the project. Also, with this perspective, profit is often the most important goal, which can lead to some unfortunate consequences of the project that can create significant reactions from society.

The users are more concerned about the utility of the project rather than the actual execution, which the project manager should be aware of. With this perspective, the results of projects will have a broader evaluation. It is important to consider the needs and priorities of the users after the project is completed. These needs might differ significantly from the supplier and the project owner's needs and priorities. Samset (2008) claims that the success rate of the project will decrease if only the supplier perspectives are considered, but he points out that the user perspective is more ambitious and time consuming. The last and third perspective is the

project owners; the owner's perspective will usually overshadow the users. The owner has often a more long-term effect on the project. If the owner is a public organization, they will focus on the societal benefits of the project, while a private owner will normally focus on the value creation or the profit.

Shenhar and Dvir (2007) argue that a new framework and approach is needed in projects. Executives often believe that the budgets for projects are costs rather than investments. This is a misconception that needs to be dealt with. Project teams often try to follow guidelines that are well-established and that have become standard in the discipline of project management. Although the conventional project management body of knowledge provides a good foundation for basic training and initial training, it might not suffice for dealing with the complex issues of today's projects. Even if everything is done by the guidelines of the conventional body of knowledge, the project may still fail. Traditional project management often fails due to the two major drivers: *the iron triangle* which entails time, cost and quality (performance) and the *one size fits all.* Many managers and executives assume that all projects are the same, and by following the guidelines of conventional project management books, it will bring success.

Shenhar and Dvir (2007), introduce the *adaptive project management approach*, based on successful, flexible and adaptive framework. Table 1 shows how to make the change from traditional project management to the adaptive approach. In the first column from the left, it shows the different steps and in the second column one can see how traditional project management handles the different steps. Finally, in the third column the solutions from adaptive project management are suggested.

Table 1 adaptive project management (Shenhar and Dvir 2007)

From traditional to adaptive project management

Approach	Traditional project management	Adaptive project management
Project goal	Getting the job done on time, on budget, and within requirements	Getting business results, meeting multiple criteria
Project plan	A collection of activities that are executed as planned to meet the triple constraint	An organization and a process to achieve the expected goals and business results
Planning	Plan once at project initiation	Plan at outset and replan when needed
Managerial approach	Rigid, focused on initial plan	Flexible, changing, adaptive
Project work	Predictable, certain, linear, simple	Unpredictable, uncertain, nonlinear, complex
Environment effect	Minimal, detached after the project is launched	Affects the project throughout its execution
Project control	Identify deviations from plan, and put things back on track	Identify changes in the environment, and adjust the plans accordingly
Distinction	All projects are the same	Projects differ
Management style	One size fits all	Adaptive approach; one size does *not* fit all

3.3 Supply Chain Management

According to Lambert and Cooper the most succinct definition of supply chain management (SCM) is *"the integration of business processes from end user through original suppliers that provides products, services, and information that add value for customers"* (Lambert and Cooper 2000:66) . The term Strategic Supply Chain Management (SSCM) has gained importance in the strategic planning process in organizations, and SCM should be included in the organizations overall strategies (Handfield et al., 2005). Cousins et al., (2008) argues SSCM is a key strategic business process and that supply is needed to be viewed as a dynamic strategic process, not only as bureaucratic business function. Cousins et al., introduces the strategic supply wheel model, this is used as a framework to discuss the main issues related to supply chain management. The figure 6 illustrates key areas for consideration in SSCM and how these key areas are connected and with feedback loops between them, which indicates the areas are interrelated.

Figure 6 Key areas in SSCM (Cousins et al 2008)

According to Cousins et al., (2008) managers should not consider any area in isolation, for example focusing on portfolio of relationships and ignoring cost/benefit analysis. At the centre of this supply chain wheel is the construction of corporate and supply strategy. This key area holds the wheel together, without it the model would fall apart. Cousins et al argue that the key area in the middle requires strategic alignment between supply chain and corporate strategies. This is achieved when the supply chain strategies support and facilitates corporate strategy.

Skills and competencies for strategic supply is the first of five key areas in the wheel model, Cousins et al., (2008) claims that organizations is only as good as the skills and competencies that is provided, which means that supply chain management can be strategic if the personnel in this area possess the necessary skills and competencies. If these skills and competencies are not available the company might not reach its strategic objectives. Organizational structure which support supply strategies is the second key element that needs to be in place, as purchasing and SCM becomes more strategic part of the firm and is expected to become a more significant contributor to its competitive advantage. Therefore organizational structure becomes critical. In other words the shape, location and form of the organizational structures are important for successful SSCM.

Performance measurement is vital for a firm's Supply chain management to be successful, and is an important approach of monitoring and evaluating the performance of the employees within this field. The main objective of a purchasing and supply chain performance measurement system is to assist in strategy implementation through a specific, formal and systemic approach to monitor and evaluate purchasing activities. A cost-benefit analysis is the fourth of the fifth key element in this supply chain wheel, Cousins et al., (2008) argues that traditionally price has been the main focus of the measurement of the performance of purchasing, but this might be too simple when evaluating purchasing and supply chain. All cost along the entire purchasing supply chain should be evaluated, rather than limited to price. This analysis is done to have a clear understanding of their strategy's cost structure Finally the last element of the wheel is the portfolio of relationships, which deals with the of relationships a company has and how they should be managed. All relationships are important, both inter-and intra-firm relationships.

Lambert and Cooper (2000) introduces a conceptual framework for successful SCM, which emphasizes the interrelated nature of supply chain management. This framework consists of three closely related elements:

- The supply chain network structure
- The supply chain business processes
- The supply chain management components

The member firms and the links between these firms forms a part of the supply chain network structure, while the activities that produce a specific output of value to the customer is related to the business processes. Finally the supply chain management component involves the managerial variables by which the business processes are integrated and managed across the supply chain. The figure 7 illustrates the elements and key decisions in this framework and also illustrates the interrelation which was mentioned earlier in the text. In addition shows the three questions that need to be discussed in this process of SCM.
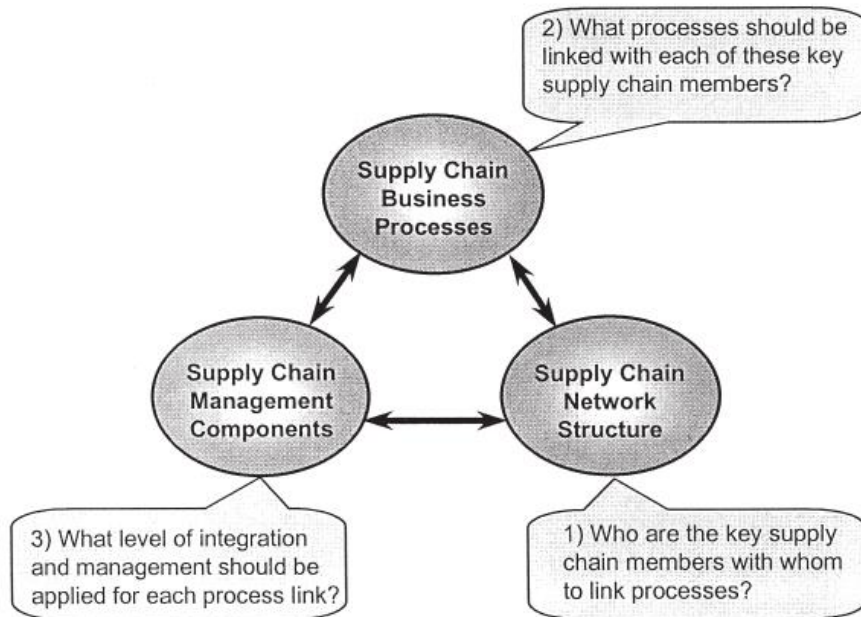
Figure 7 Key elements and decisions in SCM (Lambert and Cooper 200)

According to Lambert and Cooper (2000) supply chain management involves identifying the supply chain members that are critical for the company's business, and mapping the suppliers is vital for successful SCM. It is also necessary to recognize the importance of corporate culture and its compatibility with the supply chains or supplier. The supplier's values and business culture should not be conflicted with the company's interests; there should be at least some common grounds of how to do business. *"Successful SCM requires a change from managing individual functions to integrating activities to key supply chain processes"*(Lambert and Cooper 2000:72).

3.4 Purchasing

According to Van Weele (2012) purchasing involves:

> "managing of the company's external resources in a certain way that the supplies of all goods, services, capacities and knowledge that is necessary to operate, maintain and manage the company's primary and supporting activities is secured under the best possible conditions" (Translated from Van Weele 2012:8).

Van Weele introduces the purchasing process to be performed in six steps:

- Deciding the purchasing specification (quality and quantity) for the products and services that are necessary to procure.
- Choosing the best possible suppliers, and develop procedures and routines to be able to make the best choices.

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- Prepare and carry out negotiations with the supplier with the aim of establishing an agreement and writing and formal contract.
- Make an order with the chosen supplier and develop efficient orders and handling routines.
- Monitor and control the orders to secure the supplies
- Follow up and evaluate (Assessment)

The figure 8 illustrates the sequence of each step in the purchasing process model. This is a schematic overview of the main activities in purchasing (Van Weele 2012).

| 1.Specification | 2.Selection | 3.Contract | 4. Ordering | 5.Montoring | 6.After care |

Figure 8 The purchasing process (Van Weele 2012)

Van Weele (2012) claims purchasing is important for business, and that usually the largest part of the costs is related to cost of goods sold (COGS) and sales revenue of a company is due to purchased goods and services. As a consequence the lack of a well-defined purchasing policy and a poor structure on the purchasing process can lead to lack of control. This might cause unexpected financial loss due to extra purchasing costs. Van Weele presents the DuPont-analysis to show the benefits on a company's rate of return on the net amount property/belongings through proper purchasing. He points out three ways how this might occur:

- *Through a reduction on all direct material costs.* This will lead to immediate improvements in the company's sales margin, which in return is going to affect the rate of return on the net amount of the company's property positively. This can be

done by decreasing the number of suppliers, improved product standardization and by searching for replacement materials with more benefits.

- *Through a reduction of the working capital in the company.* This might be positive on the capital's turnover rate in the company/firm. Which can be achieved by improved supplier quality, leasing instead of buying equipment and reducing materials in storage by making "just in time" agreements with the suppliers.

- *Through improving the company's income generating potential.* A solution to achieve increase income is to challenge suppliers to innovate new products and process improvements, which can lead to new customer values that in return increase the profit margin. Since much of the innovations in many business sectors come from the suppliers, purchasing managers are challenged to mobilise their suppliers expertise and to involve themselves with the suppliers technical experts early in new product development processes.

3.4.1 Green Purchasing

Green Purchasing (GP) is a sequence of considerations in supply chain management. It is to identify the products causing negative impacts and replacing them with more environmental friendly products. GP involves reducing environmental impacts and maximizing resource efficiency. In other situations it might consist of looking at costs beyond purchasing prices and consider the environmental and social impacts of a certain product or service instead (Yeoman 2007). GP can be defined in various ways depending on which objective is to be achieved and in recent years there has been a steady growth of environmental initiatives in corporate practices. This has made it essential to perform more significant academic efforts to develop typologies of motivations and strategies, which has resulted in a larger body of literature (Hamner 2006).

Min and Galle (1997) introduces Green Purchasing strategies, the figure 9 illustrates the different strategies and trends within GP. The first step would be choosing whether if source reduction or waste elimination is goal, but one can also have a holistic approach and choose both strategies. The figure shows that the road towards GP can be travelled through many paths and therefore can be customised to fit each companies own environmental needs. In other words there are no "one size fits all" solutions.
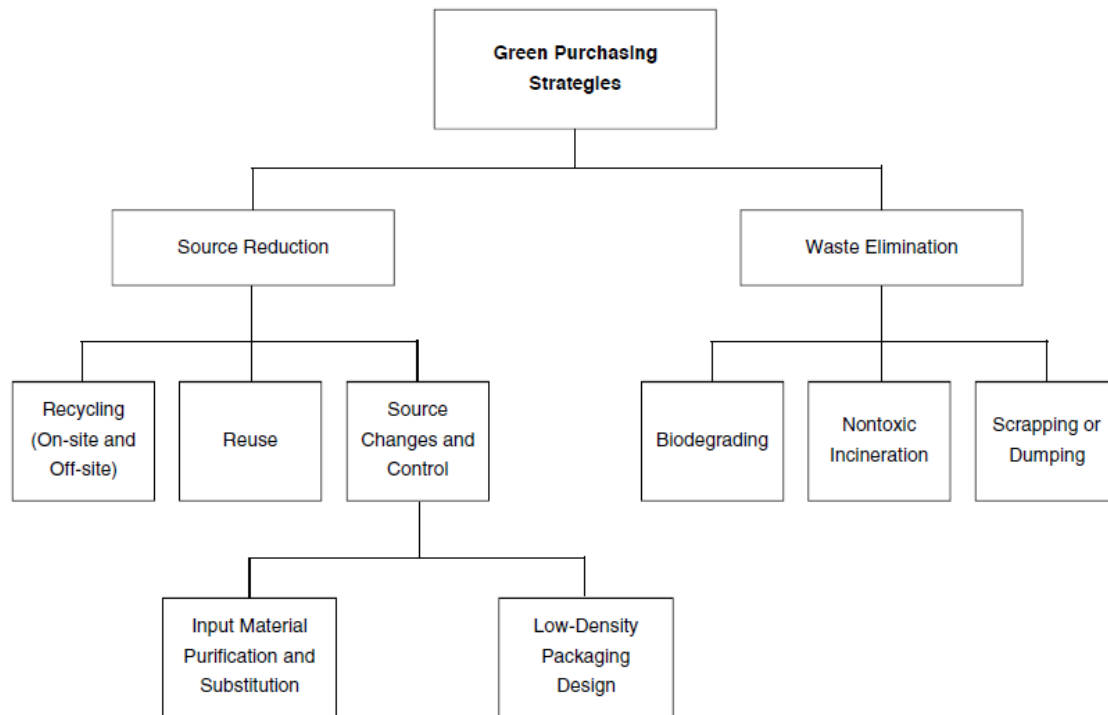
Figure 9 Green purchasing strategies and trends (Min and Galle 1997)

According to Min and Galle (1997), the Green Purchasing practices today seems to be "reactive", what this means is that companies try to avoid violations of environmental regulation, instead of being proactive by integrating environmental goals in their long-term corporate policy. The relationship between green purchasing and supplier quality assurance is weak. Min and Galle propose developing a more aggressive, and proactive environmental audit programs to achieve a greener purchasing policy. They suggest guidelines to an audit program:

1. Identify applicable environmental statutes.
2. Develop standard checklists for environmental compliances.
3. Organize an audit team comprised of both internal management and outside third-party inspectors (e.g., private contracting consultants).
4. Maintain records related to handling, storage, use, and disposal of waste.
5. Assess the nature and degree of potential violations and liabilities.
6. Develop a corrective action plan and monitor its progress (1997:16).

Carter et al., (2000) claims that environmental or green purchasing has a positive effect on firm performance, such as purchasing recycled packaging is a low cost alternative compared virgin material. This is due to development of reverse logistics infrastructure and recycling

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factories. Purchasing packaging light weighting products does not only reduce costs, but can also reduce transportation cost by increasing the amount of products that can be shipped at the same time. Guinipero et al., (2012) argue that companies that are responsive to eco-oriented issues perform better in the global marketplace. Being green can provide competitive advantages, and by intensifying production through ecological responsiveness companies can reduce environmental impacts, as well lowering the input and waste disposal costs.

3.5 Environmental demands and decision-making

According to Berry and Rondinelli (1998) corporations in North America, Europe, Japan, and in most newly industrializing nations are embracing environmental protection as part of their international competitive strategies. For many companies, the change towards proactive environmental management is compelled by demands and requirements from governments, customers, employees, and competitors. Consumers and investors are starting to acknowledge the relationship between business performance and environmental performance. There is a demand of a more proactive corporate environmental management from several stakeholders and there is no longer an option to ignore these demands. Businesses will have to adapt and embrace these demands. Berry and Rondinelli provides a list of forces driving a proactive corporate environmental management:

- **Stakeholder forces:** Customer demand clean processes and products, Shareholder rejection of environmental risks, Public demand for environmental protection.
- **Regulatory demands:** More stringent regulations, Increasing legal liabilities, More stringent legal enforcement
- **Cost factors:** Increasing costs of pollution control, New technologies for pollution prevention, Cost savings from waste reduction
- **Competitive Requirements:** New business opportunities, International trade agreements, International voluntary standards, Spread of quality management principles (1998: 40).

