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Adapting to ISO 14001:2015

How to plan for organizational and managerial changes in SMEs within the construction industry

Master of Science Thesis
in the Programme Quality and Operations Management

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ABSTRACT

With a global awareness of environmental issues, working more towards sustainable development has become an established concept. The construction industry is one of the largest industry sectors, and focusing on environmental work is therefore a necessity. Having an environmental management system (EMS) can help organizations structure their environmental efforts and control their processes. The International Organization for Standardization provides a certification for EMS called ISO 14001. In 2015, a new version of the certification, ISO 14001:2015, was released. This requires companies that have been certified to the previous version to recertify within three years to remain certified. The transition needs to be managed with the help of environmental managers and through the project-based structure that is common for construction companies.

The objective of this project was therefore to study how small and medium sized construction companies in Sweden can plan for the managerial and organizational changes when recertifying to ISO 14001:2015. This was done by evaluating the previous version (ISO 14001:2004), analyzing the potential implications for the new version as well as how to plan for the change. The findings showed that the ISO 14001:2004 certification has had several implications. It helps create an improved documentation structure which facilitates the transfer of knowledge more effectively throughout the organization, strengthens company image, improves competitiveness as well as reduces the company's perceived environmental impact. The negative implications are that the certification is time consuming, requires a lot of documentation and is difficult to apply to the whole organization. The view of working with sustainability issues and the certification differed between various roles within the companies. However, with the customer being the primary stakeholder, they influence what decisions are made within a project. In addition, projects are often operating in a time and resource pressured atmosphere, which limits how much environmental issues can be prioritized.

ISO 14001:2015 includes several changes that needs to be planned for when recertifying. The environmental manager has important roles for the transition to become successful. However, other managers also need to be educated about the new standard and receive leadership training. A change team should be created, consisting of employees from all organizational levels, which facilitates organizational learning. It is also essential to formulate a knowledge management strategy to make knowledge transfer an integrated part of an organization's decisions.

Keywords: environmental management system, ISO 14001, change management, organizational learning, knowledge management, leadership, sustainable development

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TERMINOLOGY

Construction company – A company operating in the construction and/or the real estate sector

Environmental management system (EMS) – A part of a management system addressing environmental issues

Environmental manager – Manager responsible for a company's environmental work, sometimes in addition to other work tasks

Environmental work – Efforts intended to reduce a company's environmental impact

International Organization for Standardization (ISO) – A global organization that provides voluntary standards

ISO 14001 – A standard containing requirements for environmental management systems

ISO 14001:2004 – The previous version of ISO 14001

ISO 14001:2015 – The latest revised version of ISO 14001

Management system (MS) – A system that directs all procedures used within in a company in order to accomplish its objectives

Project-based organization – An organization containing both a permanent and a temporary department, which consists of several projects

Site manager – Manager responsible for coordinating staff and operations of a building site

SME – Small and medium-sized enterprise consisting of 10-250 employees with a turnover of 2-50 million EUR/year and a balance sheet of total 2-43 million EUR/year.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

Today, the world faces many environmental challenges and many people have become used to a living standard that is not sustainable for future generations. These issues were put on the agenda almost 30 years ago when "Our Common Future", or the Brundtland report, was released by the World Commission on Environment and Development (WCED) with the purpose to formulate a global agenda for change (WCED, 1987). The report provided a widespread definition of sustainable development, which is: "*development that meets the need of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p. 41). Strategies to reduce environmental impact, e.g. less resource use and more life cycle thinking in production, have since then become more common among organizations.

The construction sector has for long been one of the greater consumers of energy. Rajagopalan and Tony (2012) found that the construction sector was responsible for around 30-40 percent of the total energy usage in the world. It causes 40 percent of the global account of carbon dioxide (CO_2) emissions (UNEP, 2016). In addition to this, the construction sector accounts for one third of the total amount of waste produced in Sweden (Naturvårdsverket, 2016). At the same time, it is a growing industry in Sweden. For example, the Swedish administrative authority Boverket presented a report in 2015 showing that housing construction had increased in 2015 and is expected to increase in 2016. In addition to this, more than 375 000 residences must still be built between 2015 and 2020 (Boverket, 2015). This example alone shows a need for Swedish construction companies to focus more on sustainable development to reduce their environmental impact.

Many organizations implement environmental management systems (EMS) as tools for managing their environmental work. An EMS is a "*[...] part of the management system used to manage environmental aspects, fulfill compliance obligations, and addresses risks and opportunities*" (EN ISO 2015, European standard, p. 2). In other words, an EMS more or less explicitly state what actions should be taken for reducing an organization's environmental impact. A common standard related to EMS is ISO 14001, which contains a set of requirements that are put on an organization's EMS (ISO, 2016d). In September 2015, a revision named ISO 14001:2015 was launched to replace the previous version within three years. Some main changes are related to an increased demand on lifecycle thinking, larger emphasis on leadership and environmental management within the organization as well as improving environmental performance and communication strategies (ISO, 2016a). However, transitioning to the new revision can become a challenge. Due to the recent publication of the revision, more research needs to be conducted on how to implement ISO 14001:2015. As more construction companies are working in accordance to the ISO 14001 standard (Gluch et

al., 2011), there is also a need for more research on how to implement the standard specifically within the construction sector.

Searcy et al. (2012) studied challenges when implementing a functional ISO 14001 EMS and found that expertise about how change should be managed is required to preserve the knowledge in a system. They explain that this expertise often is missing when implementing an ISO 14001 EMS and that the change process is managed rather unstructured and informally. Therefore, they suggest that more research should be conducted on how change management can be integrated into an EMS. Already in the Brundtland report it was stated that sustainable development is not a state, but a change process that advocates efficient resource use and division of investment to meet the needs of the present and future generations (Moneva et al. 2006). The report also explains the importance of sustainable development and how this should be incorporated in organizations as a natural way of thinking. By studying what changes organizations face as a result of ISO 14001:2015, this research could contribute to the field by bringing more knowledge on how change management can become an integrated part of implementing ISO 14001. There is also a need for more research about how companies within the construction sector view environmental concerns (Zutshi and Creed, 2015). It is therefore interesting to study what measures that can be taken to improve the environmental work within the construction industry, due to its environmental impact. In addition, it is also relevant to study how management can create commitment for environmental work within their organizations. Therefore, this project aims to study what implications ISO 14001:2004 has had on Swedish small and medium-sized construction companies' environmental work, as well as how they can plan for the transition to ISO 14001:2015.

Initially, this research project was intended to be written as two separate reports. One of the reports would have had a larger environmental focus from the perspective of one of the authors, who studies the master's program Industrial Ecology at Chalmers University of Technology. The other report would have had a larger organizational focus, as the two other authors study the master's program Quality and Operations Management at the same university. However, since the study was conducted together continuously throughout the research process, it became clear that the research would benefit from being composed into a single report, combining both academic perspectives. This conclusion was drawn on the basis that the study concerned both knowledge domains and that these would mutually strengthen the findings of the study.

1.1 Background

The background intends to provide a broad description of the construction industry in Sweden, the general organizational structure of a construction company as well as common environmental certifications within the national sector. In addition to this information, general sustainability efforts and challenges are presented, which are based on construction companies' culture and organizational structures. The chapter is concluded by explaining the role of the environmental manager within the construction industry.

1.1.1 Project-based organizations

According to Sydow et al. (2004), companies within the construction sector are often characterized as project-based organizations. They explain a project-based organization as an interorganizational network with different project organizations, in which all company services and products are distributed. Each of the project organizations operates in a unique environment. There are several advantages related to it, such as providing the opportunity to perform low-cost experiments, as well as avoiding traditional hinders for innovation and organizational change. However, Sydow et al. (2004) also explain that there are difficulties with operating in project-based organizations. To keep knowledge gained in the various projects, substantial coordination is needed to preserve and diffuse it. There is also a risk of tension arising between the dilemma of task performance and learning opportunities.

Lundin and Söderholm (1995) present a theoretical framework for the temporary project organization. They argue that there are four essential pillars to differentiate temporary organizations from the permanent; time, task, team and transition. Time refers to the different phases the project goes through and the boundaries that the project is operated within. It is a crucial factor that sets the limits of the actions that need to be performed during the various time horizons before the project dissolves due to completion. Task refers to the set number of assignments that need to be accomplished within the time frame. Team means the individuals that operate on the task within the available amount of time. The last pillar, transition, concerns the expectations that there should be a difference between the start and the finish of the project, meaning that the task should have led to a change.

Bresnen et al. (2004) found that the diffusion and management of knowledge in project-based organizations is complex due to the structural conditions in which employees have to operate in combination with the set procedures for managing projects. The project members work on a set time threshold, with limited cost and quality expectations, which can cause tensions between the members. Also, with the limited amount of time, managing and sharing knowledge between the members can be difficult. The work of the environmental managers becomes complicated when there is reduced knowledge transfer, since they often have lower

status amongst the other construction workers (Gluch and Räisänen, 2012). Diffusing environmental work and spreading knowledge related to this area is therefore difficult, due to the structure of the project-based organizations and the loosely-coupled link between the environmental managers and the rest of the organization.

1.1.2 Organizational structure of construction companies

Most construction companies operate in both a permanent and temporary structure, with a project-based matrix organization being the basis (Gluch, 2009a). The permanent organization is hierarchically composed based on customer focus, geographical factors as well as project characteristics. The temporary organization is a part of the permanent organization, referring to the different active projects in the company (see figure 2.1).

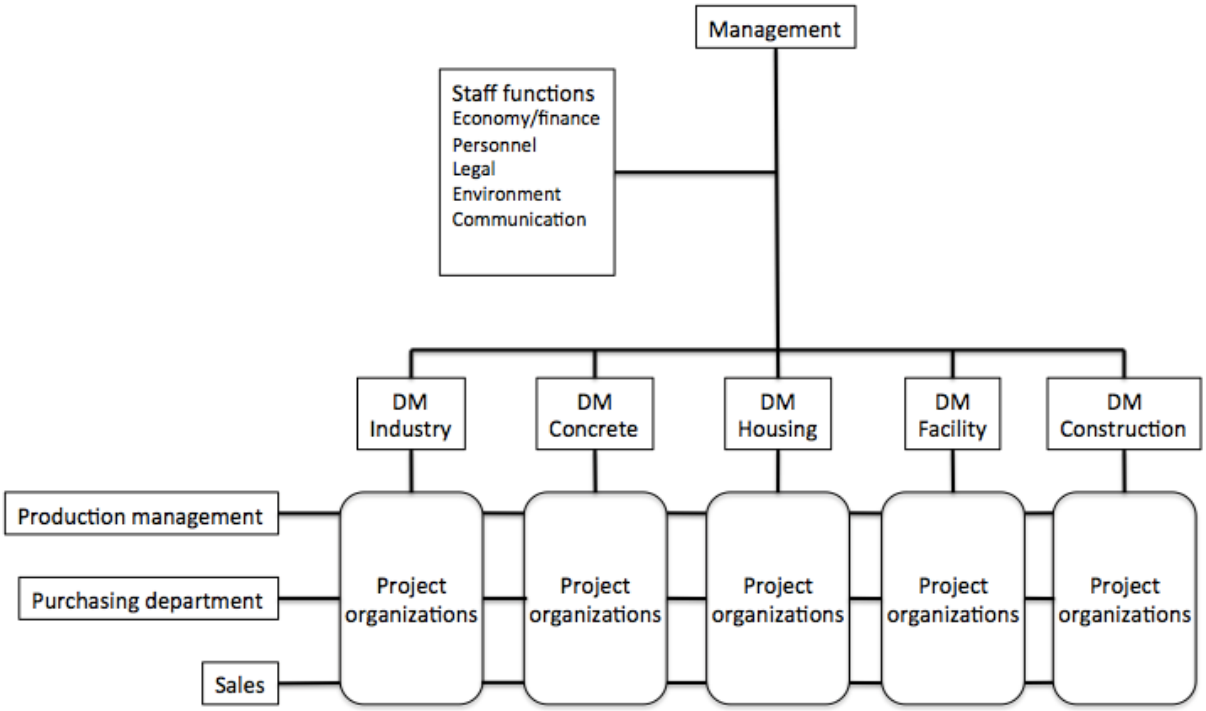

Figure 2.1: Shows the general organizational structure of a construction company (Gluch 2009a). DM refers to department management.

Due to the organizational structure, one of the largest challenges for construction companies is to coordinate work between the permanent and temporary organization (Gluch, 2009a). Another issue is the institutionalized culture (Kadefors, 1995) among the different roles within the company. Strong norms and values among the workers also hinders the coordination of permanent working procedures to the temporary projects. In each building project, sub-cultures are often created due to the common goal that the project members unitedly need to reach. This results in that changes might be difficult to implement because of the unique atmosphere that each sub-group creates. Environmental strategies and efforts are

hence affected by the coordination challenges due to the effects they have on organizational learning, management practice and change management (Gluch, 2009a).