By implementing a proactive environmental management, these driving forces could be dealt with significant success, and opens the possibilities for new opportunities. Berry and Rondinelli (1998) argues that the companies will have to consider going beyond complying with increasing regulation and that, *"they must protect or enhance their ethical images, avoid serious legal liabilities, satisfy the safety concerns of employees, respond to governmental regulators and stockholders, and develop new business opportunities in order to remain competitive in world markets"* (1998:39). The AHP Model from Handfield et al., (2001) can

be used to help companies in environmental decision making. This model, is illustrated in figure 10, shows what environmental attributes to include when making environmental decisions. The model can be a framework to choose the most environmental friendly suppliers.
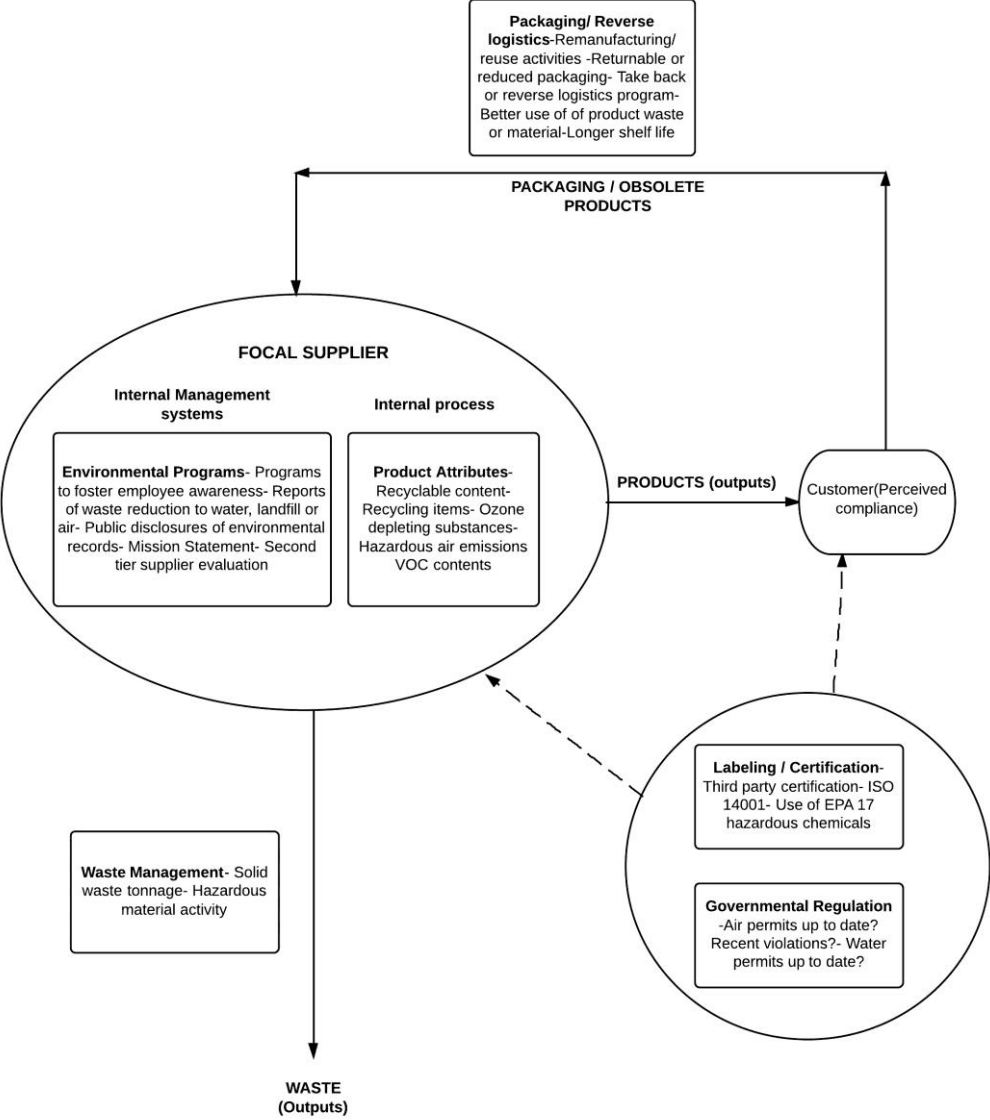
Figure 10 The AHP model (Handfield et al., 2001)

There are three agents involved in this model, the customer, supplier and third parties. Figure 10 illustrates the relationships between these actors and how they can all be included in the decision making process. It also shows what the different actors can contribute to better the environmental performance (Handfield et al., 2001).

4 Faveo Management

Faveo Management is the largest company within independent project management in Scandinavia. They offer project management, project development and specialist services for both small and large projects across different sectors including both private and public. Faveo assists their customers with all kinds of projects and alteration processes. Faveo has over 1500 on-going projects, with over 320 employees divided over 9 regional offices in total both in Norway and Sweden. Their revenue is about 420 million NOK (Faveo 2013b).

4.1 Organization

Faveo Prosjektledelse AS is a daughter under the parent company Faveo Management AS. In addition, under Faveo Management there is the Swedish daughter company Faveo Prosjektleding AB. However, the focus of the paper is Faveo Prosjektledelse AS. The organization of employees at Faveo is structured in top-level management, mid-level management, employees and supportive roles. The top-level positions consist of directors, while the mid-level management includes regional directors and section directors. The employees below mid-level management include the project managers, quality managers and project assistants. The supportive roles include: IT, human relations, finance and administration. Faveo has seven office locations in Norway; these are in Bergen, Trondheim, Tromsø, Oslo, Sarpsborg, Kristiansand and Tønsberg (Faveo 2012).

4.2 Environmental Outlook at Faveo Prosjektledelse

Faveo projektledelse considers the environment to be an important issue. Faveo is ISO 14001 certified, and some of their offices are Eco-lighthouse certified. One of their services includes assisting other companies to become ISO 14001 and Eco-lighthouse certified. Faveo has its own work group that focuses on CSR and environmental management that work both internally in the company and with customers. Faveo has also BREEAM expertise amongst their employees and can assist in projects that use the BREEAM assessment methodology (Faveo 2012).

4.3 Services provided by Faveo Prosjektledelse AS

Faveo has three main competency areas that they provide to their customers. This includes: project management, project development and specialist services. Their fields of operations are in the following sectors: Building and Property, Construction and infrastructure, Energy and Industry, Business development, IT and Technology Development.

Procurement	Engineering Management	Digital interaction	Property development	Business development	Progress control
IT and tech devlopment	Industrial projects	Interactive business systems	Communication	Concept range study	Cost management
Quality Management	Quality assurance	Management	Environment	Project scope Management	Training
Organizational development	Area planning	Process analysis	Document management	Project advising	Risk analysis
	Infrastructure Mangement	Testing	Uncertainty management		

Figure 11 Services provided by Faveo (Faveo 2013a)

The figure 11 shows an extensive list of services that are provided by Faveo. There are even more services offered. This figure shows that the area of expertise in the company is broad, but, at the same time, they have acquired specialist areas that give them a unique profile (Faveo 2013a). Faveo is an intermediary between the customer (project owner) and the contractors that perform the engineering and constructing. A small number of support clerks and experts work in the offices of Faveo, while most of the project manager consultants work externally at the customers or project location.

4.4 Project Management at Faveo

Faveo has several project managers that have certifications from the Project Management Institute and the International Project Management Association. They apply several of the principles of project management developed by PMI and IPMA, combined with their own internal management systems developed in Faveo. Faveo has developed a project management system to guide the project managers. The system is presented in four perspectives, according to the chosen leaf of the "four leaf clover" in figure 12. The four areas in this filter are: business areas, specialist areas, project models and work flow. This is illustrated in Figure 12 (Faveo 2012).
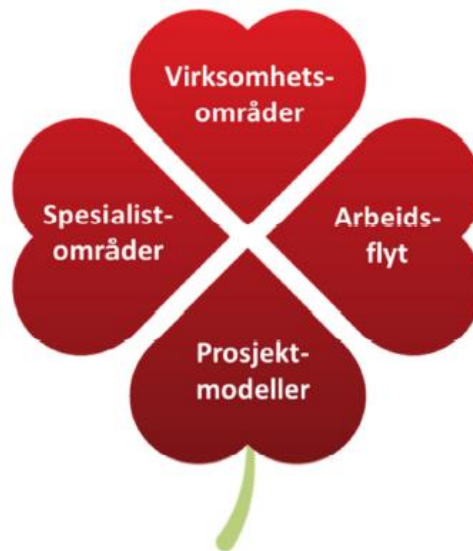
Figure 12 Four leaf model from annual report (Faveo 2012)

Project management in Faveo includes twelve specialist areas: value, scope, leadership, integration, stakeholder management, procurement, uncertainty, economy, quality, environment, health and safety and time. Ten knowledge areas are provided from the PMBOK guide, but they have expanded the area called quality to show the environment (nature), health and safety separately. The ICB provides two elements of competency that Faveo uses: leadership and project environment. Then there is also one element that neither the PMBOK nor the ICB provide, but is important for Faveo's projects: value. Value is not mentioned in PMI and ICB, but Faveo considers value to be an integral part of project management. Actually, a key to understanding project management. By adding this element Faveo wants to take their projects to another level, beyond time, cost and quality which seems to be more important for PMI (Faveo 2012). The five project management processes of Faveo are derived from the PMBOK guide as illustrated in figure 13.
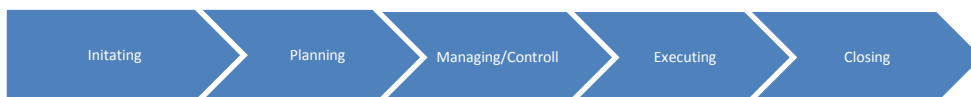
Figure 13 Project management process at Faveo (Figure from Faveo annual report 2012)

4.4.1 Faveo Academy

Faveo Academy is established to serve as the common arena for competence development and exchange of experience. It is an internal program offered to every new employee to train them and give them the best tools to achieve the best project results. This program is especially important for Faveo since most of the project managers' working time is spent externally with the customers. Therefore, it is beneficial to have this program to create a common ground of thought amongst the employers to ensure that the company is represented properly when working with the clients.   The academy contributes to developing shared visions company culture and develop project management "the Faveo way" is also a part of Faveo academy's objectives. Faveo Academy is primarily for own employees, but do offer training and courses to other organizations (Faveo 2013c).

5 Qualitative Analysis

The qualitative analysis performed in this study serves the purpose of gaining more richer and deeper data from the project managers at Faveo Prosjektledelse AS, in order to develop a proper basis for the quantitative analysis in chapter 6. It also serves the purpose to provide a basis for developing the green purchasing indicator set and indicator model in chapter 7, in order to develop the most relevant indicators for project managers. The interviews are performed with project managers that work in construction projects.

5.1 Semi-structured interviews

The data from the semi-structured interviews are categorized in three topics:

- Green Value Creation ambition of the project managers

- The project manager as a purchaser

- Environmental demands from the customers

The questions in the interview guide and the respondent's answers can be found Appendix **A** and **B**. The interviews started with the explanation of what Green Value Creation entails to the respondents in order to give them an idea on what the topic of the interview is. The interview starts with introductory questions with fairly simple answers without requiring any deep reflection, such as education, experience and responsibilities at Faveo Prosjektledelse AS. The first part of the main questions was related to Faveo in general and the respondent's views on the environmental profile of Faveo. The purpose of these questions was to uncover information on Faveo and to help the respondents reflect on Faveo as an environmental actor. The second, third and fourth part of the main questions concerns the three topics mentioned above, these questions servers the main purpose of the interviews. The interviews finished with ending questions that served to normalize the situation after a long interview. These questions were designed to be easy to answer and allow the respondents to mention relevant information not covered by the introducing and main question. In total six interviews were performed with project managers in Faveo that worked or has worked in building and construction projects. The respondents are referred to not by name, but by the letters A to F, dependent on the chronological order on the date of the interviews were held. Appendix B includes the different answers from each person from A to F. The interviews lasted between 20-45 minutes depending on the knowledge of the respondents on the topics and all of the interviews were performed in the Trondheim at Faveo's office. The interviews were held in the respondent's native language Norwegian, which explains why the interview guide is

written down in this language. This choice was made in order to make the respondents more comfortable and to eliminate issues that would occur with English. The interviews in this study are recorded after gaining the respondents permission, and it was agreed upon that all the respondents would remain anonymous. The recording will also be deleted when the study is completed. Bryman's (2012) principles on recording interviews are followed rigorously in order to secure the ethical considerations that might arise when conducting recorded interviews. Based on the recordings the interviews are partially transcribed, this means only key words that were relevant as answers to the questions are written down in a table in Appendix **B**. The reasoning behind the partially transcribing is both to save time, and to give the reader the most relevant answers related to the three main topics.

5.2 Analysis and Discussion

The analysis methods are based on Bryman (2012), by choosing some themes and key words that shows a tendency amongst the respondents. The thematic analysis we find in Bryman is somewhat different, but the principles are similar. In this thematic analysis some central questions in each of the three topics mentioned above are analysed and discussed, the answers of these questions are considered to be most significant for research questions. This section combines both analysis and discussion.

5.2.1 Green Value Creation ambitions of the project managers

9) Are you familiar with any environmental labels and certifications which can be used in projects by Faveo?

To this question BREEAM seems be the theme, other certifications such as ISO standards and the Nordic Swan were mentioned. The BREEAM certification was mentioned most, person A, C and D mentioned this one, but neither of the respondents had much knowledge of environmental labels and certifications. It seems that BREEAM is a popular certification amongst project managers at Faveo, but there is a lack of competence in other labels and certifications that might promote Green Value Creation. There can be many explanations such as the lack of proper training and demand for these labels and certification from the customers.

10) How important are environmental consequences to you as decision maker in projects?

The answers varied too much to give a thematic tendency, but all of the respondents gave an indication that the environment was important, but both person C and E mentioned that the customer had an important role. None of the respondents gave specific environmental

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initiatives that they would use or follow. Again one can argue that the clients of Faveo does not request the knowledge and competence to include environmental consequences in the decision making in projects, but a positive trend is that they all agreed that issues related to the environment was important.

11) What do you think is the biggest obstacle to promote environmentally friendly investments in projects?

Economy and issues related to this subject was mentioned by all the respondents. Public demands were also mentioned by three of the respondents, the lack of public requirements was an important factor. Person A and B also mentioned the users as an important actor. The budget can be regarded to be a difficult obstacle to conquer, especially when there is missing public demands and governmental requirements. Costs and lack of requirements from the government makes promoting the environment in project very difficult and this might be the reason why costs usually gain the most influence.

13) What do consider the most important criteria for a successful project?

Time, cost and quality was a repetitive theme in the answers to this question, these three criteria coincides with the traditional project management methodology. Person A considered the Triple Bottom Line as important, while person C mentioned projects where the environment was important. The answers to this question indicate a shared view on projects of the project managers at Faveo Prosjektledelse AS. Time, cost and quality can be considered to be criteria that can be an obstacle to introduce new criterion such as the environment.

14) What are your thoughts on the environment being brought in as a criterion to evaluate successful projects?

It was mostly positive answers from the respondents, but different solutions and ideas. They agreed on that the environment should be a criterion. The answers varied too much to give a tendency amongst them. The answers might have varied due to the fact that the respondents have different education and background. The positive reactions to the question might indicate that there is a need for a tool or strategy that can bring in environment as criteria.

5.2.2 The project manager as a purchaser
16) What is your role as a purchaser in project?

Three out of six respondents did not work with purchasing right now, but they have done it previously. Person E mentioned the task of making a specification which gives the foundations for the price, and to collect price and offers from several suppliers in order to make a comparison. Purchasing consultancy services and enterprises was also mentioned by person D. The purchasing role differed from respondent to respondent. The project managers interviewed does not have a common role in purchasing, which makes it difficult to generalize. The purchasing role changes with each project and customer.

18) Which criterion is most important to you as purchaser in projects?

Time, cost and quality are themes which are repeated, especially cost is a key term. A tendency is that each respondent has actually mentioned environment as important in purchasing. Functionality and delivery are other key words mentioned by two respondents. Such as the most important criteria for a successful project also here time, cost and quality is mentioned as important in purchasing. These three criteria can also in this case be an obstacle for environmental improvement, but it is interesting that the environment is mentioned by each respondent, indicating a significant step towards a change.

19. What kind of strategies and models do you use to make purchasing decisions?

None of the respondents mentioned any specific strategies and models, Person C and D mentioned that they it depends on the client and often their systems and models are applied. Person E mentioned that they have to follow regulations and instructions since 90 percent of his clients are pubic companies. The response to this question varied amongst the respondents, which makes it difficult to provide an overall tendency, but one tendency is that none of the respondents used any strategies or models. The answers indicate either insufficient purchasing competence or lack of possibilities to use strategies and model then specified by the client.

20) How much does the customers your purchasing choices and the criteria to the purchasing decisions?

Most of the respondents answered that it depended on the customer; some customers are more active than others. Person D and F claimed that the client makes the final decision, while Person A mentioned time, cost and quality plays a big part. The answers indicate that the decision making in purchases in projects is not always done by the project managers and this might make it difficult to introduce environmental friendly products. In some cases they can influence the purchases, but there are still limitations that can't be avoided.

5.2.3 Environmental demands from the customers

21) How do you perceive as the most important criteria of the customers for successful project?

Money, budget, price and economy are key words that are uttered by the project managers, the difference between public and private sector is also mentioned. Person B claims that private companies that are big and serious has the environment and sustainability as a priority, and this is verified by Person C which mentioned that in the private sector they have more leeway. It seems that issues that are related to costs in projects are the most important criteria for the customers. Other criteria related to the project owners own agenda was mentioned. The agenda differs from public to private companies, and this variation amongst the clients makes it hard for project managers to promote Green Value Creation, especially if the investments are too expensive.

22) What kind of demands is there to implement environmental friendly solutions from the customers?

Most of the respondents did not give any specific answers. Person B mentioned the demand for environmental accounting was moderate. Person E expressed that there is a tendency of being more focus on the environment, especially in the public sector where energy and environment is important. The answers to this question indicate the lack of demand for these solutions, and this might be a reason why the project managers are not more environmentally aware. It can be argued that the customers don't think being green is economical sustainable, and since there is no strict requirements from the government they are not compelled to pursue green initiatives.

25) Do you think that the environmental awareness of the project owners have increased the last ten years?

Five out of six respondents answered yes to this question, but person A, D and E are critical to the development. Person A claimed that it was only on the surface, while person E said it was only recycling rubbish that has increased the last 15 years, and Person D mentioned that reducing the CO_2 emissions was ongoing, but it was not always for the better. Based on the response from the project managers it seems that has not been a radical change, instead it has been a process that has been slow. The answers varied which makes it difficult to recognise commonality between them, but it can be pointed out that there was not much knowledge within this subject amongst the project managers.

5.3 Results and Concluding remarks

The interviews indicate that there is a significant difference between the environmental knowledge and competence amongst the project managers. This can be related to the different background and education, and it is also depended on the experience and types of projects the project managers have. The Green Value Creation ambitions can be considered as moderate to low amongst these project managers at Faveo, and it seems that their surroundings at work does not make it easier to promote Green Value Creation. Their familiarity with eco-labels and certifications was not extensive, but three of them mentioned BREEAM, which indicate some knowledge. The respondents consider time, cost and quality to be the most important criteria in project, and even though three out six mentioned the environment this was not a criterion. Budget and lack of public requirements seemed to be the most significant obstacle for environmental friendly investments in project, in addition to customer demands. A positive trend amongst the respondents was the agreement on including the environment as criterion in projects, this can indicate a small elevation on the Green Value Creation ambition of the project managers at Faveo.

The purchasing role of the project managers differed depending on their project and their tasks. Their role varied anything from setting requirements in building contract to purchasing consultancy services and contracts. The project managers did not purchased specific products and materials, but instead supervised and developed specifications for purchases. Time, cost and quality were mentioned as the most important criteria, in which cost was the most important when purchasing for projects. The environment is also mentioned by five out of the six respondents as a significant factor when dealing with purchases, and this shows that the project managers have to a certain degree an environmental awareness as a purchaser. The customer's preferences and requirements is important to decide the criteria in purchasing, but this depended much on how much involvement the customer wanted in the purchasing procedures. Sometimes the project managers had some flexibility.

The environmental demands of Faveo's clients are from moderate towards minimal according to the respondents, this is reflected by the mentioning of money, budget, and economy as important criteria for the customers in evaluating projects. The environment is mentioned briefly, in which the clients in the private sector gave the project managers more leeway. A positive trend is that five out of six project managers agreed on that the environmental awareness of their customers has increased the last ten years. According to the respondents in the interviews the environmental demands from clients vary from project to project.

The interviews of the project managers at Faveo indicate that further research needs to be done in order to give proper answers to the research questions. A self-completion questionnaire will be performed, which will give more data to analyse.

6 Quantitative Analysis

This chapter provides the quantitative analysis, which gives the study data that can be generalized to a larger population. The self-completion questionnaire provides a larger amount of quantifiable data which a semi-structured interview cannot. This quantitative analysis provides valuable data which is used to develop the green purchasing indicators in chapter 7.

6.1 Self-completion questionnaire

The self-completion questionnaire was developed with the help of the semi-structured interviews that were performed on the respondents from Faveo Prosjektledelse AS. The questionnaire has two purposes; first is to explore the same three topics such as the interviews, which are:

- Green Value Creation ambition of the project managers
- The project manager as a purchaser
- Environmental demands from the customers

The second purpose was to use the survey to develop the indicators that enable the project managers to purchase greener building materials and contracts. The interviews, survey and the indicators are to a certain degree interconnected. The questions in the self-completion questionnaire are chosen based on the performance of the questions in the interviews. The survey consist of 16 questions covering the three topics mentioned above, it has a similar structure as the interview guide. The questions and summary of the answers can be found in appendix **C** and **D**. The survey tool that was used was the free Google Form tool provided by Google Inc. The first five questions are related to gender, age, education and work experience. The rest of the questions are directly related to the three topics mentioned above.

The questionnaire was sent out to 60 project managers at Faveo within the building/construction and transportation department in Norway, it was sent out through e-mail by the managers of the construction and transportation department. Out of 60 recipients 20 of them filled out the questionnaire which means that the response rate is about 33 percent or 1/3. 16 of the respondents are male, while 3 of them are female and one is unknown due to lack of answer on the gender question. The questionnaires revealed that 12 of the 20 respondents hold a master's degree and the rest of the 8 have a bachelor degree. The largest age group is between 40-50 years, which consist of 40 percent of the respondents. None of the respondent is between 20-30 years, while the age groups 30-40, 50-60 and older than 60

years have each a 20 percent share. The respondents work experience within project management was high with 60 percent with more than 10 years' experience.

The variables in this quantitative analysis can be classified on the measurement level of the nominal scale and ordinal scale. Some variables in this study are in nominal scale, in which the variables values are exhaustive and mutually excluding categories such as gender, education level. Other variables can be meaningfully ranked such in the questions related to environmental demand, influence of the customer and level of agreement, which can be classified as ordinal scale.

6.2 Analysis and Discussion

The analysis is done through using Google Form answer sheets and graphics provide through this tool. The answers are also provided in excel worksheets, excel is used in order to uncover similarities on responses based on the respondents age, gender, experience, education and field of work. The first issue to address is the overrepresentation of male respondents compared to females, this makes it difficult to make any generalization on the differences between the responses based on gender. The self-completion questionnaire was sent out to project managers without any gender preferences and is completely anonymous. The most realistic explanation on the lack of female respondents might be the overrepresentation on male employees in Faveo in the building/construction and transportation department.

6.2.1 Green Value Creation ambitions

The response to the question number 6 *which of these following environmental labels and certifications are you familiar with?* shows that 6 of 7 of recipients that responded NONE familiarity are males, while the last recipient which also gave the same response failed to answer the gender question. This means it is not possible to claim whether this respondent is male or female. A commonality between all the females was the familiarity with both BREEAM and Eco-lighthouse, in general females was more familiar with these labels and certification than their male counterparts. Since none of the females replied NONE to this question, which means 100 percent had some familiarity about these labels and certifications. Another commonality is that all of the females have 4-7 years' experience in project management, which can explain that they relatively new to the field compared to their male counterparts, and might therefore be more open to newer development within project management where the environment has a more significant role. The only other respondent which is male that also have 4-7 years' experience had the same level of familiarity with

environmental labels and certification as the females. This also opens for the possibility of environmental knowledge might be related to work experience.

Additional data that can back up the statement above made concerning work experience and environmental knowledge is that 7 out of 7 respondents replied NONE familiarity with these labels and certifications have more than 10 years' experience within the field. It could be argued that professionals with long experience are less prone to newer developments within their field, in other words they might be more set in their ways. Another explanation might be that their education at the university did not cover environmental perspectives, which is more current in today's society and in the universities. It is worth mentioning that 5 out of 7 respondents that gave NONE as response to question number 6 holds a bachelor degree. This response may indicate that education level can be related to environmental competence, but on the other hand all of these also have ten or more years' experience which is mentioned and this might be the common denominator, not their education level.
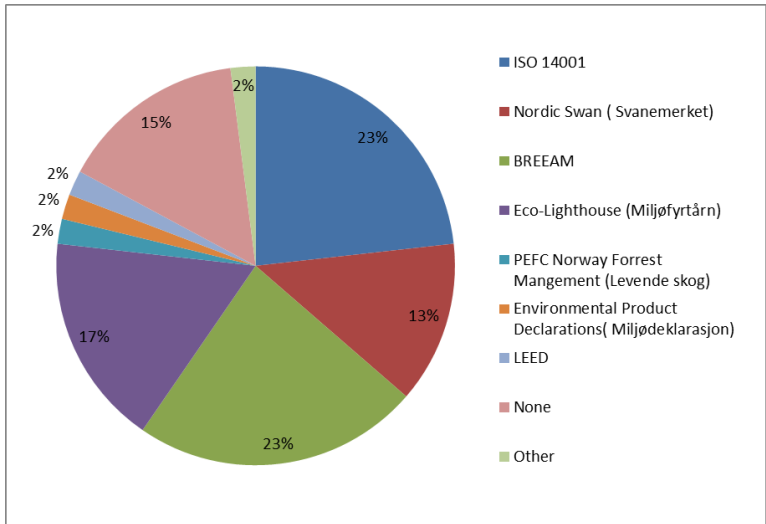
Figure 14 Familiarity of Eco-labels and certification amongst respondents

The figure 14 illustrates a pie chart that shows ISO 14001 and BREEAM are the most recognised certifications amongst the project managers at Faveo. Each of respondents had the opportunity to tick one or more of the options, which means that one could give multiple answers depended on their knowledge. BREEAM and ISO 14001 got 23 percent each of total answers. BREEAM is a certification methodology that has been used by Faveo in construction projects, which is an explanation why BREEAM is one of the most recognized certifications. In addition Faveo provides services that help companies to achieve ISO 14001 certfication, which can explain the high response this certification gained amongst the respondents.

BREEAM was also the most mentioned by the respondents under the interviews, some also mentioned ISO 14001. The Eco-Lighthouse (Miljøfyrtårn) is the second most recognised certification, with 17 percent of the answers. With 15 percent of the responses on NONE familiarity, might indicate that the environmental knowledge of the project managers is decent, but still might need improvements, especially within the project managers with more than 10 years' experience and a bachelor degree.

The response to question 7 *Environmental performance should be included in projects as a criterion for successful projects* illustrated in figure 15, indicates that the respondents agree to the statement. Each respondent could only tick one response.
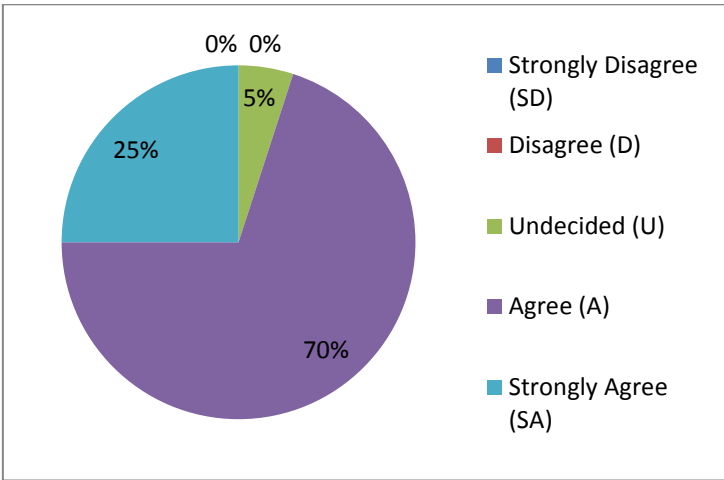
Figure 15 Response to question 7

70 percent replied AGREE as a response, while 25 percent choosing STRONGLY AGREE and only 5 percent with UNDECIDED. The pie chart in figure 15 shows the distribution of response and the different answer options. Another interesting observation is that none of the responses are STRONGLY DISAGREE or DISAGREE, which might indicate that the environment is an issue the project managers think should be brought into projects. Even though the positive response from the respondents favouring the environment, the response on the next question number 8 *Environmental consequences are important in my decision making as a project manager* tells a slightly different story. The pie chart in figure 16 illustrates a different distribution on the level of agreement.
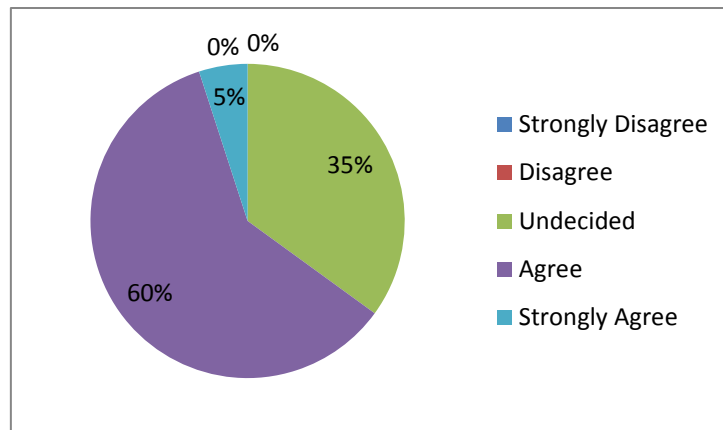
Figure 16 Response to question 8

The chart illustrates a distribution where both response on has gone down STRONGLY AGREE with 20 percent and AGREE with 10 percent, while UNDECIDED has gone up with 30 percent which is a significant difference from question 7. It could be argued that even though the respondents think that environmental criteria are important, does not mean that they necessarily agree on that environmental issues are important in their decision making. In other words what people ideally think should be done, does not always correlate with their practices in real life situations. It is worth mentioning UNDECIDED does not mean that the respondents disagree with the statement, it only means that they have not formed an opinion about the matter in hand. Another explanation regarding the decline in STRONGLY AGREE and AGREE might be the lack of competence and training that makes involving environmental consequences in decision making difficult.

The respondents were asked *What do you consider the most important criteria for a successful project?* They were provided with small textbox to give their response. This was one of the questions that showed how similar the priories of the project managers at Faveo in evaluating projects. 75 percent of the respondents gave an answer that was related to time, cost and quality or all of these three criteria combined together. Only one respondent provided an answer related to the environment which was *low energy consumption*. The answers here indicate that even though 95 percent of the respondents answers in question 7 were positive to include the environment as criterion in projects, in reality it seems that the environment is not a priority. It seems that the influence from PMI and IPMA is still present amongst these respondents.

6.2.2 Purchasing at Faveo Prosjektledelse AS

The response to the question *Have you ever used environmental certifications or labels when purchasing materials and services in a project?* shows that most the project managers at Faveo has not used or can't remember using these certifications or labels when purchasing materials and services in project. The results reveals that 26 percent replied YES to this question, and over 53 percent on NO this indicates and 21 percent on CAN'T REMEMBER. There can be many explanations to these results such as lack of knowledge, environmental training and demands from customers. Another explanation could be that purchasing is not a significant part of their work load, in other words purchasing is not a large part of the work tasks for these respondents. This explanation can be to a certain extent be verified by the replies to the question 11 related to percentage of task involved with purchasing in projects.

The figure 17 illustrates a pie chart that shows the distribution of the answers to the question 11 How *much of your tasks at work involve purchasing of materials and services?* The respondents were asked to only give one answer.
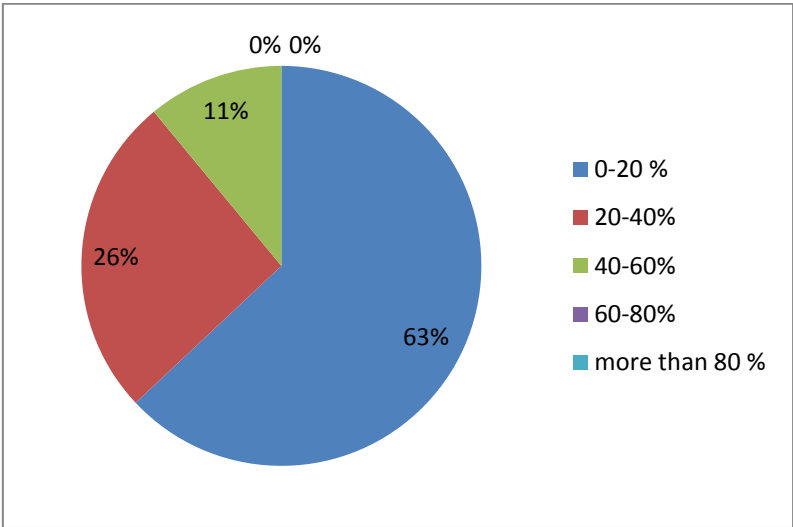
Figure 17 Response to question 11

With over 63 percent of the respondents choosing 0-20 % of their work task are related to purchasing materials and services in projects, one could argue that purchasing is not significant work task. But 26 percent on 20-40 % and 11 percent replied 40-60% shows that purchasing can be regarded as significant part of 37 percent of the respondents work tasks.
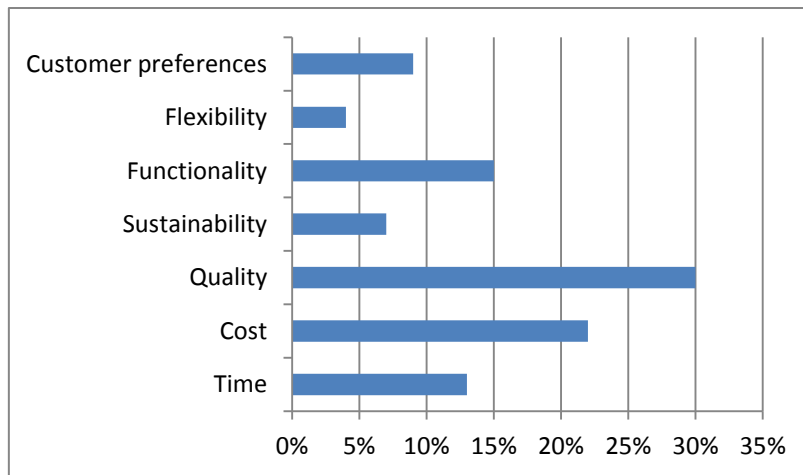
Figure 18 Most important criteria for purchasing

The figure 18 provides a chart that illustrates the most important criteria for the respondents at Faveo as a purchaser in projects. Each respondent was allowed to tick out one or more answers of criteria they use when performing purchases. QUALITY seems to be the most important criterion with over 30 percent of the total responses, with COST in second place on 22 percent and FUNCTIONALITY on third with 15 percent. Behind these three criteria is TIME with 13 percent. Similar to the most important criteria's for a successful project, also in purchasing these criteria are most important, with functionality included in the case of purchasing. Again one can see the influence of the traditional project management framework. An interesting observation is the low percentage that sustainability received with only 7 percent. The environment had also a low response in the question related to criteria on successful projects, in this case *low energy consumption* was the only answer related to the environment. This is an interesting pattern, which shows the importance of the "iron triangle" (time, cost and quality) amongst the project managers.