1.1.3 The construction industry in Sweden

Sveriges Byggindustrier is an industry association and employer's organization with more than 3 200 member companies from the Swedish construction industry (Sveriges Byggindustrier, 2016). In a report from 2015, they published statistics describing the industry's status in numbers. The report showed that in 2014, 96 700 construction companies were registered, corresponding to 8 percent of the total amount of all companies in the industry sector in Sweden. Out of the 312 000 employees working in the sector, only 8 percent of the workers are women while the remaining 92 percent are men. Among the construction companies, 88 percent have four or less registered employees, which means that most of the companies within the sector are hence originating from self-employed businesses. Few construction companies in Sweden operate in an international context (Sveriges Byggindustrier, 2015). This results in that most of the companies comply with the same set of laws and regulations.

1.1.4 Common environmental certifications within the Swedish construction sector

From reviewing a few of the largest construction firms in Sweden, some of the most common environmental certifications have been identified. Other than ISO 14001, general certifications in Sweden are Building Research Establishment Environmental Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED), CEEQUAL, GreenBuilding, Miljöbyggnad and Svanen. The certifications address different environmental aspects of the building process, such as energy efficiency, integrated sustainability as well as the overall leadership. Table 1.1 shows a brief description of each certification (Breeam, 2016; Sweden Green Building Council, 2016a; Sweden Green Building Council, 2016b; Sweden Green Building Council, 2016c; Svanen, 2016; ISO 2016d).

Table 1.1: The table shows a selection of commonly used environmental certifications within the construction industry and what environmental aspects they address.

Certification	**Addresses**
BREEAM	Environmental performance of the building
LEED	Environmental performance of the building
CEEQUAL	Sustainability of construction and infrastructure
GreenBuilding	Energy efficiency in facilities
Miljöbyggnad	Environmental performance of buildings and facilities
Svanen	Environmental performance of the building
ISO 14001	Environmental management system

1.1.5 Environmental impact of the construction industry

With the construction sector being one of the largest industries and accounting for a great amount of global emissions, it is important to find and adopt strategies to reduce the environmental impact. Five essential factors have been stated by Constanza et al. (2013) as being the most important for a sustainable construction industry; (1) having an integrated and functioning EMS system, (2) environmental coordination, (3) energy efficiency, (4) resource efficiency and (5) pollution prevention. For example, they say that the construction industry is one of the largest sectors contributing to emissions of greenhouse gases (GHG) as well as sulfur oxides (SO_x) and nitrogen oxides (NO_x). It is therefore essential to create awareness and integrate functioning environmental work in all organizations within the sector. Having a functioning EMS will contribute to this being achieved.

In a study by Gluch and Räisänen (2012), it was found that transferring long term environmental operations might be difficult for construction companies due to their organizational structure. Zutshi and Creed (2015) also argue that there are difficulties in finding a suitable strategy to implement environmental initiatives that work globally for all companies within the sector. They say that businesses that are overwhelmed by an EMS can implement other sustainable strategy solutions, such as basing their environmental work on the waste hierarchy. Working accordingly with other methods will help the organizations move closer to the complete EMS and make the final transition easier. In a review of global

environmental initiatives made by Zutshi and Creed (2015), it is recommended that the governments should reinforce equal EMS requirements on the construction companies, independent of where the parent company is located. They propose that the companies should conduct cost-benefit analysis to identify hidden costs as well as execute LCA on all construction projects. Applying LCA as a tool is helpful when working with waste reduction, since it provides the opportunity to measure emissions and translate these into for example CO_2-equivalents, which can be used to compare different processes and their environmental impact (Baumann and Tillman, 2004).

1.1.6 Sustainability efforts in the construction industry

To be able to work towards sustainable development, several measures can be taken. The government and lawmakers can set regulations and policies, but also reward organizations that are in the forefront of their sector (Constanza et al., 2013). Additionally, companies can choose to aim for certifications and green labeling that can be used for marketing purposes, as well as being a strategic advantage towards other organizations within the sector. ISO 14001 is one of the main certifications that set requirements on a sustainable management system with regards to the environment. It should be possible to apply the standard in all organizations, as it is designed to suit any type of business (ISO, 2016b).

1.1.7 Sustainability challenges in the construction industry

The construction industry is a relatively unique business with regards to it being constructed of a permanent and a temporary organization, which causes several obstacles when implementing change and innovation (Bresnen et al. 2005; Dubois and Gadde 2002b). According to Gluch and Räisänen (2012), most of the companies within this sector are operating in project organizations that mainly have face-to-face communication, which complicates the company's work with ISO 14001. They explain that operating in a project-based business leads to an additional problem related to the influence of communication patterns within companies. When a strategic change has to be implemented, it needs to reach a long chain of people throughout many levels in different organizations, who are often located in geographically distant locations. For example, the leading committee might be positioned in the head office, while the site manager is located at the building site, which complicates diffusing information. Research shows that some of the key challenges of implementing a functioning management system are increased costs and resources, a need for more documentation, lack of competent personnel and implementation tools as well as resistance to change from the employees (Searcy et al. 2012).

In a study by Gluch (2009a), sustainability reducing factors within the Swedish construction industry were researched. The results showed that there are difficulties related to working with environmental management due to the organizational project structure that can be seen in

many companies within the sector. Also, many environmental managers end up being trapped between the top management, the sustainability targets and the limited time frame given in different projects. They are also often responsible for several projects at the same time, making it difficult for them to gain enough knowledge about each individual project to make appropriate decisions (Gluch and Räisänen, 2012). Below follow contradictions towards adopting functional environmental efforts within the sector.

1.1.8 Culture in construction companies

Environmental work in the construction sector is sometimes not prioritized since it is perceived to be very bureaucratic, which hinders personal engagement for sustainable efforts (Gluch, 2009a). However, research by Searcy et al. (2012) concerning integrating management systems shows that it is possible to reduce cost due to a clearer strategic structure, increased process efficiency, increased employee motivation and better stakeholder relations. In construction companies, Gluch and Räisänen (2012) explain that the culture among employees is often somewhat grouped, and face-to-face communication is the normal way to share knowledge. Applying a structured EMS puts constraints on the workers because of the need for documentation, which contradicts the common way of communicating. Also, the necessity of being certified according to ISO 14001 is therefore seen as an administrative task that does not belong to the site workers responsibility. This cultural conflict causes larger distances between the environmental managers' work and the rest of the workers.