Another explanation on the small response on sustainability can the customers influence on the purchasing decision making done by the project managers. Faveo is a company that offer their employees services to private and public companies to work on their projects, in other words these firms are the project owner with most of the influence. The respondents were asked to give a response on a scale from 1 (No influence) to 10 (Strong influence) on the question 13 *How much does the customers influence your purchasing choices in projects?* The table 2 shows the responses from the respondents.

Table 2 Response to influence from customers in purchasing

Scale	Percentage of response
1	0%
2	5%
3	0%
4	0%
5	11%
6	21%
7	26%
8	26%
9	5%
10	5%

The table 2 illustrates that the decision making is not always only done by the project managers. Over 95 percent answered that the customers influence on purchases 5 or over on a scale from 1 to 10, over 5 on the scale equals medium to strong influence. 62 percent replied with number from 7 to 10 which is a large number that indicate a strong influence from the customer. It could be argued that one of the reasons that sustainability got such low response is that customer's preferences and specifications has the most influences, and in some situations the project managers have no choice, other than following them. The interviews also gave similar response with the customer influencing both the project and purchasing.

6.2.3 Environmental demands from the customers

The customers influence with the absence of environmental demands and requirements makes it could be difficult to promote Green Value Creation. Table 3 indicate that the environmental demands from the customers are not significant. The scale goes from 1 (No requirements) to 10 (Strong requirements).

Table 3 Environmental demands from customers

Scale	Percentage of response
1	0%
2	11%
3	21%
4	11%
5	21%
6	11%
7	16%
8	11%
9	0%
10	0%

The table shows that more than 64 percent of respondents replied that the environmental demand is between 1 to 5, which is considered being from medium to low, but there is still a percentage of 38 percent that responded from 6 and above. Still the majority was from 5 and below, which means that the demands from the customers are not that significant. The respondents were asked *What do you perceive as the most important criteria of the customers for successful project?* The purpose of this question was to uncover the differences and similarities of the project managers criteria compared to their clients. Each respondent were given the opportunity to answer through a small textbox qualitatively. The responses on their own criteria are somewhat different from the customers or project owners, it seems functionality is a more important criterion for the customers. With over 7 project managers responded functionality as an important criterion for the customers compared to only 2 on the project managers criteria it could be argued that some clients goes beyond the *iron triangle*.

Even though functionality is important for the clients, still it is time, cost and quality are the most important the customers. It appears that there are similarities between the project managers and the clients, with over 14 answers given by the respondents related to time, cost and quality as the important criteria for the customers. Criteria related to environment and sustainability was not mentioned much except once by one respondent. This criterion was low energy consumption. It is worth mentioning that the question asked for the respondents perceptions of their clients, it should be pointed that their answers might slightly deviate from the customers own perceptions. The similarities between the between the clients and customers criteria is not positive considering environmental performance in projects.

6.3 Results and concluding remarks

The analysis provides some interesting results regarding the Green Value Creation ambitions of the project managers at Faveo. It seems that most of the respondents agree on that environmental performance should be a criterion evaluating projects, but fewer actually agree that they consider environmental consequences in their decision making in projects. It is difficult to observe any trends related to gender due to only three female respondents out of 20, but all the of these three were familiar with two or more environmental labels and certifications. An interesting observation is that work experience might influence the familiarity with these labels and certification, apparently all of the respondents that replied none familiarity had ten years or more experience. The commonality between less environmental knowledge and work experience is interesting and might be explained by lack of environmental education and training.

The most recognized environmental certification amongst the project managers are ISO 14001 and BREEAM, with over 23 percent of the total response each it is apparent these two are most recognized. The eco-lighthouse certification and the Nordic swan label had also a significant level of familiarity amongst the respondents. In general the knowledge regarding these environmental labels and certifications is good, even though 15 percent did not have any familiarity. It could be argued that some training and education within environmental labels and certification might be beneficial in order to increase the GVC ambitions of the projects at Faveo.

Over 95 percent of the respondents either agrees or strongly agrees on that environmental performance should be a criterion to evaluate successful projects, but less actually agrees that they include environmental consequences in their decision making. It seems that ideally the project managers would prefer that environmental issues should be included in project management, but don't know how this is actually done. The silver lining in this situation is that most of the respondents agree on including environmental performance in projects. This is a positive trend amongst the project managers, which indicate that the ambitions towards Green Value Creation can be found amongst the respondents.

The respondents were asked what they think are the most important criteria for a successful project and only one respondent gave a response that was related to the environment, which was low energy consumption. Over 75 percent gave an answer related to time, cost and quality developed by traditional project management frameworks. One could claim based on this response that the GVC ambitions are not significant. Accordingly the criteria of the customers are coincides with the project managers. It seems that time, cost and quality are important criteria for both the customers and project managers. The dominance of this criteria indicate that the GVC ambitions are not high, which in turn can make it difficult to promote environmental initiatives.

The purchasing role of project managers differ from an individual to another, most of respondent in this study replied that purchasing was not a significant work task. With 63 percent of the respondents replying that only 0-20 % of their work task involve purchasing it can be argued the purchasing of materials and services in project is delegated someone else. It should be mentioned for 37 percent of the respondents purchasing is a significant work task. The analysis also show that the customers influence on purchasing is significant, which means that the project managers shares the decision making on purchases in projects. Another

significant result is that the most important criteria for the respondents as purchasers are time, cost, quality and functionality, again the "iron triangle" from traditional project management is the guiding light. Sustainability got only 7 percent of the responses, which also confirms that the GVC ambitions of the project managers are not high. The customers influence on purchasing might affect the criteria for purchasing, through requirements and specifications that does not include environmental issues.

An obstacle for promoting Green value creation might be the inadequacy of environmental demands, with over 64 percent responding that environmental demands from customers are medium requirements to low requirements. With the majority answering 5 or below on a scale from 1 to 10 it seems that the customers does not promote green initiatives. It is evident that lack of environmental education, training and demands from customers has a negative effect on Green Value Creation ambitions of the project managers at Faveo Prosjektledelse AS.

Based on this quantitative analysis it could be argued that the GVC ambitions of project managers and the environmental demands from customers are from moderate to low. The influence from customers does not give the project managers much leeway to promote GVC. Another dilemma that project managers are facing is their obligations towards fulfilling the requirements of their clients in order to gain their satisfaction. It might be to narrow minded to give the all of environmental responsibility to the project managers or their customers, the responses to the self-completion questionnaire indicate that there is need of more environmental training and knowledge for both sides. The solution might be to work towards collaboration between the project managers at Faveo and their customers to promote GVC through increasing awareness and training. The next chapter will give suggestion on how one can promote Green Value Creation through green purchasing indicators to increase the environmental performance of projects. These indicators can provide a guideline to enable the project managers to perform greener purchasing practices.

7 Green Purchasing Indicators

Both the qualitative and quantitative analysis reveals the need for higher Green Value Creation ambitions amongst the project managers at Faveo, the need for more environmental competence is apparent. The indicator set and indicator model in this chapter is developed for project managers in order to enable greener purchasing in construction projects. The purpose of the Green Purchasing indicators is to promote GVC in projects. This chapter contains explanations of the indicators chosen, and it provides guidelines for using the indicator set and indicator model. The reason behind the development of an indicator set and indicator model in this thesis is to give project managers a practical and simple tool to evaluate the environmental performance of materials and contracts.

7.1 Development of indicators

The development of these indicators has been done by following the steps from Andersen and Fagerhaug (2002). The indicators set and indicator model are suggestions on how indicators of Green Purchasing can be developed. With the collaboration with project managers at Faveo through semi-structured interviews and self-completion questionnaire the indicators that are listed in this chapter are developed. As mentioned in section 2.7 the definition of indicator from UNEP (2012) is applied in this study.

7.2 The Indicator set for evaluating building materials

The indicator set is developed for project managers that have a purchasing role where they have to order the building materials directly from the suppliers. The indicators for this set are chosen based on two criteria.

- The eco-labels and certifications that the quantitative analysis uncovers the most commonly mentioned amongst the project managers at Faveo Prosjektledelse AS.
- The second criterion is that the indicators should cover environmental problem areas such as biodiversity, CO_2 emission, recycling and take back/reverse logistics.

Building materials is chosen due to the extensive resources it requires to construct a building, according to Guggemose and Horvath (2005) the construction of buildings are responsible for a significant consumption of material and energy in industrial societies. The building sector accounts for one-sixth of the withdrawals of fresh water in the world, in addition to one-quarter of the wood harvest and two-fifths of the world's material and energy flows.

The building materials that is chosen to make indicators for is concrete, steel, timber and glass, the reasoning behind these choices is based on the significant environmental footprint

of these materials. The assessment of the environmental impacts of building materials done by Harris (1999) provides the comparison of the environmental profiles of these materials. This comparison is illustrated in the table 4.

Table 4 Environmental profile of building materials (Harris 1999)

Material	Embodied energy kWh/m³	Renewable resource?	Scarcity of raw materials	Local extraction disruption	Indoor effects (Toxicity)	Recycling potential	Energy (Resistance per 100 mm)
Brick (Fletton)	300	Non-renewable	Common	High	Dust if exposed	Low-med	0.125
Timber (imported softwood)	7540	Renewable	Common	Low	None	Med	0.714
Timber (local oak)	110	Renewable	Common	Low	None	Med	0.588
Clay tiles	1520	Non-renewable	Common	High	n/a	Low	0.175
Concrete	800	Non-renewable	Common	High	Dust if exposed	Med	0.078
Lightweight blocks	600	Non-renewable	Common	High	Dust if exposed	Low-med	0.077
Crushed granite aggregate	150	Non-renewable	Common	High	n/a	High	0.04
Cement	2860	Non-renewable	Common	High	Dust if exposed	Med	0.139
Steel	103,000	Non-renewable	Common	High	None	High	0.002
Copper	133,000	Non-renewable	Scarce	High	None	High	0.00027
Aluminium	75,600	Non-renewable	Scarce	High	None	High	0.0005
Glass	23,000	Non-renewable	Common	High	None	High	0.095
Cellulose insulation	133	Made from recycled material	Common	Low	n/a	It is recycled material	2.5
Mineral wool	230	Non-renewable	Common	High	Dust if exposed	Low	2.22
Synthetic finishes	High	Non-renewable	Common	High	Asthma etc.	Low	n/a
Plastics	47,000	Non-renewable	Common	High	None	Low-med	0.625

According to the table 4 timber from local oak is the most environmental friendly based on the numbers presented, it requires the least embodied energy, and has the best thermal resistance (0,588, resistance per 100mm) of the four chosen materials. It is the only renewable building material of these four and has low local extraction disruption compared to the other three. It is worth noting that imported soft wood timber requires significantly more embodied energy that the local oak timber. There is none indoor effects (toxicity) of timber from local oak and the recycling potential is medium. Concrete has an embodied energy of 800 kWh/m3 compared to timber of local oak which has 110 kWh/m3, it is non-renewable and has a high local extraction disruption. The timber and concrete has the same recycling potential of medium. The steel (103.000 kWh/m3) and glass (23.000 kWh/m3) has the highest embodied energy requirements, and high local extraction disruption. These two materials can be considered to have the largest environmental impact, but at the same time the best recycling potential. The steel has the lowest thermal resistance on 0.002 per 100 mm, while glass has 0.095 which is better than concrete with 0.078 (Harris 1999). According to the table 4 the timber from local oak is the most environmental friendly compared to steel, glass and

concrete. Section 7.2.1-7.2.4 provides background information of the indicators, in order to provide the users of the indicator set some basic knowledge.

7.2.1 Eco-Labels Type 1, 2 and 3.

Eco labelling is a worldwide voluntary environmental performance certification method. An Eco label identifies the overall environmental performance of a product or service (Global Eco labelling Network (GEN 2004). The reasoning behind Eco labelling was the recognition of the need to address environmental issues, as the emerging internationalization of commercial enterprises came about. Businesses recognized the need for providing their products with labels that could claim an environmental friendliness towards their stakeholders such as customers and general public. This type of labelling could lead to a competitive advantage since consumers were looking for products which address environmental concerns. According to the International Organization for Standardization (ISO), Eco labels can be of three types (GEN 2004.):

Type 1, environmental labels: a voluntary, multiple-criteria based, third party program that rewards a license that entitles the use of environmental labels on products or services. Indicating the overall environmental performance of a product within a particular product category supported by life cycle considerations (GEN 2013). E.g. Nordic Swan, EU Flower etc.

Type 2, self-declared claims: informative environmental self-declaration claim (GEN 2013). Self-declaration claims means that the companies themselves create labels about their own products or services environmental performance.

Type 3, environmental declaration: voluntary programs that contribute quantified environmental data of a product, under pre-set categories of parameters decided by a qualified external third party and based on life cycle assessment, and verified by another qualified third party (GEN 2013.).

As a result of the growth of different types of Eco labels a situation occurred in which customers kept getting confused, this led to concerns about how credible and objective these labels actually were (GEN 2013). Especially with type 2 labels which included self-declaration. The need for guiding standards and third party investigations emerged in order to form a guarantee of the labelled products actual environmental performance could be given. Third party labelling by public and private institutions emerged, in order to build the credibility and objectivity of Eco labels through different programs or schemes.

Environmental Product Declarations, (EPD) which are a third party Eco labelling, emerged from this.

7.2.2 Environmental Product Declaration (EPD)
An EPD indicates the environmental consequences and resource use of products throughout their life cycle (SINTEF Byggforskning 2011). EPD are designed as a tool for companies to communicate and could be used as an environmental documentation to meet customer's demands, in a situation which an increased Life Cycle Assessment (LCA) quantified information such as EPD are demanded (Nyland and Vold, 2003). Environmental declarations are also applied to promote products and the company´s environmental performance. An EPD might also be seen as a competitive advantage. With the development of the environmental declarations and through data collection, the producers can get acquainted with production process, and become familiar with improvements which could be potentially made. This approach provides an overview of the products own environmental profile. This approach on addressing Corporate Social Responsibility (CSR) by showing the declaration to an external stakeholder and developing an EPD for its products is a feasible way of displaying corporate- and value chain accountability. The EPD encompasses the whole value chain (Fet and Skaar, 2012).

7.2.3 ISO 14001, Eco lighthouse and PEFC Norway forest management standard
The ISO 14001 is specification standard that provide requirements for an Environmental Management System (EMS) to make an organization able to develop and implement policy and goals that consider statutory requirements and provide relevant environmental aspects. This standard allows the EMS of an organization to be ISO 14001 certified by following the specifications. ISO 14001 is supposed to be applicable to organizations of all types and sizes, and at the same time be adaptable to different geographic, cultural and social circumstances. The purpose this standard is to contribute protection of the environment and prevent pollution (ISO 14001:2004).

The Eco-lighthouse is a Norwegian environmental certification targeting enterprises, and is completely self-funded through service payments that are charged annually from the participating companies (Miljøfyrtårn 2014). To achieve the certification, the organisation is required to have an environmental accounting system, provide an annual environmental performance report based on a template, and satisfy two sets of requirements. These are the industry-wide requirements and industry-specific requirements. The requirements encompass health, safety and environment (HSE), working environment, energy use, purchasing, material

use, waste and emissions management, transportation and environmental accounts .One area, which differentiate the Eco-Lighthouse from most EMS's is that the environmental management procedures are to be unified in the existing internal control of an organisation, and internal control routines are settled to preserve conformity with the Norwegian Labour Inspection Authority regulations (Granly and Welo 2014).

The PEFC is the world's largest forest certification system established in 1999, the PEFC Norway forest management standard is the *Levende Skog* standard from 2006 with statutory precisions. The first *Levende skog* was approved in 1998 and revised in 2006. The Norwegian PEFC forest standard is developed to promote a sustainable Norwegian forestry and has 25 requirements that together cover areas and initiatives with environmental impacts or other significant practice of forestry. The purpose of PEFC Norway is to work towards a sustainable forestry by making it easier for certification of forests, in addition the certification of forest products that comes from sustainable forestry (PEFC Norge 2014).

7.2.4 Recycling, Take-back policies and Travel distance
According to Brattebø et al., (2011) closed loop recycling is the most beneficial recycling strategy.

> "In product loops, the term closed-loop recycling means to recycle waste materials from one product system back to the production phase of the same type of system or application, whereas open-loop recycling is to recycle in to the production phase of another of system or application" (Brattebø et al., 2011:6).

Brattebø et al., (2011) claims that there are many benefits with closed loop recycling such as the reduction of demand of virgin materials and reduction of leakages of waste to the environment. Loop closing has some benefits in energy saving such as in aluminium recycling where recycled aluminium uses less energy than the processing of bauxite to produce primary aluminium. Open loop recycling involves materials that are recycled into other product systems, which can lead to the use of more materials and energy to recycle. According to Brattebø et al., closed loop recycling should be avoided such in situations where it may be too expensive and also if the product chosen to recycle contains hazardous waste that has large environmental impacts.

A take-back policy involves having a form of extended producer responsibility; this means that manufacturing companies are held responsible for their product throughout their whole life cycle. Take-back policies gives customers the opportunity to deliver back product that

they don't use anymore to the manufacturing firms, in which the products are remanufactured and resold with considerably less resource and energy use. Product take-back reduces waste generation and increases the use of recycled materials. In a study performed by Klausner and Hendrickson (2000) of a voluntary take-back program for power tools in Germany shows the high profits from remanufacturing. This take-back program allowed the manufacturer to offer buy-back plans with discounts on new tools for the customers, with more convenient collection or cash payments.

Transportation is an important basis for many economic activities and is therefore an crucial part of the modern world's life. The increased amount of transportation leads to many environmental challenges, in Germany transportation is responsible for more than 20 percent of the country's energy consumption and CO_2 emissions (Pehnt et al., 2010), while 18 percent of Norway's total global warming emission is associated with road transportation (Bright and Strømman 2009). Reducing the travel distance of building materials might reduce global warming emission, measuring the travel distance of these materials gives an indicator on how environmentally friendly these are.

7.2.5 Date collection, targets and objectives

The data collection for indicator set is simple, these indicators works as guidelines to purchase the most environmental friendly products by asking the supplier for environmental information for each building material. In other words the data collection is to gain environmental information of each building material before choosing the materials to purchase. The purpose of this data collection is to gain as most possible environmental data about each material individually before the supplier selection. An example is asking the concrete supplier whether his concrete follows an environmental product declaration or if the company is ISO 14001 certified.

The targets for indicator set are set with the collaboration of R&D director at Faveo on the basis of what might be realistic to achieve. The targets are met by choosing a building material that is supposed to be purchased, then selecting the materials or supplier that follows an environmental label, certification or declaration. In order the meet the targets in table 5 a certain percentage of the money used on building materials of the total budget in the project should follow with labels or certifications. The targets are set in order to be able to use quantitative measures to evaluate purchasing practices of these building materials. The number used as targets are not supposed to be mandatory, in other words the numbers chosen

gives an example of what the targets could be if one chooses accomplish significant changes in purchasing practices.

The objectives for this indicator set are to increase the use of environmental labels and certifications when purchasing timber, steel, glass and concrete materials in projects. The objectives state the purpose of the indicators in order to give the project managers an idea what should be achieved by using these indicators.

7.2.6 Guidelines for the use of indicators

This indicator set is supposed to be applied when performing the specification and supplier selection. The purpose is not to apply all the indicators at the same time, but give guidance on how to use environmental labels and certifications to perform Green Purchasing. It should be noted that the project managers should choose the indicators and targets that feasible for their project.

1. Make yourself familiar with the indicators in table 5
2. Asses the projects purchasing specifications and requirements from the project owner
3. Gain an overview of suppliers that deliver concrete, timber, glass and steel
4. Look for suppliers that delivers building materials that has environmental labels and certifications that are mentioned in table 5
5. Assess the possibility to purchase the building materials that follow labels and certifications and consider the environmental vs economic benefits of these materials.
6. Choose the most environmental friendly materials that are feasible to purchase after the assessment

If one is to use this indicator set for supplier selection and purchasing it is important to keep in mind that the project owner or the customer should be informed in the case of increased costs.

7.2.7 The indicator set

Table 5 Indicator set for evaluating building materials

Type of products	Objectives	Indicators	Targets (Share of total)
Building Materials(Timber, Concrete, Steel, Glass)	Increase the amount of building material following with Type I Eco-labelling	Products with ECO-Labels, Type I	Increase to 40 % of total NOK in budget
Building Materials(Timber, Concrete, Steel, Glass)	Increase the amount of building material following with Type II Eco-labelling	Products with ECO-Labels, Type II	Increase to 40 % of total NOK in budget
Building Materials(Timber, Concrete, Steel, Glass)	Increase the amount of building material following with Type III Eco-labelling	Products with ECO-Labels Type III	Increase to 40% of total NOK in budget
Building Materials(Timber, Concrete, Steel, Glass)	Increase suppliers with Environmental Certifications	Supplier with ISO 14001 Certification	Increase to 30 % of total suppliers providing the material
Building Materials(Timber, Concrete, Steel, Glass)	Increase suppliers with Environmental Certifications	Supplier with Eco-lighthouse Certification	Increase to 30 % of total suppliers providing the material
Building Materials(Timber, Concrete, Steel, Glass)	Increase the amount of building materials with Environmental Product declaration (EPD)	Products with Environmental Product declaration.	Increase to 30 % of total NOK in budget
Building Materials(Timber, Concrete, Steel, Glass)	Reduce CO2 emissions related to Transportation	Travel distance of products	Decrease to 30 % of total travel distance of the materials
Building Materials(Timber, Concrete, Steel, Glass)	Increase the amount of building materials based on recycled materials	Products with recycling content	Increase to 30 % of total NOK in budget
Building Materials(Timber, Concrete, Steel, Glass)	Increase the amount of suppliers with take-back policies.	Suppliers with take-back policies	Increase to 30 % of total suppliers providing the materials
Building Materials(Timber)	Increase the amount of materials that preserve biodiversity	Products with The PEFC Norway forest management standard (Levende Skog)	Increase to 30 % of total NOK in budget

7.3 The Indicator model for evaluating contracts

The indicator model is developed for project managers that have a purchasing role which involves deciding the most environmental friendly contracts and services from contractors based on environmental documentation and data provided. The steps from Andersen and Fagerhaug (2002) combined with consultancy from the R&D director at Faveo is considered in the development of this indicator set. The environmental performance indicators are based on indicators from OECD (2013), UNEP (2013) and Handfield et al., (2001). The indicators that are included the most relevant for construction projects that Faveo Prosjekledelse AS work with. The environmental categories are chosen through collaboration with the R&D director at Faveo, in order to choose the most relevant for construction projects.

7.3.1 Date collection, weighting and scoring system

The data collection for the indicator model is done by asking the suppliers for the data related these indicators before purchasing the contract. The contracts from suppliers should be evaluated on their environmental performance based on the indicators. The data collection is done by searching in the contracts and requiring environmental data from suppliers. The more documentation of environmental improvement the better score is achieved.

The weight system is pretty basic; each category is worth 20 percent of the total score of 100 percent. Each category has equal weight, and with each category part weights are provided which is given a value between 20-100 percent to each indicator. Climate change is considered to be the most important environmental impact, which explains why the indicators with the highest number of part-weights are the indicators closest related to climate change. Climate change is chosen due to the fifth assessment report published by Intergovernmental Panel on Climate Change (IPCC) where it has been proven human interference on the climate system in the world (2013). According to the IPCC

> "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC 2013:4)

The IPCC reports that the last three decades has been successively warmer in the Earth's surface than any other decade since 1850. In the Northern Hemisphere, between 1983 and 2012 was likely the warmest 30-year period of the last 1400 years. These climate changes have affected the rising ocean levels and temperature which has led to floods and melting of the Greenland and Antarctic ice fleets (ibid).

The scoring is based on the weighting system, with climate change having the highest scores. The maximum score possible is 5.0 points with each category contributing maximum 1.0 point. The more environmental documentation in the contract for each indicator the higher score is given. Full environmental documentation needs to be provided to an indicator in order to gain full score in that category. An example is in order to get 0.2 points on water usage, the contract have to provide full overview on the water usage of the project, if not 0 points are given. It is the project manager's that decides when full documentation is provided from the suppliers. There no mandatory categories that gives automatic disqualification for evaluation if no documentation is provided in that category. The purpose is to give reward the suppliers that offer environmental documentation in their contract, not to punish the suppliers that are

missing documentation. Some environmental documentation and data is better than none. The table 6 illustrates the rating system from Not passed to Very High.

Table 6 Rating system

Rating	Score(points)
Not Passed	0
minimal	0.2-1.5
medium	1.6-2.5
High	2.6-4.0
Very High	4.1-5.0

The scoring and rating system are chosen to provide the project managers an example of how to evaluate contracts environmental performance based on environmental documentation and data provided by the suppliers. Other rating and scoring systems can be applied if necessary and preferred.

7.3.2 Objectives

The objectives in the table 7 are supposed to give the users the purpose of the indicators and what the indicator model is trying to achieve. It makes the model more understandable to use for the project managers. The objectives are developed in collaboration with the R&D director at Faveo.

7.3.3 Guidelines for the use of indicators

The following guidelines are provided for the use of the indicator model in table 7:

1. Gain familiarity with the indicator model
2. Asses the projects purchasing specifications and requirements from the project owner
3. Review the environmental targets of the project provided by the projects owner
4. Evaluate the environmental documentation in the contract provided from suppliers
5. Use the indicators in the model and its scoring system to compare with existing environmental documentation in the contracts offered from the different suppliers
6. Request additional environmental data missing from the supplier accordingly to the indicator model
7. Assess the most environmental friendly contract and choose the contract with the highest score

7.3.4 The indicator model

Table 7 The Indicator Model for evaluating building contracts

Total weight (100%)	Categories	Environmental Performance Indicator	Objective	Partial weight	Score
20%	**Resource Efficiency**	Water Usage (litres)	Reduce the water footprint of the project	**20%**	0.2
		Use of forest resources	Reduce the impacts on biodiversity in forests	**30%**	0.3
		Recyclable Content (Percentage of total)	Improve the resource efficiency of the project	**50%**	0.5
20%	**Waste Management**	Landfill - tons of waste during the project.	Decrease the amount of waste during the project	**50%**	0.5
		Waste water treatment	Improvement of treatment of waste water generated in the project	**20%**	0.2
		Chemical treatment by supplier	Improvement of treatment of chemical used in the project	**30%**	0.3
20%	**Environmental Documentation**	Number of suppliers with ISO 14001 certification	Increase the amount of suppliers with ISO 14001 certification involved in the project	**50%**	0.5
		Environmental Product Labelling	Increase the amount of products with labels in the project	**50%**	0.5
20%	**Transportation**	Transportation waste emissions	Reduce the waste emissions of transportation of products and services	**20%**	0.2
		Travel distance of product and services	Reducing CO_2 emissions of the project	**80%**	0.8
20%	**Energy**	Energy efficiency labels	Reduce the CO_2 emissions and costs related to energy usage generated by the project	**100%**	1
				Total Score:	

7.4 BREEAM

An alternative to the Green Purchasing indicators developed in this thesis could be BREEAM which is an environmental assessment method and certification scheme designed to develop more sustainable building practices. With over 250,000 certified buildings and more than a million registered for an assessment since 1990, BREEAM claims to set the standard for best practice in sustainable building design, construction and operation. BREEAM encourages designers, clients and others to consider low carbon and low impact design, therefore minimising the energy demands created by a building before considering energy efficiency and low carbon technologies. BREEAM applies a scoring system that is transparent, flexible, and easy to understand and supported by evidence-based science and research. It has a positive influence on the design, construction and management of buildings, defines and maintains a sturdy technical standard with quality assurance and certification (BREEAM 2014).

BREEAM-NOR is a Norwegian version developed by the Norwegian Green Building Council (NGBC), the NGBC is given the authority by the BRE global LTD to issue BREEAM rating to building projects from; Pass, Good, Very Good, Excellent and Outstanding. BREEAM-NOR covers ten areas that should be considered in order to reduce environmental impacts (Norwegian Green Building Council 2012). These are:

- Management and Administrations
- Health and Indoor Environment
- Energy usage
- Transportation
- Water
- Materials
- Waste
- Land use and Ecology
- Pollution
- Innovation

BREEAM was mentioned by several respondents both in the interviews and questionnaires, for this reason it could be a viable option. The BREEAM handbook has indicators that have already been tested and proven to be resourceful in construction projects. The BREEAM methodology is more extensive and can increase the total environmental performance of a project, rather than only focusing on purchasing.

8. Discussion

Chapters 4, 5, 6 and 7 provide reveals interesting results that deliver a solid basis for discussion. The discussion provides answers to the research question mentioned in section 1.2 and evaluates the qualitative and quantitative analysis.

8.1 The Green Value Creation ambitions of project managers at Faveo

The interviews and the questionnaires gave similar results, with some minor differences. An interesting observation is the difference between what the project managers think and what they actually practice. Both in the interviews and the questionnaires the respondents agreed and were positive to the inclusion of environment issues in project management, but very few actually used it as a criterion for evaluating a successful project. An explanation could be that ideally the project managers would prefer to involve environmental initiatives in projects, but few have the environmental training and experience to do that. The involvement of the Faveo Academy to offer environmental training to the project managers could increase environmental awareness amongst them.

In the interviews the respondents did not have significant knowledge regarding environmental labels and certification, while the results of the self-completion questionnaire indicate more familiarity with environmental labels and certifications. It might be easier for the recipients of the questionnaire to name more labels and certification due to multiple choice answers that make it easier to remember, rather than no answer choices such as with the interviews. It should be mentioned that the familiarity with the BREEAM certification and ISO 14001 amongst the project managers indicate an increasing trend towards GVC.

8.1.1 The influence of traditional project management framework

The Green Value Creation ambitions of the project managers is influenced by the traditional project management frameworks, where time, cost and quality are dominant, especially in the PMBOK guide published by PMI. It seems that the methodologies developed by PMI and IPMA have a significant influence on both Faveo and their employees. Faveo applies both elements from PMI and IPMA in their project management frameworks, and several project managers have certification from these two organization. The results from the self-completion questionnaire reveals that, time, cost and quality is dominant criteria for evaluating projects, while the environment was mentioned only by one respondent. It is quite interesting to observe that even though most of the project managers have different background, work experience and education they are all very loyal to time, cost and quality as measures of successful projects.

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8.1.2 Newer project management perspectives in Green Value Creation

The GVC ambitions might significantly increase by introducing newer perspectives on project management from authors such as Samset, Shenhar and Dvir that goes beyond the "iron triangle ". It could be argued that the project management frameworks of the project managers at Faveo should be updated in order to move beyond time, cost and quality. Shenhar and Dvir adaptive project management could provide significant improvement of the ambitions of the project managers by offering more flexible and adaptive project management framework where environmental concerns are easier to include. The table 1 (section 3.2.3) illustrates the change from traditional project management to adaptive project management, this table could be used to evolve the traditional project management beyond the time, cost and quality perspective and find a place for GVC. Samset's (Section 3.2.3) three perspectives can provide a more broad understanding of the field of project management. Samset argues that one needs to include supplier, user and owner perspectives when evaluating projects, rather than only time, cost, and quality which is the supplier perspective or in this case the project manager's perspective. By having the more holistic approach from Samset, Faveo can reach out to the users and project owners to promote or uncover the possibilities to achieve GVC. In other words by moving beyond the supplier perspective the project managers can collaborate with users and project owners to increase the GVC ambitions on projects.

8.1.3 Is Green Value Creation present in Faveo today?

The semi-structured interviews indicate that costs and the lack public or governmental requirements are the most significant obstacles to environmental friendly investments in projects. The questionnaire also revealed that economic concerns are important and might be an obstacle to environmental initiatives in projects. The interviews reveal that the project managers need more environmental training and competence in order to build up the GVC ambitions at Faveo. At this moment the ambitions related to Green Value Creation can be interpreted to be moderate to low, which the interviews reveal. The questionnaire also revealed that the ambitions at this moment are moderate to low which can be explained by the lack of environmental awareness and education.