1.1.9 Organizational structure of construction companies

In a review of previous studies, Gluch and Räisänen (2012) conclude that most companies within the construction industry in Sweden have an integrated EMS system. However, many of them have only set environmental goals without having measures of how to follow up and evaluate the performance. A general challenge that hinders the development of more sustainable work in the construction sector is the project-based structure of the organizations. This may result in environmental managers being torn between the project requirements and the overall sustainability goals set by the management of the organization. Also, with several projects being of varying size and geographic locations, the projects differ a lot from each other, which causes difficulties in implementing a general guidance that can be followed in all cases (Gluch et al. 2013). Another issue with this type of structure is the distance between the temporary building projects and the permanent organization it creates. A loose-coupled system within the construction industry results in a distance between the two units which can be difficult to overcome when trying to improve an organization's learning and innovation capabilities (Dubois and Gadde, 2002b). With the environmental managers often being positioned in management, the obstacles are many when trying to work through the decoupled system and implement more environmental strategies (Gluch and Räisänen, 2012). This creates distance between the environmental managers and the rest of the company.

1.1.10 Role of environmental managers

To improve a company's environmental work, it is essential that both managers, other employees and relevant stakeholders find it a priority. Having their involvement is likely to be a way of ensuring that these issues are given enough attention and resources. This emphasis can be assured by having a higher level manager who is in charge of the environmental work. Gluch et al. (2013) explain that this is becoming increasingly common in companies, where a few years ago, an environmental manager had a lower degree of authority, but is now often a part of higher management.

Since the construction business is a relatively pressured business with regards to costs, time and quality, it reduces the amount of assets that can be put on environmental effort. Also, environmental issues are often only perceived to be relevant during the time the projects are active (Gluch and Räisänen, 2012; Kungliga ingenjörsvetenskapsakademien, 2014). After completing the projects, no further efforts are made to evaluate the effects, which complicates the work for the environmental managers. A study by Gluch (2009a) also shows that there are in many cases no clear structures of how to spread and communicate environmental information, either within the organizations or to external companies. With contributing factors, such as a high level of face-to-face communication and cultural groupings, the work of the environmental manager therefore becomes relatively difficult. In addition, findings by Rodrígues et al. (2011) show that many environmental managers are responsible for additional areas, such as quality and health and safety. This complicates their work in the sense that less efforts and resources can be put on improving the company's environmental work.

A case study of two large infrastructure projects in Sweden showed that there is limited respect for the environmental managers because of the distance between the permanent management organization and the project organization (Gluch and Räisänen, 2012). The environmental managers were expected to coordinate the environmental issues in approximately 100 different construction projects simultaneously, handling and passing on relevant information. Having strategically important environmental knowledge caused tensions since the site manager's role as the top manager of the construction site was challenged. Also, by working in accordance with both the permanent organization and the different project organizations, the environmental manager had to make conflicting decisions based on the time-pressured project atmosphere and the visions of top management.

1.2 Aim and objective

The main objective of this master's thesis is to investigate how Swedish small and medium-sized (SME) construction companies can plan for organizational and managerial changes due to a future transition to ISO 14001:2015. This will create more knowledge about how organizational change can become an integrated part of companies' management systems as new revisions of ISO 14001 standards are released. To meet this objective, three research questions were formulated.

To evaluate the implications of the changes related to ISO 14001:2015, it is necessary to first study what impact ISO 14001:2004 has had on Swedish small and medium-sized construction companies. This will make it possible to bring both good and bad experiences into the implementation of the new standard. Most environmental management systems used within construction companies in Sweden follow the requirements set in the ISO 14001 standard (Gluch et al. 2011). In order to investigate the implications of ISO 14001:2004 on small and medium-sized construction companies in Sweden, and thereafter evaluate the expected impact of the implementation of ISO 14001:2015, the first research question is:

- *What organizational and managerial implications has ISO 14001:2004 had on Swedish small and medium-sized construction companies?*

ISO 14001:2015 must be implemented within three years for companies' EMS systems to remain ISO 14001 certified, which includes integrating aspects such as lifecycle thinking, leadership and strategy to their EMS system (ISO, 2016a). The transition process has not yet been completed by many companies. For example, only two small and medium-sized construction companies in Sweden had transitioned to the new revision in April 2016 when searching through all construction related categories at Certifiering.nu. Based on the implications found from ISO 14001:2004, and the new changes in the ISO 14001:2015 revision, the second research question intends to answer how the transition will affect Swedish small and medium-sized construction companies to further evaluate how they can plan for the upcoming change. It has therefore been formulated as:

- *How is the transition from ISO 14001:2004 to ISO 14001:2015 predicted to affect Swedish small and medium-sized construction companies?*

Since only a few small and medium-sized construction companies in Sweden have become ISO 14001:2015 certified, it is interesting to study how companies aiming for the new certification can plan for the changes related to it. The project-based structure within the construction industry makes it more difficult for long-term environmental efforts (Gluch and Räisänen, 2012). Companies being certified to ISO 14001 should integrate change

management when working with the standard requirements (Searcy et al., 2012), which likely is an important aspect when transitioning to the new version. Companies also need to consider how to manage the organization's learning and the knowledge it possesses during the transition, as sustainable thinking should be a natural part of how the organization makes decisions (Moneva et al., 2006). These theoretical considerations, combined with the findings of how the transition is believed to affect companies, aims to answer the third research question, which is:

- *How can Swedish small and medium-sized construction companies plan for the change processes related to ISO 14001:2015?*

1.3 Focus

To achieve the aim of the research project, a focus was set at the initiation of the study and was continuously reevaluated throughout the project. The companies included in the study are categorized as small and medium-sized. By reviewing previous research, Searcy et al. (2012) concluded that this group of companies is likely to face more challenges related to implementing ISO 14001 than larger companies, as they often have less resources. The definition of SMEs provided by the European Commission's (2016) will be used, meaning companies with 10-250 employees, a turnover 2-50 million EUR/year, and a balance sheet of in total 2-43 million EUR/year. Even though micro-sized companies constitutes the largest group of construction companies in Sweden, significantly fewer of these companies are ISO 14001 certified than small and medium-sized companies (Certifiering.nu, 2016a). Limiting the study to small and medium-sized companies increases the relevancy of the study.

The studied companies are ISO 14001:2004 certified, and consists of a focused group of recipients within the construction industry in Sweden. The certified companies were deemed most relevant, since the study focused on managing the transition from the 2004 version of ISO 14001 to the 2015 version. The participants are managers at different hierarchical levels within the company, which contributes to an understanding of how their views on sustainability issues differ and how environmental work impacts their respective positions.

2 FRAME OF REFERENCE

The following section presents theory related the study, starting with a general description about management systems, as well as the benefits and challenges of implementing an ISO 14001 EMS. This is followed by a general description of stakeholders within environmental work. Next, theory related to change management is described in order to create an understanding of how the change to ISO 14001:2015 can be conducted, as well as what obstacles there may be during the transition process. Finally, theory about organizational learning, including knowledge management, is presented in order to create an understanding of how organizations can learn and manage knowledge related to ISO 14001.

2.1 Management systems

ISO defines a management system as "*[...] the set of procedures an organization needs to follow in order to meet its objectives*", which can be an explicitly communicated system, but also a more mental system consisting of how employees of an organization work (ISO, 2016b). Management initiatives can for example also be viewed as a framework of structures containing documentation structures, explicit normative and tacit guiding, and behavior, which are mutually influencing each other (Marmgren et al. 2012). The degree of which the management system is spoken is often dependent on the size of the organization; larger organizations tend to have more explicitly communicated systems in order for all actors within the organization to know their individual roles (ISO, 2016b). Management systems can be interpreted differently by different people. In their research, Marmgren et al. (2012) present some views they have observed. A few of these concern more abstract concepts, such as documentation structures and the organization itself viewed as a system. The list also includes more concrete interpretations, such as manuals of documented procedures and structures consisting of external demands, models or tools. Organizations can implement management systems with different purposes, e.g. quality management systems, service management systems and environmental management systems.

2.2 Environmental management systems

To work with efforts to reduce environmental impact, companies and organizations can develop an environmental management system (EMS), which is defined as a "*part of the management system used to manage environmental aspects, fulfil compliance obligations, and addresses risks and opportunities*" (EN ISO 2015, European standard, p. 2). An EMS is hence focused on supporting all environmental activities, with regards to measurements, reduction of environmental impact and improvement of environmental performance. Due to a growing environmental interest all around the world, there is a pressure from the market on

construction companies to implement proper EMS in their businesses (Zutshi and Creed, 2015).

2.2.1 ISO standards for environmental management systems

The International Organization for Standardization (ISO) is a global organization that provides voluntary standards, which are based on consensus within the industry (ISO, 2016c). ISO offers different standards to which organizations can be voluntarily certified, such as the ISO 50001 for energy management, ISO 14001 for environmental management and ISO 9001 for quality management. Each standard focuses on different aspects of business that is relevant for all types of companies globally, where they lead to different certifications. The certification process is not managed by ISO, but by external actors known as third-party audits (ISO, 2016b).

ISO 14000 is a group of standards that "*[...] provides practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities*" (ISO, 2016d). One component of this group is the ISO 14001 standard, which is directed towards environmental management systems (ISO, 2016d). For construction companies, it functions as a tool for managers to identify in what way the environment is affected (Zutshi and Creed, 2015). ISO 14001 is implemented by using an approach based on continual improvements (Swaffield and Johnson, 2005), which is similar to the PDCA-cycle commonly used within quality management. It contains the following five stages:

1. An *environmental policy* fulfilling regulations and legislations must be formulated;
2. The implementation must be *planned* by setting goals and creating related targets;
3. A suitable structure with clear responsibilities, e.g. routines for training and documentation, is crucial for the *implementation and operation* of an EMS;
4. When it comes to *checking and corrective action*, the level of environmental performance must be measured and investigated by demonstrating clear procedures of how and what the outcome is supposed to be;
5. Continuous improvements require continuous *management review* of the EMS (Swaffield and Johnson, 2005).

2.2.1.1 The PDCA-cycle

When working in accordance to the ISO 14001 standard, the approach of a functioning environmental management system is based on the Plan-Do-Check-Act (PDCA) cycle. The PDCA cycle, also known as e.g. the Deming cycle, the Shewart cycle, or PDSA, is a tool that makes it easier to follow all stages of an improvement (Deming, 2000). It consists of four phases that an improvement effort meaning to solve a problem should ideally pass through in order to achieve a successful implementation (Bergman and Klefsjö, 2010). The PDCA-cycle

is often used within quality management, where it has been shown to facilitate workplace learning by helping to create and share new knowledge while at the same time eliminating old knowledge (Matsuo and Nakahara, 2013).

Bergman and Klefsjö (2010) describe the cycle as consisting of four phases. The first part of the cycle is the Plan phase. During this phase, the problem's causes are investigated and discussed to find the reasons of the problem occurring, which can be done by e.g. using tools and methods, such as an Ishikawa diagram or FMEA. The next phase is Do, where the implementation is conducted. During the next phase, Study, the effects of the improvement are studied in order to see if the change has been positive. The last phase, Act, is when the improvement efforts, if they are successful, should be integrated into the organization's regular processes and standardized to ensure that the changes will be lasting. If the improvement was not as successful as intended, the cycle should be repeated by analyzing the same problem again. Otherwise, the cycle should be continued with a focus on another problem the organization has.

2.2.2 Benefits of certifying an EMS to ISO 14001

There are various reasons for why organizations choose to certify according to ISO 14001 and research shows that there are different advantages to gain. In 2012, a literature review was conducted by Tarí et al., in which they studied 29 articles concerning what benefits implementing an ISO 14001 EMS could bring to organizations. The authors identified 13 common benefits that researchers had analyzed. From the literature review, they found that the most identified benefits concerned environmental performance, efficiency and profitability. In addition, they also found that better image, more satisfied customers, improved results of employees, increased competitiveness and better relations with stakeholders to be important aspects.

When it comes to environmental performance, some research has shown that certifying an EMS to ISO 14001 has positive environmental effects. When studying 116 Swedish manufacturing firms, Zobel (2015) found indications of certified companies using less energy and reducing their waste. However, the same study showed that non-certified companies tend to improve their air emissions. He reflects upon these somewhat contradictory results by explaining them as a result of being forced to prioritize between different environmental considerations. Air emissions are also said to be difficult to reduce by EMS improvement programs due to technical reasons. Zobel (2015) concludes by saying that companies might have focused on other issues than air emissions, which are more commonly being debated.

In a study by Swaffield and Johnson (2005), they investigated more specifically what financial benefits there are for construction companies of implementing ISO 14001. They

found that there are both direct benefits, such as lower costs for waste disposal, as well as indirect benefits, e.g. a better company image which leads to more project bids won. Similar results were found in a case study of the construction industry in Hong Kong (Tse, 2001). Tse (2001) also mentions that the insurance premium was reduced due to lower environmental risks involved in the businesses. Financial benefits of implementing an ISO 14001 EMS was also the topic of de Vries' et al. (2012) literature review. According to the authors, most studies have found a positive financial influence from certifying an EMS to ISO 14001. They say that being certified leads to larger financial benefits than what it costs to implement the standard, such as increased competitiveness and improved operations. The authors say that positive financial benefits are increased by "*[...] the age of the environmental management system, commitment of top and middle management, internal motivation, size of the organization, well-defined responsibilities, employee training and involvement, employee awareness, and stakeholder involvement.*" (p. 432). De Vries et al. (2012) also found that managers have important roles in the implementation of an ISO 14001 EMS by considering aspects such as "*strong internal motivation; top management commitment; communication with interest groups; stakeholder involvement; well-defined responsibilities for environmental management; and training and educational programs*" (p. 432).