Is Green value creation present in Faveo today? To give an answer to this question one should involve the definition of GVC that is developed for this study, Green Value Creation is defined as *"when a firm uses and shapes the resources they have available to develop a product or service, by using tools and strategies that promotes social, environmental and economic benefits for all stakeholders involved, but with a stronger focus on the*

environment" (Section 3.1.3). At the present moment it could be argued that GVC ambitions are from moderate to low amongst the project managers, if one is to dictate the definition above. Economically the project managers are performing well, but environmentally there is still some distance to cover. The reason for this might be that there is a need for more environmental awareness and competence amongst the project managers, in order to increase environmental performance and this could be achieved through the Faveo Academy. Even though Faveo claims to have a strong environmental profile, it seems that their employees do not follow these strategies decided by Faveo internally, which can be explained by the fact that the project managers spend most of their working hours with the clients.

It is not clear that the services from Faveo provides both socially and environmental benefits, at least not at the same level as the economic benefits. The interviews and questionnaires reveal this. It should be mentioned that the willingness of the project managers to promote GVC is present at Faveo, but the lack of guidance and tools hinders Green Value Creation.

8.2 The project manager as a purchaser

The interviews revealed that the purchasing role of the project managers varied, for some it was substantial while for others purchasing played a minor role in their position. It seems that the amount of work tasks related to purchasing was dependent on the project. The quantitative analysis gave results that indicate that the majority of respondents do not have a significant work tasks related to purchasing, but 37 percent had a significant amount of purchasing tasks between 20-60 % of their total work task. An interesting observation is that some project managers did not purchased specific products and materials, but instead supervised and developed specifications for purchases. This supervising role of the project managers in which the purchasing of materials is delegated to others, can cause an issue of achieving complete overview of purchases can be difficult. Another interesting result was the response on what the project managers considered as the most important criteria as purchaser in projects, both in the semi-structured interviews and the self-completion questionnaire reveal that time, cost and quality as the most popular responses. However in the interviews the respondents mentioned the environment as also important in purchasing, while the questionnaires revealed that functionality is also an important criterion. Sustainability only got 7 percent of the response as an important criterion, which indicates that the position of the environment is not very significant.

8.2.1 Time, cost and quality in purchasing

The most important criteria for purchasing amongst the project managers at Faveo reveal a negative trend toward Green Value Creation ambitions, by using time, cost and quality criteria from traditional project management the possibility of performing Green Purchasing decreases. If the greener materials or products are more expensive, GP might be difficult to perform. The interviews revealed that the environment was important in purchasing, but few actually have applied environmental labels and certifications in purchasing materials and services their projects. Even in purchasing the "iron triangle" influences the project managers, again it is an interesting observation how coherent the project managers are to include time, cost and quality as guiding principles. The influence of PMI is apparent also in project purchasing and it could be argued that this influence might be one of the most significant obstacles against increasing Green purchasing at amongst project managers.

According to the respondents in the questionnaire the customers have a significantly strong influence on the decision making process in purchasing, this influence can be both positive and negative for including environmental criteria in purchasing. The customers might be very proactive towards the environment or they can be reactive and ignorant towards the environment. The respondents in the interviews revealed that customers influence is depended on the project and customers own preferences; some are more active than others. Often the customers make the final decisions on the specifications and the criteria. For a company such as Faveo Prosjektledels AS the customers are and most likely will also in the future be an important decision maker. Therefore it might be difficult for the project managers at Faveo to make purchasing decisions without consulting their customers' needs and preferences.

8.2.2 The need for purchasing competence and training

The interviews revealed that the project managers did not use any specific strategies and model on purchasing in projects, this can indicate either lack of purchasing knowledge or that the clients has their own strategies and models that the project managers has to abide. The solution to improve the environmental performance of purchasing materials and services might be providing the project managers with more environmental training and purchasing training, with this training the project managers will be more equipped to give recommendations to their customers with both environmental and economic benefits. In order to increase the purchasing competence of the project managers, they could familiar themselves with the Cousins et al framework Strategic Supply Chain Management (SSCM) and apply this way of thinking in projects (Section 3.3). SSCM is a key strategic business

process and supply chain is needed to be viewed as a dynamic strategic process, not only as bureaucratic business function. SSCM encourages the inclusion of the whole organization when performing supply chain management and provides the key areas of consideration. By increasing the competence in supply chain management, the project managers can take their purchasing practices to a higher level.

Applying the purchasing process model from Van Weele in purchasing could also strengthen the purchasing role of the project managers at Faveo. In section 3.4 Van Weele argues through using DuPont-analysis to show the benefits on a company's rate of return on the net amount property/belongings through proper purchasing; these benefits could also occur in Faveo through proper purchasing. Both the interviews and survey shows that there is need for the project manager to gain a stronger purchasing role before they can adopt environmental criteria in purchasing. The purchasing process model from Van Weele could be used to strengthen the purchasing competence of the project managers by providing guidance on how to perform purchasing step by step.

8.3 Environmental demands from customers

Both the semi-structured interviews and self-completion gave similar results regarding the environmental demands from the customer at Faveo. According to the respondents in the interviews the environmental demands from clients vary from project to project. The demand also depended on whether the project is executed for the public or private sector. In the private sector it was claimed that sometimes the project managers had more leeway, compared to the public where the budget was often an issue. The questionnaire revealed that the environmental demands were from moderate to low, which is coherent with the response from the interviews. An interesting observation is that the environment was perceived amongst the respondents in the interviews to be a more important criterion for the customers compared to the recipients of the questionnaire. An explanation for this difference might be the effect of the interviewer on the respondents, which could have altered the answers. Time, cost and quality were perceived to be the most important criteria for successful projects amongst the customers by the respondents both in the interviews and questionnaires. The respondents therefore confirms the influence of traditional project management amongst the customers, this might indicate a coherency between the customers and the project managers. Again it seems that time, cost and quality are preferred instead of the environment and this reluctance of going beyond the "iron triangle" could potentially affect the moderate environmental demands from the customers.

It could be argued that the lack of environmental demands from customers influences the Green Value Creation ambitions of the project managers at Faveo, with few customers demanding environmental initiatives the project managers do not have incentives to promote GVC in projects. It should be noted that both the interviews and questionnaires indicated some environmental demands, but this is not considered sufficient enough to incorporate GVC in to projects. According to Berry and Rondinelli (section 3.5) the environmental demands has increased and will increase in the future, they claim there will be more demands for a more proactive corporate environmental management from several stakeholders and it is no longer an option to ignore these demands. Businesses will have to adapt and embrace these demands and this will most like be the case at Faveo. The customers and other stakeholders of Faveo will probably require better environmental performance of the services they provide, most of the interview respondents claimed that the environmental awareness of the customers or project owners has increased the last ten years.

8.3.1 The project manager's dilemma

A dilemma that the project manager in Faveo faces is the choice between customer's preferences and the strategies and models that Faveo have developed internally. This means even if Faveo as a company encourages environmental initiatives in projects, this might conflict with the client's preferences and as the interviews revealed it the customer preferences that have the most influences. The project managers often spend most of their working hours in customer's location using their systems and models, which means that this situation needs to be factored in when evaluating the Green value creation ambitions of the project managers. As a project management consultancy Faveo has the obligation to fulfil the customers' requirements and needs, if the fail to do this they might lose profits. In order to promote GVC in projects the project managers has to convince their clients, this could be difficult without showing to both economic and environmental benefits and this requires a certain amount of environmental competence that is missing amongst the project managers at the present moment.

8.4 Adopting Green Purchasing in construction projects

In order to achieve more sustainable purchasing practices, it could be beneficial to take a step further by performing a proper supply chain management. Purchasing can be considered as important part of supply chain management, and therefore it might be beneficial to consider the bigger picture which is the whole supply chain. According to Lambert and Cooper (section 3.3) supply chain management involves identifying the supply chain members that

are critical for the company's business, mapping the suppliers is vital for successful SCM. Faveo could use the mapping the suppliers to uncover those suppliers that might contribute to greener purchasing. The figure 6 (Cousins et al., section 3.3) illustrates the key areas in their organization that Faveo should consider in order to achieve a successful SCM, the same key areas can be guidance to improve the Green Purchasing in projects.

8.4.1 Proactive Green Purchasing strategies

Adopting Green Purchasing in construction projects should be possible if right measures are initiated, the first step would be develop a strategy and the GP strategies from Min and Galle (section 3.4.1) might be applicable. Min and Galle argues there is a need for a more proactive stance towards the environment, instead of the reactive stance which is present in most companies at the moment. The figure 9 in section 3.4.1 illustrates the strategies that could be chosen. The first step for the project manager would be choosing whether the goal with the Green Purchasing is source reduction or waste elimination and select supplier thereafter. The project managers could go for both source reduction and waste elimination strategy, but should try to focus on the most feasible. With source reduction; recycling, reuse and source changes and control are indicators that the project manager should look for when choosing materials, products or services provided from the suppliers. Waste elimination entails biodegrading and nontoxic incineration, which are indicators the project managers can apply when evaluating suppliers. In Faveo's construction projects both source reduction and waste elimination seems to be feasible Green Purchasing strategy to apply. The interviews and questionnaires performed in this study reveal that the Min and Galle's claims on the need of a proactive stance could be beneficial to increase the GVC ambitions at Faveo. The proactive environmental audit program introduced could also be applied to the construction project of Faveo, the guidelines in section 3.4.1 might be useful to develop a comprehensive auditing scheme.

8.4.2 Combining the purchasing and project management process with indicators set and model

The indicator set for evaluating building materials in section 7.2 could be used as a guideline to purchase greener building materials in construction projects, this indicator set is developed specifically for project managers that perform purchasing of building materials. The demand for this indicator set was decided from the results of the interviews and questionnaires that revealed there is a need amongst the project managers for more environmental education in order to increase the GVC ambitions. The correct way to apply this indicator set is combining it with the project management process from PMBOK (section 3.2 1) and the purchasing

process from Van Weele (section 3.4). These indicators should be applied in the initiating and planning phase of project management process and in the specification and selection phase of the purchasing process. Already in the initiating and planning phase of the project the project managers should consult the project team and the project owner (if necessary, due to extra costs) to discuss the possibilities of greener purchasing. It is in the specification and selection phases where the purchasing decisions are made, and it is early enough in the purchasing process to make changes in suppliers. This application of the purchasing process model from Van Weele can provide guidance to the project managers at Faveo to perform proper Green Purchasing since the model provides a comprehensive understanding on which steps to consider when dealing with purchasing.

The indicator set for evaluating building materials enables the project managers to purchase environmental friendly materials by using environmental labels and certifications as indicators that shows which materials and suppliers are most green. An advantage with these indicators it that it is developed for project managers through interviews and self-completion questionnaires with project manager at Faveo Prosjektledelse AS, in order to make the best possible fit. These indicators are also specifically suited for construction project and the indicator set is followed by guidelines to make it easier to use. It should be mentioned that the purpose of the indicators are that they are suggestions on how Green Purchasing might be achieved through already established labels and certifications, but the project managers has the possibility to exclude some irrelevant indicators in situations where it is necessary to tailor the indicator set to fit their project. Another advantage with the indicators is also includes recycling, take-back policy and travel distance of material, which makes the indicator more diverse. This diversity enables the users to apply some of the indicators in situations where there are few or none materials and products with environmental labels or certifications attached. The targets as mentioned in section 7.2.5 are suggestions if the project manager wants a proactive and significant green profile on the purchases, but the targets can be adjusted to needs of the project. These targets give the users an idea on what could be accomplished, and gives the project manager's goals to achieve. These targets strengthen the indicator set and increase the chances for the indicators to be used and quantified.

The interviews revealed that the project managers often purchases building or construction contracts, and therefore an indicator model for evaluating contract with a scoring system is developed. The advantage with this model is that provides indicators based on established organization such as the OECD and UNEP. Another advantage is the scoring system that

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allows the indicator model to be applied to several different contracts, and therefore enable benchmarking or comparison. This indicator model covers several areas such as resource efficiency, waste management, environmental documentation, transportation and energy use. By covering several environmental areas enables the project managers to evaluate a wide range of environmental issues. The purpose with the indicator model is to generate environmental data as much as possible, in order to make the decisions that are beneficial for the environment. The indicator model is developed in collaboration with the project managers at Faveo, which makes it easier to use due to the inputs from the professionals that are supposed to use it.

The application of this indicator model should be discussed in the initiating and planning phase (PMI) in the project management process, it is in these phases where the decisions can be made in and early enough in process that the model feasible to apply to the project. The application of Van Weele's purchasing process is recommended, where the indicator model should be applied in through each purchasing process, from specification to after care, but with a stronger focus on the contract phase. Incorporating the indicator model with existing models such as the project management and purchasing process might increase the success rate of the indicator model.

The figure 19 illustrates that the indicator set and indicators can be used in the purchasing and project management process. The figure 19 indicates that the indicator model for evaluating contract goes further than the indicator set, by being applied throughout the whole purchasing process, including contract, ordering, monitoring and after care.
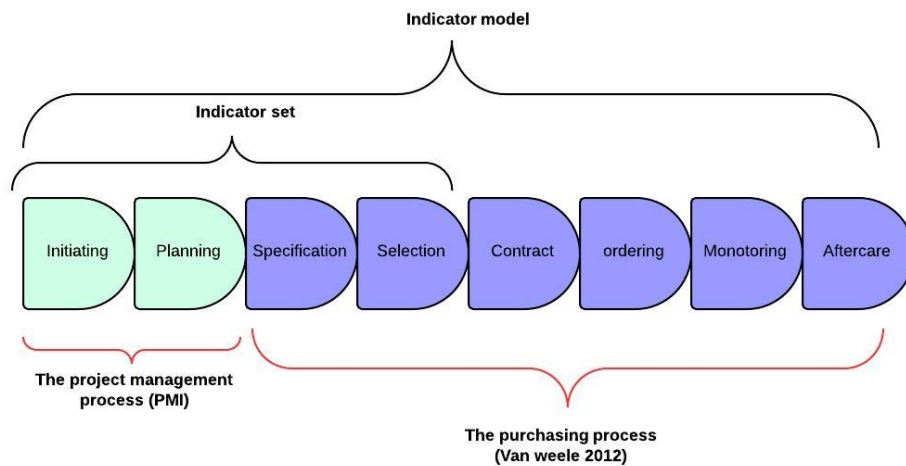
Figure 19 The application of indicator set and indicator model

The following steps should be considered when combining the indicator set and indicator model with the project management and purchasing process:

- Step1 Explore the possibilities of applying the indicators set and model in the initiating and planning phase.
- Step 2 Apply the indicator set and model to the purchasing process, if the result of step 1 is to apply these indicators.
- Step 3 Involve the personnel with relevant environmental and purchasing competence if needed
- Step 4 Evaluate the performance of the indicator set and indicator model through monitoring and controlling.

An alternative to the indicator model mentioned above is AHP model from Handfield et al (section 3.5), if one considers Faveo as the customer that is deciding to purchase materials or a contract this model provides a list of environmental performance attributes from suppliers to include in the purchasing decision making. The AHP model illustrates how the project managers can involve the suppliers and other third parties to increase the environmental performance of the purchasing in their projects. If the indicator set and indicator model proves to be difficult to apply, the project managers could use BREEAM methodology instead. Even though BREEAM does not promote Green Purchasing specifically, it is an established certification that could promote GVC. It might be easier to sell BREEAM to the customers

due to is popularity in Norway, and Faveo already has employees with BREEAM expertise that could provide assistance to the project managers.

8.4.3 Obstacles to Green purchasing

There might be some obstacles that could occur to adopting GP in projects management, one major obstacle is the hegemony of time, cost and quality from traditional project management framework. Both the interviews and self-completion questionnaire reveals the influence of the "iron triangle" amongst the project managers and their customers. It should be pointed out that this thesis does not consider time, cost and quality to be entirely poor criteria to evaluate and guide projects, but the argument is that project managements should also consider the environmental impacts caused by human activities. Project management and purchasing should evolve beyond the "iron triangle" and include environmental factors. The fifth assessment report from the IPCC climate change indicates the extensive influence human activities has had on the climate change and therefore environmental issues are more important today than it has ever been.

Another obstacle is the difficulties that might occur for the project managers to apply the indicator set and the indicator model developed in this study. In order to successfully use these indicators the project managers will need more environmental and purchasing training, in addition increased knowledge in supply chain management. It is not a secret that some time and resources will be necessary to train the project managers to ensure the proper use of the indicator set and indicator model, but since these are developed with the involvement of project managers the transition should be easier. Another issue which should be discussed is the lack of environmental documentation from supplier following the building materials and contracts. A situation that might occur which the suppliers does not offer or can't offer environmental data or documentation and therefor making it difficult to use the indicator set and indicator model. It should not be taken for granted that sufficient information is available in the building contracts or amongst the suppliers. In other words the data collection might difficult, and for this reason the users must be proactive and competent, in order to gain access to environmental data.