Being certified to ISO 14001 is according to Christini et al. (2004) advantageous as it puts requirements on an integrated EMS and provides an opportunity to compare companies' environmental performance. They say that many organizations implement environmental reduction strategies that go beyond the requirements mentioned in the ISO 14001 standard. In turn, this puts additional pressure on other companies within the sector, as well as on customers and regulators to continuously improve environmentally.

2.2.3 Challenges with certifying an EMS to ISO 14001

Implementing ISO 14001 within the construction sector has shown to sometimes be challenging. Tse (2001) argues that the subcontracting layers of the industry causes difficulties of achieving some of the control requirements that are necessary for an ISO 14001 certification. Searcy et al. (2012) found that challenges mainly concern three categories. The first is about loops and synergies among the elements of a management system, including e.g. addressing variation in how to manage non-conformities, corrective and preventive actions as well as to make objectives, targets and programs fit to the organization. The authors continue with challenges related to management system auditing, related both to first-party auditing as well as third-party auditing. Finally, Searcy et al. (2012) bring up the issue of integrating management systems. This contains both common challenges related to the integration of management systems, but also how to integrate the topic of change management and corporate social responsibility (CSR) with the management systems.

As mentioned in several studies, ISO 14001 certification can be a time and cost consuming process (Tse, 2001; Searchy et al., 2011; Turk, 2009). Tse (2001) argues that this is due to the increased documentation necessary by the employees. Some research also shows that adopting a certified EMS might not actually improve a company's environmental performance. Indications of this were found by Hertin et al. (2008) when they studied 274 companies and 400 production sites, operating within six manufacturing sectors in six EU member states. They found various reasons that could explain the results. One of these reasons is that an EMS does not drive change by itself. Instead, it is said to be a tool for improving performance. They also explain the lacking link between an EMS and environmental performance as a weakness in how procedures are implemented and enforced. Furthermore, they say that companies only do improvements in specific contexts. Finally, Hertin et al. (2008) also take up the issue of cost barriers, meaning that cost-effective environmental measures lead to smaller effects in comparison to the company's total impact on the environment.

Environmental managers often face challenges in their work. When Rodríguez et al. (2011) evaluated the implementation of ISO 14001 at 90 construction sites in Spain, they identified challenges related to the role of the environmental manager. One finding was that these managers often lack relevant engineering and environmental knowledge. Monitoring environmental work was also hindered by the fact that these managers often did not have their offices at the construction sites. Some were also hired by other companies, which resulted in a lack of knowledge about how the other companies function and thus hindering their work. The environmental managers often had other work tasks to perform, e.g. quality, safety and/or health related tasks, leading to less focus being directed towards environmental efforts. However, having multiple responsibility areas did not seem to improve the integration of management systems. Often, construction workers did not perceive the environmental manager's work to be useful, but instead complex and hindering, and construction projects managers did not value environmental management. Furthermore, the supervisor often lacked enough resources, authority and autonomy for environmental improvements. Rodríguez et al. (2011) conclude their discussion by describing the implementation for ISO 14001 at construction sites as a formality for gaining contracts instead of a dedication to actually reduce the environmental impact of companies. A more successful implementation could be achieved by e.g. providing all employees enough resources, having committed managers, emphasizing that everyone should engage in and prioritize environmental work, and having experienced environmental managers with no construction work tasks.

2.2.4 ISO 14001:2015

All standards are revised on a five year basis, which enables ISO to guarantee that the current versions of ISO standards are updated and relevant for the market (Ciravegna Martins da Fonseca, 2015). Ciravegna Martins da Fonseca (2015) wrote an article that broadly describes the process of ISO 14001:2015 as well what logical foundations the revision is built upon. He explains that ISO summarizes the revision process into five steps: (1) Working Draft, (2) Committee Draft, (3) Draft International Standard, (4) Final International Standard, and (5) International Standard. As a result of this revision process, a new ISO 14001 standard was published in September 2015. The new version was released for the standard to remain current and relevant, which was done by constructing it in accordance with the latest trends and the potential compatibility of others standards (ISO, 2016a). The revision includes some changes and requirements in comparison to ISO 14001:2004, which mainly concern:

- the inclusion of environmental aspects in strategic decisions within the organization;
- an increased focus on leadership;
- more proactive measures to contribute to the work of reducing environmental impact;
- continuously improvements of environmental work;
- life cycle thinking when considering environmental reduction work; and
- a larger focus on how to increase strategy communication (ISO, 2016a).

The current amount of research related to the new version is limited. When searching for ISO 14001:2015 in Chalmers library's databases, only nine articles appear. This means that it is unlikely that studies have so far been conducted concerning the organizational and managerial implications of the revision.

2.3 Stakeholders within environmental work

Stakeholders are important to consider in all aspects of a business, since they have the possibility to affect the present and future outcomes of an organization. Freeman (2010, p. 53) defines a stakeholder as "*any group or individual who can affect or is affected by the achievement of an organization's purpose*". In a questionnaire study from 2006 by Gluch et al. (2009a), environmental attitudes and performance within e.g. the construction and real estate sector were investigated. The study showed that clients and managers are considered as having the most influence in the company's environmental performance by the employees. It was also discussed that, despite clients being the main stakeholders, little effort was put on activities such as eco-labeling and green marketing. Having a good relationship with the organization's stakeholders is essential for gaining a competitive advantage within the sector, as well as for future development and expansion (Constanza et al., 2013).