The indicator set and model in chapter 7 has not been tested amongst the project managers at Faveo due to time limitations, therefore it should be noted this could be an obstacle to Green Purchasing. Even if the indicator set and model is developed with the assistance of project

managers, it cannot be claimed with absolute certainty that the indicator set and model will be successful without further testing.

8.4.4 Benefits of Green Purchasing

In section 3.4.1 some of the benefits of Green Purchasing are mentioned, and these benefits might occur in Faveo. Benefits such as lower cost due to purchasing materials or products based recycled materials, instead of virgin materials. Project managers can also save transportation cost and emissions with products with light packaging. Reducing cost and emissions can improve Faveo reputation both with the customers and the public, and the saved costs can enable the project managers to implement other environmental initiatives in the project. Faveo can perform better in the market by being more eco-oriented and being green can provide competitive advantages. Purchasing materials and products from ecological responsiveness companies can reduce environmental impacts, as well as lowering the input and waste disposal costs of the projects.

8.5 Evaluation of the qualitative and quantitative analysis

This thesis uses a modified case study method from Yin (section 2.6), such as the case study described by Yin, this study also uses multiple sources of evidence such as interviews and questionnaires. Another similarity is investigating a phenomenon in depth and within its real life context, which is done with Green Value Creation amongst the project managers in Faveo. By using some of the elements from Yin case study research, it could be argued that this study applies a semi-case study method.

The purpose of the qualitative analysis was to gain richer and deeper data from the respondents, in order to develop the quantitative self-completion questionnaire that was distributed to a larger amount of respondents at Faveo.

8.5.1 Validity and Reliability of the qualitative analysis

The internal validity of the semi-structured interviews performed in study could be argued to be acceptable since there was a good match between the observations made and theoretical framework developed. The interviews performed in this study had the purpose of not only to develop theoretical ideas, but also serves as pre-study to develop the questionnaire and Green Purchasing indicators. External validity entails whether the findings could be generalized across the social setting, to some degree the results from the interview could be generalized. The similarities between the findings of the interviews and the questionnaires indicate that it could be generalized to a certain degree, at least amongst the project managers in Faveo. In

should be mentioned that the external validity could be argued to be weak, due to small sample of respondents.

The internal reliability from Bryman is not applicable since all of the interviews and observations are done by one individual. It might be difficult to replicate the results of the interviews due to the degree of the structure of the data collection and the different background of the respondents. The replication of this study is possible, if the same methodologies and structure is applied, similar findings can be achieved by other researchers. The semi-structured interview methodology is recognized to be an appropriate method to use in qualitative research with advantages such as the possibility of asking probing question, greater breath of coverage, and more rich and deep data. The disadvantages should also be pointed out such as small sample, difficulty of generalization and sensitivity of context. The interviews are performed with the knowledge of these advantages and disadvantages, and this thesis tries to compensate by also including a quantitative analysis to deal with these issues that appears when performing qualitative analysis.

8.5.2 Validity and Reliability of the quantitative analysis

The validity of the self-completion questionnaires performed in this study is considered to be acceptable; the indicators that are used to assess the concept does really measure the concepts that are chosen in this study such as Green Value Creation, purchasing and environmental demands. The questions in the questionnaire measures the concepts they were expected before the questionnaire were distributed to the respondents at Faveo. Face validity could be applied in this study, other people persons such as the supervisors and the R&D director at Faveo was asked if the questionnaire seems to be getting the concepts that are in the focus of attention before the questionnaire was distributed.

Reliability is whether the same results are achieved if the same study is repeated several times. It is difficult to decide whether there is a strong reliability of the self-completion questionnaire performed in this study, but the coherent responses from the respondents might indicate that if the same questionnaire is distributed to other project managers the results could be the same. The only way to evaluate the reliability of this quantitative analysis is to distribute it to a new sample of respondents. The self-completion questionnaire was chosen due the advantages which are that, it is cheaper and quicker to administer than other methodologies, there is also an absence of the interviewer affecting the respondent and finally it is easier to generalize to a larger amount of population. While there are many advantages,

the disadvantages such as the lack of opportunity to ask probing questions, greater risk of missing data, lower response data and more difficult to ask the right questions are considered. The disadvantages were dealt with by performing qualitative interviews, as mentioned earlier in this section.

8.5.3 Generalizability of the qualitative and quantitative analysis

It should also be mentioned that this thesis does not claim that the responses and answers from the project managers at Faveo is automatically generalizable to other project manager in Norway outside Faveo Prosjektledelse AS. In other words the perceptions and attitudes of the respondents in this study may differ from other project managers in other companies, but some of the results from the questionnaire are generalizable to certain extent, especially the results related to time, cost and quality which are considered as guiding principles amongst project managers around the world. The combination of qualitative and quantitative analysis has proven to be very valuable in this study, using both types of analysis has provided both rich and deep data, but at the same time a larger amount of data that increases the opportunity of generalization. The interviews and questionnaires resulted in developing an indicator set and indicator model that enables the project managers to perform greener purchasing. The response rate of 33 percent on the self- completion questionnaire can be considered to be adequate in order to make a generalization of the findings amongst the project managers in Faveo. The results from the interviews are more difficult to generalize to larger population, due to only six respondents, but the interviews provides some tendencies that were useful. Both the interviews and questionnaires does not give a complete picture of the GVC ambitions of the project managers, but provides enough insights to show tendencies in Faveo, which enables this study to answer the research questions and achieve the main goal.

9. Conclusion and Recommendations

The main goal of the thesis was to gain understanding of the GVC ambitions in project management and to develop indicators to enable project managers to purchase greener building materials and contracts. In order to address the main goal, the four research questions needs to be answered.

9.1 Conclusion

Q1: What are the Green Value Creation ambitions of project managers at Faveo Prosjektledelse AS?

The ambitions related to GVC amongst the project managers could be considered to be from moderate to low based on the results of the semi-structured interviews and self-completion questionnaire performed in this study. The respondents indicated that they agreed to the inclusion of the environment as criterion in projects, but fewer actually considered environmental consequences in their decision making. The environmental knowledge varied amongst the project managers, this variation could be explained by differences in work experience, education level, and projects. It is evident that there is need for more environmental training and competence to increase the GVC ambitions, but a positive tendency was that it seemed that the project managers would like to see more environmental initiatives in projects. One major obstacle to GVC is the influences of time, cost and quality criteria from traditional project management framework, in order to promote Green Value Creation it would be beneficial to move beyond these criteria. If the definition of GVC in this thesis is applied in Faveo's project today, it could be argued that GVC is not present in theirs project today. It would seem that Faveo services provide economic benefits, but the environmental benefits needs improvement. The social benefits from Faveo were not explored in this study.

Q2: How does the project manager function as a purchaser in projects?

It seems that the project manager's purchasing tasks in project varies from project to project. In some projects the project manager has specific purchasing responsibilities and in others the purchasing is delegated to other members of the project team. The most important criteria for decision-making in purchasing were again time, cost and quality, but also functionality was mentioned. The criteria for purchasing are significantly influenced by the customers, which can make it difficult to purchase the products which the project managers recommend. In order to gain more influence in purchasing practices in projects, more purchasing competence

and training should be acquired amongst the project managers in Faveo. Gaining more purchasing knowledge the project managers could influence the customers to allow them to make more purchase decisions. By strengthen their purchasing abilities through the works of Cousins et al and Van Weele, the project managers could increase the chances to promote Green Value Creation through purchasing. Increasing purchasing competence could improve the perceived competency from customers, which might make the customers more lenient to follow recommendations from the project managers, which is in this case implementing GP

Q3: What are the environmental demands from customers of Faveo?

The environmental demands are from moderate to low, which makes both GVC and GP difficult to promote amongst the customers. The lack of environmental requirements and demands can be considered to be one of the most significant obstacles to GVC. The ambitions related to Green Value Creation will be difficult to increase without the support from customers. Environmental demand also varies amongst customers, with differences between public and private sector. The study shows that amongst the customer's also time, cost and quality are the most important criteria of a successful projects, the environment was not significant criterion. In order to increase Green Value Creation ambitions amongst project managers, the support of the customers and the management of Faveo are required. It is might be very difficult to make environmental investments in project without the customers approval, therefore the project managers should promote GVC towards the customers.

Q4: How can Green Purchasing be adopted in construction projects?

GP can be adopted by combining the indicator set and indicator model developed in this thesis with both the project management process from PMI and the purchasing process from Van Weele. The key might be using existing project and purchasing frameworks and integrate environmental initiatives. A proactive GP strategy might also improve the success rate of GVC in construction projects. One of the major obstacles to Green purchasing is strong influence time, cost and quality, these criteria should be revaluated before Green Purchasing in projects could be successfully practiced. The benefits of GP that might occur in Faveo can be lower cost due to purchasing materials or products based recycled materials, instead of virgin materials. Project managers can also save transportation cost and emissions with products with light packaging. Reducing cost and emission can improve Faveo reputation both with the customers and the public.

9.2 Recommendations for Faveo Prosjektledelse AS

Based on the findings of this master thesis study, the following recommendations are provided to Faveo and their project managers:

- Increase the purchasing competence of project managers
- Provide the necessary environmental training and education to enable Green Purchasing in projects.
- Explore the possibilities of promoting GVC to customers by offering environmental training through the Faveo Academy
- Test the indicator set and indicator model and collect feedback
- Execute a survey amongst the customers regarding environmental needs and demands.

There will be some challenges for Faveo Prosjektledelse AS to follow these recommendations, and it will require resources that might increase some costs for the company and therefore it should be noted that Faveo should chose the most feasible recommendations to execute. Gaining support from the management, employees and customers is another challenge that should be addressed, this support can be attained by involving the different parties in the process and allow them to provide inputs.

9.3 Suggestions for further research

A suggestion for further research is to perform a comparison study with another project management companies. By performing a quantitative and qualitative analysis, the researcher could gather more data and therefore increase the possibilities to generalize to larger population than this master thesis is able to. Another suggestion is to move beyond the qualitative and quantitative analysis and to develop the Green Purchasing indicators further and include a testing phase to strengthen application of the indicators.

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Appendix A Interview guide

The purpose of the interview is to answer these research questions:

- What is the Green Value Creation ambition of the project manager?
- What is the project manager's influence as a purchaser in projects?
- How do project managers at Faveo perceive the demand of environmental friendly solutions in projects by their customers?

The interview guide will consist of questions in Norwegian due the fact that most of the project managers have Norwegian as native tongue. The interviews will be performed as semi-structured interviews based on methodology from Bryman (2012).

Intro:

- Introduce myself and explain the purpose of the interviews. Give a short introduction about Green Value Creation.

Introducing questions:

1. Hvor lenge har du jobbet i Faveo Prosjektledelse?
2. Hva slags bakgrunn har du?
3. Hva er dine ansvarsområder?
4. Hvor lenge har du jobbet innen prosjektledelse?

Main questions:

Faveo Prosjektledelse:

5. Hva kjennetegner Faveo Prosjektledelse?
6. Skiller Faveo seg ut i fra sine konkurrenter? Hvordan?
7. Hva synes du om Faveo sin miljøprofil og deres tilnærming til miljøhensyn?
8. Faveo er ISO 14001 sertifisert, har dette hatt noe betydning for deg som prosjektleder?

Green Value Creation Ambitions:

9. Kjenner du til noen miljømerker og sertifiseringer som kan brukes i Faveo sine prosjekter? Hvilke?
10. Hvor viktig er miljøkonsekvenser for deg som prosjektleder når du skal ta beslutninger i prosjektet?
11. Hva tror du er den største hindringen for miljøvennlige investeringer i prosjekter?
12. Hva tror du er nøkkelen til å utvikle miljøvennlige løsninger som kan promotere grønn verdiskapning i prosjekter?
13. Hva synes du et de viktigeste kriteriene for et suksessfullt prosjekt?
14. Hva synes du om at miljø blir brakt inn i prosjektledelse som et kriterium for et suksessfullt prosjekt?
15. Har du brukt noen miljømerker og sertifisering som grunnlag for innkjøp av materialer og servicer for et prosjekt?

The project manager as a purchaser:

16. Hva er din rolle som innkjøper i prosjekter?
17. Hvor stor andel av dine arbeidsoppgaver omhandler innkjøp av materialer og servicer til prosjekter? Prosent?
18. Hva slags kriterier er viktigest for deg som innkjøper?
19. Hva slags modeller og strategier bruker du for å foreta de mest gunstige innkjøpsavtalene?
20. I hvilken grad påvirker kunden dine innkjøpsvalg og kriteriene bak innkjøpsbeslutningene? Fra skala 1-10?

Environmental demands by the customers

21. Hva oppfatter du som kundene viktigeste kriterier for et suksessfullt prosjekt?
22. Hva slags etterspørsel er det fra kundene om å implementere miljøvennlige løsninger i prosjekt? Fra skala 1-10?
23. Hva synes du er kundens ansvar ovenfor en bærekraftig fremtidig? Hva kan gjøres annerledes?
24. Har du noen forslag om hvordan du som prosjektleder kan promotere grønn verdiskaping ovenfor kundene?
25. Synes du at dagens prosjekteiere etterspør mer miljøbevissthet enn for 10 år siden? Hvis ikke? hvorfor tror du at det er slik?

Ending questions:

26. Hva tror du etterspørselen for bærekraftige løsninger i prosjekter fra deres kunder vil være i fremtiden?
27. Hvordan ser du deg for fremtiden for prosjektledelse med fokus på grønn verdiskaping?
28. Gitt at Faveo velger å satse på grønn verdiskapning, hvordan bør dette gjøres?
29. Gitt et verktøy som kan promotere Grønn Verdiskaping blir utviklet, ville du ha brukt det?

Appendix B Interview answers

Question Number	Person A	Person B	Person C	Person D	Person E	Person F
9. Are you familiar with any environmental labels and certifications which can be used in projects by Faveo?	I know a few, such as BREEAM is the most relevant. LEED is also current, but I'm not an expert.	I've heard about energy-labelling and the Nordic swan for products.	I know little about this, but I've been in project where the environment has been important, and right now I'm in a project that has BREEAM certification.	I'm familiar to BREEAM, but don't know about of any else.	I know that there exist some, but have no relation to it myself. No demands for any detailed knowledge, but energy labelling in buildings is important.	No, but have heard about some ISO standards and I have not worked with them myself, but know some other ones as a consumer.
10. How are environmental consequences to you as decision maker in projects?	Environmental consequences has a little role in my decisions right know, due to I have only paper projects right know. Try to promote Green Value Creation and I have more competence now than before.	It is important, and we should evaluate the environment in the same level as economy.	Important enough not to forget about it. We can focus on it, but it is the project owner that decides.	Personally, it is important, but professionally I've not been thinking about it too much. I'm currently working on a project with a significant environmental profile.	I'm environmental aware and intuitive enough to put the environmental on the table when comparing solutions, but the customer that decides which solutions are chosen.	Developing some solutions for environmental improvement is important. Creating technologies to improve the environment is a priority, and carbon capturing is worth mentioning.
11. What do you think is the biggest obstacle to promote environmentally friendly investments in projects?	In general it is economy and it depends on the users and owners	Economy is very important to the contractors and suppliers. Nobody wants to ruin their competiveness. The government and the users must try to set higher requirements.	Often it is cost and some believe it is more expensive with environmental considerations. Sometimes it is, but not necessarily and a lot can be done without increased costs.	It is lack of competence and environmental demands. The project owner must want it and competiveness is also an obstacle.	It is a lack of governmental demands, challenges with new and expensive technologies, and the front runners usually have to pay much. There is also a challenge in creating a marked.	Environmental investments are not commercially sustainable, and it is the bottom line that counts. Frameworks have to come from the public.

12. What do you think is the key to develop environmental friendly solutions that can promote Green Value Creation?	Some users demand it and investors may want it for reputation. One has to prove that green is a good investment, green and economy needs to be interrelated.	There is a need for a better balance between economy and CO2 emissions. Governmental demands could be trend setting.	It is knowledge and focus on as field of study. Spreading the word and putting a price on environmental consequences	The government must come with demands.	Better company policies that trigger creativity, public demands and creating awareness. .	The key is economic sustainability, and political guidance tools is a must have.
13. What do you consider the most important criteria for a successful project?	The project has to be relevant to the users and the execution has to be efficient. Profit for the owners and triple bottom line is also important.	A total and honest environmental accounting, so we can make the right decisions	It is delivering the project within the right time, cost and quality; the environment is not a focus right now. I've been in project where the environment has been a criterion.	It is that you build the right thing with the right solutions and create must value for the customer.	Reaching the goals, and time, cost and quality. Delivering what the customers expect.	It is achieving the goals of the project, using fewer resources than planned and delivering to the expectations of the actors involved.
14. What are your thoughts on the environment being brought in as a criterion to evaluate successful projects?	I consider the environment to be on a higher scale that time, cost and quality. Avoiding destruction of the environment is important and the environment is important for the user quality. .	Yes, but it have to be holistic and not only symbolic.	It is coming along and BREEAM is relevant, but the environment as a criterion is on the way. .	I'm positive, but one needs clear goals and tailor it to each project. The government has to set the demands.	It depends much on the stakeholder both internally and externally. To most of the stakeholder the environment will be important.	I have no problems with it, but it needs to be anchored at the project owners
15. Can you tell me if you have used environmental certifications or labels when purchasing materials and services in a project	In private yes, but not at a project manager	Yes, I believe we have, our suppliers are demanded to give full specifications and environment is a part of this.	Yes, we have and BREEAM has been used.	Yes, but I don't remember which.	That depends on the specifications which is the foundation for price, if there is no specific requirement the environment won't be considered.	No, it has not been a criterion.