Adding stakeholder pressure to companies could enhance their sustainability strategy. In 2000, the British Department of the Environment, Transport and the Regions published a document explaining ways for organizations within the construction industry to work more towards sustainable development (Pitt et al., 2008). The criteria include being more competitive and working towards constructing projects that are valuable to the customers, as well as respecting stakeholders, improving environmental work and reducing energy and resource use. As mentioned by Bremmers et al. (2004), previous research shows that the most relevant stakeholders for small and medium-sized companies are governments with regards to environmental factors. It is therefore important that the right measures are taken by the regulators to ensure environmental improvement practices

2.4 Managing the change towards ISO 14001:2015

In order to remain ISO 14001 certified, organizations must adapt their operations in accordance to the requirements of ISO 14001:2015. In turn, this requires them to enter various change processes that must be managed. However, change can be a challenging process, because people tend to dislike changing their habits and try to keep their current behavior unless they face some threat (Garvin and Roberto, 2005). In an interview by Coutu (2002), learning is discussed in relation to anxiety by the psychologist Edgar Schein. Schein explains that anxiety can be divided into learning anxiety, which is about avoiding changes e.g. due to their risks of being too difficult, and survival anxiety, which occurs when the necessity to change is unavoidable. He believes that in essence, change occurs only when people in an organization face real threat, both from within as well as outside the organization, i.e. when survival anxiety is larger than learning anxiety. In his own words, Schein (1996) described human change among individuals and groups as "*[...] a profound psychological dynamic process that involved painful unlearning without loss of ego identity and difficult relearning as one cognitively attempted to restructure one's thoughts, perceptions, feelings and attitudes*" (p. 2). A research field that looks closer at these challenges is change management. This research field is also central for organizations transitioning to ISO 14001:2015, because a proper management of change is an essential factor when integrating a management system (Searcy et al., 2012).

2.4.1 Change management

Kurt Lewin, who dominated the research field of change management for many decades, summarized how to successfully manage change into two requirements; (1) "*to analyse and understand how social groupings were formed, motivated and maintained*" (Burnes, 2004, p. 986) and (2) "*to change the behaviour of social groups*" (Burnes, 2004, p. 986). One of his most recognized contributions is the widespread 3-Step-model for changing behaviours of social groups, which contains the following steps: unfreeze (if necessary), change and

refreeze (Lewin, 1947). This means that it is not enough to only have a goal of reaching a different level than prior to a change, but also to consider how to make the new level permanent.

In its essence, change is about creating a new system of some kind, which requires leadership (Kotter, 2007). First, leaders must create a sense of urgency, as motivated individuals is a prerequisite for change (Kotter, 2007). This also goes in line with the findings of Schein (1996), who explains that all change needs dissatisfaction from unfulfilled hopes or expectations to get started. When a sense of urgency has been created, Kotter (2007) says that a guiding coalition consisting of people with different backgrounds, e.g. in terms of titles, reputations and relationships, should be formed to lead the change. They need to formulate and communicate a vision to guide the change process, e.g. by acting as role models, to empower others to act upon the vision. This could be facilitated by making the change easier, avoiding undermining the vision, and emphasizing creativity and risk taking. Next, Kotter (2007) mentions the importance of short-term wins, e.g. by showing improvements and appreciation to individuals. The improvements must also be consolidated, e.g. by involving individuals capable of implementing the vision. However, change is a continuous process in need of new energy, which can be done by e.g. creating new projects or hiring change agents. Finally, Kotter (2007) mentions the importance of institutionalizing the change by explaining how it is related to business success, as well as by leadership development and succession. It is also highlighted that if a key change person should move on to another business, it is important to appoint a new change leader who is aware of the original change made so that it can be carried on.

Having committed managers are important for a successful implementation of ISO 14001 (de Vries et al., 2012). Leaders also have an important role in persuading people that change is necessary. Concepción López-Fernández and Serrano-Bedia (2007) studied the implementation processes of ISO 14001 EMS among SMEs within the Spanish manufacturing and service sectors. They found that managers play important roles in making their employees' behaviors change. One way for managers to achieve this real change is according to Garvin and Roberto (2005) to first convince employees that change is necessary and explaining why the change process should be performed in a certain way. They say that this leads to the creation, revision and finalization of a plan for the change that can be announced for implementation, which leaders should communicate to their employees to manage their moods. Garvin and Roberto (2005) also say that managers must continue to emphasize the behavioral guidelines that have been set to avoid the change from reversing.

The approach leaders take towards their employees is another important factor of successful change processes. To successfully manage change in large systems, Nadler and Tushman

(1990) highlight the role of charismatic leaders who give their employees vision, direction and energy. Due to the complexity of large organizations, they suggest change to become an integral part of an organization's management system. Overall, Nadler and Tushman (1990) describe change in large systems as a result from the interaction of charisma, consideration of systems and processes, and involving people at all levels of an organization. In addition, they see it as a continuous process rather than a single transition, which requires learning from the past as well as adapting to new situations.

2.4.2 Overcoming obstacles to change

Change is not only dependent upon leadership. There are also obstacles within organizations that can make the change process challenging. Garvin and Roberto (2005) have identified some common obstacles. The first is having a no-culture, which means that people avoid risks by not doing anything. Next, they say that organizations often emphasize the process rather than its intended product. Furthermore, leaders are said to often evade problems by avoid facing challenges. It is also common for leaders to get stuck in politics rather than the substance of the change, which can be difficult to discover. Some leaders also fail to set a specific direction of the change process. Finally, Garvin and Roberto (2005) mention that individuals avoid changes by ignoring them, trying to work around them or waiting until something happens.

People are also an important part in the change process. One of the key challenges of implementing a functioning management system is to have employees showing resistance towards change (Searcy et al., 2012). The anxiety associated with learning new things is according to Schein (1996) the main reason to why change is hindered, as it causes people to avoid or disconfirm information in order to keep status quo. In other words, he argues that overcoming learning anxiety is the core of producing real change. Schein (1996) says that it is easier to change if the threat from a person's experienced disconfirmation is balanced by a psychologically safe climate. Furthermore, he discusses the concept of cognitive restructuring, which is composed of three parts of learning. First, things can mean something else than what they are perceived to mean. Secondly, things can be seen from a broader perspective. Finally, there is no final perspective for judging or comparing. Schein (1996) also believes that learning anxiety can be overcome by having positive role models, who play particularly important roles when people feel the actual sense of urgency for change. In addition to this, he mentions scanning, where people use different means of searching for gathering information, e.g. by reading. This process can make people feel more psychologically safe and create cognitive redefinitions that leads to a trial-and-error behavior where change occurs. As a final means for overcoming learning anxiety, Schein (1996) mentions personal refreezing and relational refreezing. Personal refreezing occurs when there are no role models or scanning occurring, which makes it more likely for people to find

solutions suitable for themselves. Relational refreezing occurs when a group is trained to change its norms.

Some studies have more specifically looked at what obstacles there are for change to occur in the construction sector. In a study by Sunding and Ekholm (2015), they identified patterns to why construction companies tend to have a difficult time to change. One finding was that the focus of these companies mainly has been directed towards structural, organizational developmental concepts rather than on human functioning and behavior for improvements. As the process of learning and changing is said to be a product of challenging old ways of doing and thinking about things, they expect that construction companies would benefit from a larger focus on the functioning of their employees.