16. What is your role as a purchaser in project?	It is setting the terms and being responsible for the purchases. It can be delegated to others, and I must admit that that I've been performing poorly towards the environment before.	It is to set the requirements in building contracts and evaluate offers. In addition to participate in discussions related to supplementing orders and project changes.	On a general basis I have not so much to do with purchasing, but have been involved with it before in projects where purchasing has been important.	It has been being responsible to purchase anything from consultant services to enterprises.	The role is to make a specification which gives the foundations for the price, and to collect price and offers from several suppliers in order to make a comparison. It is also to rank the offers according to criteria of the procurements.	Right now I have little role within purchasing
17. How much of you work load is related to purchasing? In percentage?	Big differences from project to project, with total enterprises it is the contractor's responsibility. My task is to follow up the purchases.	When you are construction managers this can be said to be the job. It is not only to follow up on the purchases, but also monitoring the execution. Narrowing it down to only purchasing it can be said approximately 25 percent of the time.	Right now it is close to zero, if we go back a few years purchasing had a big part.	Approximately 50-70 percent with contract and procurements.	The time I was active, it could be almost a hundred percent. The purchasing process could be long and have multiple phases.	It is zero right now.
18. Which criterion is most important to you as purchaser in projects?	It is the "Iron Triangle", which are time, cost and quality. Today being green is more important than before	The most important is that all deliveries serves a function, to those functional demands it also should be attached an environmental performance and it also depends on the project.	The most important criterion I have is usually the same as the client, for me personally it is economy and environment, but in the end it is the client decides. I will also mention price is often important to the client.	The quality of the products and services, but also price and utility value. For me it is also environment and economy. .	Most important is functionality and that it covers a need. Also quality in relation to time and then there is price.	It is Cost, quality and term of deliverance. If there are environmental concerns, in this case the environment is considered.

19. What kind of strategies and models do you use to make purchasing decisions?	I know several, but don't use them myself anymore.	I'm not good at it myself, but want people with me that know environmental accounting.	It the client that decides that and it depends on who is the client. If possible I will use Faveo's models.	I use the customer's models and an electronic completion tool.	Ninety percent of the project I have is public, and in these projects one has to abide to regulations and instructions.	I prefer to test several suppliers, in order to avoid relying on only one. .
20. How much does the customers your purchasing choices and the criteria to the purchasing decisions?	It is big differences between customers and it depends on how involved the customer wants to be in the purchases. The users play an important role, and time, cost and quality can also play a important part.	The customers or the purpose plays a significant role, they are setting the terms and from a scale 1-10 it is eight.	It varies from customer to customer, depends on the customer and this makes it difficult to answer.	The customer decides a lot, it is seven on a scale from 1-10. I have some flexibility, but it is the specifications that decide.	In accordance to regulations on has limited leeway, but in certain situations one is helping to develop the specifications and assist the client to meet a need.	This depends on the customers preferences, the client is in charge and it is worth mentioning that in some cases the customer has too specific demands which can create some issues.
21. How do you perceive as the most important criteria of the customers for successful project?	It is a big difference between public and private. With the public it is often money, and with the private sector they might have the environment as a criterion, but in the one has to follow the budget..	Time and economy is important, time is money and in some cases the environment is important. In private, big and serious builders environment and sustainability is a priority. It has changed the last years.	Money is often most important, in public sector they are more frugal than the private sector. It is difficult to achieve other criteria than economical, but in the private sector there is more leeway.	I work mostly with the public sector where it is a combination of building the right thing, following the budget and filling a need.	It has changed throughout the times, one period it was only costs, but after a while it has developed an awareness one can pay dearly if one buys too cheap.	It is competency and price
22. What kind of demands is there to implement environmental friendly solutions from the customers?	There is not much demand as it should be, on a scale from 1-10 a small share is on ten, while most are on three.	In environmental accounting the demand can be said five on a scale from 1-10.	It differs substantially, anything from customers that do not care to others that think it is very important.	It has increased, more strict requirements and mostly emissions is a priority.	No, nothing specific, but it has been a tendency that everybody should have a more focus on the environment and within the public energy and environment is important.	Nobody has mentioned it, so it is one from a scale 1-10.

23. What do you think is the customers responsibility towards a sustainable future? What could be done differently?	It is they that have the responsibility, but it cannot be demanded that they have maximum score on environmental consideration. They have to make their own decisions, but they should have a clear position on these matters. Green is usually not a priority, economy is.	The customers must have a more holistic approach towards the environmental consequences. They should promote honest environmental accounting and attach a higher value on environmental performance. .	It is thinking beyond their perspective on their projects, and it is too often money that is most important. The environment is not important to them and there are too little requirements.	Getting better in evaluating the value in being environmentally aware.	I don't know so much about it, but it should be a part of the customer's core values and the foundation must be there.	Everybody has a responsibility, especially us Norwegian due to fossil fuel and we need to set a good example in order to reduce CO2 emissions.
24. Do have any suggest how project managers can promote Green Value Creation towards the customers?	We have an influence, it is after all collaboration and we want to influence the frameworks. Often it is a lack of competence from the customers.	It is to use my own creativity and competence within construction physics and environmental accounting. From now on I will promote more environmental friendly materials and recycling.	It is to attain more knowledge in order to show the benefits of being environmental friendly and how it can reduce costs. Make the customer thinking more long term.	No, not at the moment.	To me it's a natural process to promote the environment toward the client.	It is not a problem, but it has to be anchored in Faveo and everyone has to promote green.
25. Do you think that the environmental awareness of the project owners have increased the last ten years?	On the surface it has changed, but it depends on the customers.	Yes, the last 30 years it has gone from nothing to very much, but I don't thing we do enough today.	Yes, it has been more focus on it, the government is setting more requirements and the marked is reluctantly following.	There is more focus on CO2 emissions, but some of the trends are not necessarily for the better.	Yes, it does and the society demands more environmental awareness.	The only thing that has changes the last 15 years is sorting recyclable rubbish accordingly.

Appendix C Self-completion questionnaire

Green Value Creation in Faveo Prosjektledelse AS

Must provide answer *

1. What is your Gender?*

 O Male

 O Female

2. How old are you?*
(Years)

O 20-30

O 30-40

O 40-50

O 50-60

O Older than 60

3. Which of these degrees of education do you currently hold?*
(Please tick the highest level of education)

O Skilled Worker (Fagarbeider)

O Bachelor degree

O Master degree

O Other

4. How many years have you worked with project management? *
(Please tick the appropriate response)

O 0-3

O 4-7

O 8-10

O More than 10

5. Which kinds of projects are you currently working on? *
(Please tick the appropriate response)

O Building and Construction

O Transportation

O Industry

O IT and Technology

O Business development

O Property development

 O Other

6. Which of these following environmental labels and certifications are you familiar with? * (Please tick one or more appropriate response)

O ISO 14001

O Nordic Swan (Svanemerket)

O BREEAM

O Eco-Lighthouse (Miljøfyrtårn)

O PEFC Norway Forrest Management (Levende skog)

O Environmental Product Declarations (Miljødeklarasjon)

O LEED

O None

O Other …………..

7. Environmental performance should be included in projects as a criterion for successful projects *(Please indicate your level of agreement by ticking the appropriate response)

O Strongly Disagree (SD)

O Disagree (D)

O Undecided (U)

O Agree (A)

O Strongly Agree (SA)

8. Environmental consequences are important in my decision making as a project manager *(Please indicate your level of agreement by ticking the appropriate response)

O Strongly Disagree (SD)

O Disagree (D)

O Undecided (U)

O Agree (A)

O Strongly Agree (SA)

9 What do you consider the most important criteria for a successful project?
(Give a short answer)

…………………

10. Have you ever used environmental certifications or labels when purchasing materials and services in a project? * (Please tick the appropriate response**)**

O Yes

O No

O Can't remember

11. How much of your tasks at work involve purchasing of materials and services? *
(Purchasing is defined as any products and services that have an invoice. (Answer in percentages))

O 0-20 %

O 20-40%

O 40-60%

O 60-80%

O More than 80 %

12. Which criteria are most important to you as a purchaser in a project?   (Please tick one or more of the most important)

O Time

O Cost

O Quality

O Sustainability

O Functionality

O Flexibility

O Customer preferences

13. How much do the customers influence your purchasing choices in projects? *
(From a scale 1 to 10)

O 1 No influence

O 2

O 3

O 4

O 5

O 6

O 7

O 8

O 9

O 10 Strong influence

14. What do you perceive as the most important criteria of the customers for successful project? (Give a short answer on the most important)

………………………….

15. How do you perceive the environmental demands from your customers?
(From a scale 1 to 10)

O 1 No requirements

O 2

O 3

O 4

O 5

O 6

O 7

O 8

O 9

O 10 Strong requirements

16. The customers have a responsibility towards a sustainable future. *
(Please indicate your level of agreement by ticking the appropriate response)

O Strongly Disagree (SD)

O Disagree (D)

O Undecided (U)

O Agree (A)

O Strongly Agree (SA)

Appendix D Summary of results from Google Form

1 What is your gender?
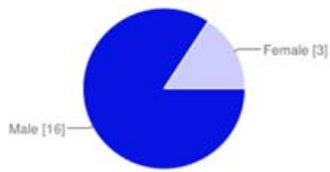
Male	16	84 %
Female	3	16 %

2 How old are you?
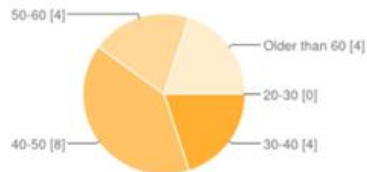
20-30	0	0 %
30-40	4	20 %
40-50	8	40 %
50-60	4	20 %
Older than 60	4	20 %

3 Which of these degrees of education do you currently hold?
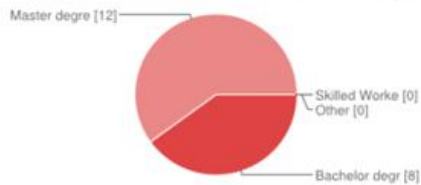
Skilled Worker (Fagarbeider)	0	0 %
Bachelor degree	8	40 %
Master degree	12	60 %
Other	0	0 %

4 How many years have you worked with project management?
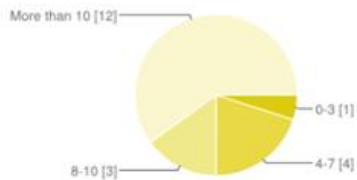
0-3	1	5 %
4-7	4	20 %
8-10	3	15 %
More than 10	12	60 %

5 Which kinds of projects are you currently working on?

Building and Construction	14	70 %
Transportation	6	30 %
Industry	0	0 %
IT and Technology	0	0 %
Business development	0	0 %
Property development	0	0 %
Andre	0	0 %

6 Which of these following environmental labels and certifications are you familiar with?

ISO 14001	11	23 %
Nordic Swan (Svanemerket)	6	13 %
BREEAM	11	23 %
Eco-Lighthouse (Miljøfyrtårn)	8	17 %
PEFC Norway Forrest Mangement (Levende skog)	1	2 %
Environmental Product Declarations(Miljødeklarasjon)	1	2 %
LEED	1	2 %
None	7	15 %
Andre	1	2 %

7 Environmental performance should be included in projects as a criterion for successful projects

Strongly Disagree (SD)	0	0 %
Disagree (D)	0	0 %
Undecided (U)	1	5 %
Agree (A)	14	70 %
Strongly Agree (SA)	5	25 %

8 Environmental consequences are important in my decision making as a project manager

Strongly Disagree	0	0 %
Disagree	0	0 %
Undecided	7	35 %
Agree	12	60 %
Strongly Agree	1	5 %
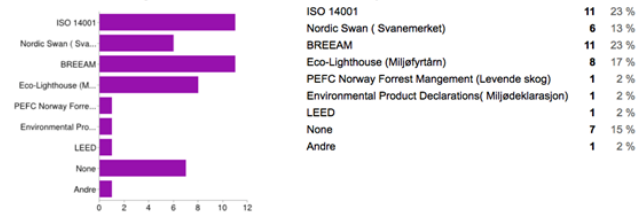
9 What do you consider the most important criteria for a successful project?

Good planning and teamwork   Deliver within time, cost estimate and with the right quality   Quality   On time. On   To deliver by cost and quality in time.   To achive the customers wishes   Performed within quality, cost an time   Quality, cost and risk management   Ha fokus på økonomi, framdrift og kvalitet.   Project economy ang progress   its function   Good planning   levere rett kvalitet til rett tid og rett kostnad   economy   Clear goals   Functional quality   On budget. On time. Good quality. Low energy consumption   Quality, cost, time
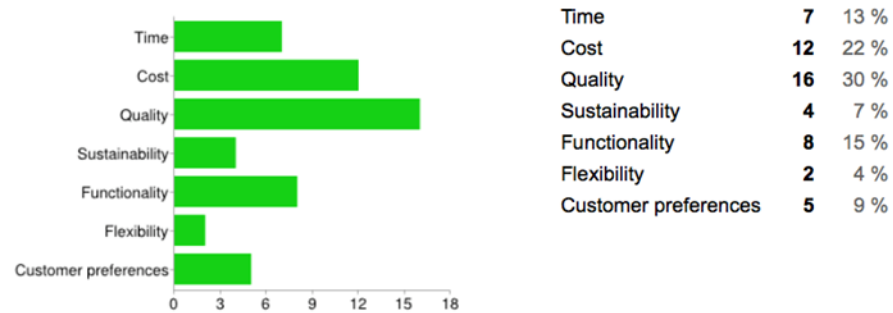
10 Have you ever used environmental certifications or labels when purchasing materials and services in a project?


Yes	5	26 %
No	10	53 %
Can't remember	4	21 %

11 How much of your tasks at work involve purchasing of materials and services?

0-20 %	**12**	63 %
20-40%	**5**	26 %
40-60%	**2**	11 %
60-80%	**0**	0 %
more than 80 %	**0**	0 %

12 Which criterions are most important to you as a purchaser in a project?

Time	**7**	13 %
Cost	**12**	22 %
Quality	**16**	30 %
Sustainability	**4**	7 %
Functionality	**8**	15 %
Flexibility	**2**	4 %
Customer preferences	**5**	9 %

13 How much does the customers influence your purchasing choices in projects?

1	**0**	0 %
2	**1**	5 %
3	**0**	0 %
4	**0**	0 %
5	**2**	11 %
6	**4**	21 %
7	**5**	26 %
8	**5**	26 %
9	**1**	5 %
10	**1**	5 %

100
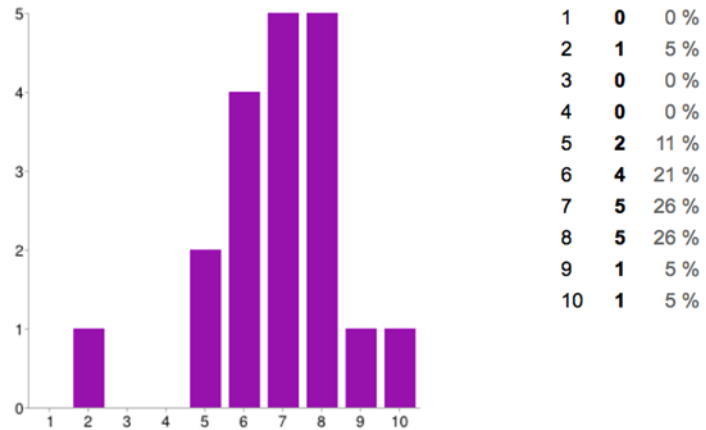
14 What do you perceive as the most important criterions of the customers for successful project?

Deliver within time, cost estimate and with the right quality   Quality   Cost, then functional quality   time and function   Leveringsdyktighet   The project has to be delivered by cost and quality in time.   Functionality, quality, cost ant time   Low price and quick delivery   Cost and functionality   On budget, on time and good quality. Low energy consumption   Delivery on time and in accordance to spec   Daily use   I am not sure.   Cost   Time and function   Functionality and economy   funksjonalitet, tid, sikkerhet, pålitelighet

15 How do you perceive the environmental demands from your customers?

1	0	0 %
2	2	11 %
3	4	21 %
4	2	11 %
5	4	21 %
6	2	11 %
7	3	16 %
8	2	11 %
9	0	0 %
10	0	0 %

16 The customers have a responsibility towards a sustainable future.

Strongly Disagree	0	0 %
Disagree	0	0 %
Undecided	4	21 %
Agree	10	53 %
Strongly Agree	5	26 %