2.5 Managing organizational knowledge of ISO 14001

Transitioning to ISO 14001:2015 requires companies to adapt their routines and structures in accordance with the changes related to the revision. This means that the whole organization must gather new knowledge and learn how to work in a way that complies with the standard. Organizational learning is commonly interpreted as a change related to organizational knowledge that happens because an organization gains new experience (Argote 2013; Argote and Miron-Spektor 2011). Knowledge is said to be a twofold concept; it is both about declarative knowledge and facts, as well as about procedural knowledge or skills and routines (Argote, 2015). This can be related to a management system, which can be explicitly communicated, e.g. by documentation, but also more mentally, such as how employees work (ISO, 2016b). Organizational knowledge can be analyzed in a continuous cycle, where task performance and experience is turned into knowledge (Argote and Miron-Spektor, 2011).

Within the construction sector, companies often use different learning approaches depending on the type of project organization (Knauseder et al., 2007). For example, a common learning approach for house construction companies is through organizing, whereas infrastructure projects tend to learn more from experimenting and networking. Senaratne and Malewana (2011) found that many construction companies lack knowledge about the meaning of organizational learning, and do not have a culture that promotes organizational learning, which is required for it to be improved and shared. They suggest that these companies can achieve an organizational learning culture by e.g. creating a database of ‘lessons learnt’, which enables individual project team members to gain knowledge. However, learning from past mistakes is not the only factor that influences organizational learning. In addition to lessons learnt, Haapalainen (2008) found other important aspects related to managing knowledge in construction companies, e.g. general project management, communicating the

project plan to all stakeholders and change management, which are common challenges for many construction companies.

2.6 Knowledge management

Several factors enable an organization to be competitive and achieve more success than their competitors, which can be valuable assets such as their products and facilities. However, another essential competitive factor which companies are increasingly seeing as strategically important is the knowledge which lies within the organizations (Styhre and Gluch, 2010). In comparison to physical assets that are easier to observe, knowledge is of a constantly changing nature and needs to be carefully managed to ensure that it is kept within the organization. It is also critical that it is spread sufficiently within the organization and that effort is put into ensuring that the knowledge is constantly evolving, giving the company the advantage of a unique, competitive position (Nonaka and von Krogh, 2009). These efforts are often referred to as knowledge management, which is comprised of two types of practices: ensuring that tacit knowledge is kept within the company as well as securing explicit knowledge (Chen and Mohamed, 2010). Managing knowledge properly becomes important when implementing ISO 14001:2015, as it has to be spread across the whole organization.

Kamara et al. (2002) discuss how knowledge management is an especially important practice for the construction industry, since much of the work is done in projects during specific, shorter amounts of time and with dedicated teams working on each project. When a project is concluded and the team is disintegrated, it is important to keep the knowledge in the organization by spreading it to other team members, for knowledge learned from projects not to be lost. Similarly, Chen and Mohamed (2010) argue that tacit knowledge is essential for a company to be competitive, especially in the construction business. This relates to the fact that a significant amount of the knowledge the company obtains is from working with specific projects, which all have unique prerequisites.

2.6.1 Tacit knowledge

A significant part of an organization's knowledge is tacit. While a lot of knowledge in an organization is written in documents and manuals, a large degree of information is less explicitly communicated. Tacit knowledge is unspoken and underlying information that employees have, which is not always said aloud but affects the way they act and take decisions. This can involve previous experiences, intuitive decision-making or remembering movements necessary to perform a task (Nonaka and von Krogh, 2009). Often, this type of knowledge is of a practical nature acquired from long work experience (Brockmann and Anthony, 2002). This means that the knowledge obtained can be subconsciously perceived by the employee and is seldom expressed aloud, e.g. how to load a machine or at which angle to

hold a tool. This type of knowledge is therefore not often conveyed explicitly between workers, but understood while working and gaining practical experience. Several workers might thereafter come to similar conclusions about best practice without discussing it or even being aware of themselves drawing those conclusions (Brockmann and Anthony, 2002). Tacit knowledge can also be seen as knowledge which is more difficult to grasp and put into frameworks and theoretical models that can be conveyed within the organization. This makes it a factor which remains in the background, affecting the work and knowledge capital in the company. However, it is often not recognized or counted as a set asset the company has, even though it can have a significant impact on the company's competitiveness and business processes, as well as its decision paths (Styhre, 2009).

The tacit knowledge obtained by an individual can make a large impact on how they are able to solve new tasks (Brockmann and Anthony, 2002). When someone has a sufficient amount of tacit knowledge, it will be easier to make quick decisions, since they already have an intuitive grasp of what the problem is and are able to quickly analyze and come to a better decision than someone without that tacit knowledge. This helps in strategic decision-making, where several factors have to be evaluated and weighed against each other, often in a short amount of time. Wagner and Sternberg (1985) say that when an individual can use their own tacit knowledge and spread it in the team, this will contribute to the team achieving a higher performance of the task. They also explain how tacit knowledge can help make better decisions in several stages of a project's lifetime. During brainstorming sessions, tacit knowledge can serve as intuition. This can lead to more interesting ideas being put forward and can help decide between a number of options which might seem rationally similar. Intuition can also help in the later stages of a project by facilitating critical decisions to be made on short notice. People with more experience of similar projects can also use their intuition as an advantage of the team, conveying their tacit knowledge to ensure that correct decisions are made (Wagner and Sternberg, 1985). To enable the team members to share their tacit knowledge and convey their intuitive ideas within the team, it is important to set structures that help individuals share their knowledge to the group, advancing the team's knowledge and bringing tacit knowledge forward. This requires more interactions between individuals and an increased level of communication (Brockmann and Anthony, 2002).

2.6.2 Explicit knowledge

Tacit knowledge can be seen as complementary to explicit knowledge, where the type of knowledge moves along a continuum with tacit knowledge in one end and explicit in the other, according to Nonaka and von Krogh (2009). They say that these work together and are both needed when developing new knowledge. Improving tacit knowledge can lead to the improvement of explicit knowledge and, similarly, explicit knowledge can help increase tacit knowledge. They explain that this is because tacit knowledge is necessary to have to be able

to obtain explicit knowledge, making it essential for learning. Nonaka and von Krogh (2009) further say that explicit knowledge can be said out loud, making it easier for others to obtain, while tacit is more difficult to communicate. Explicit knowledge is also easier to convey and is often stated in documented form, such as in manuals, checklists and written documents.

Tacit knowledge can become explicit knowledge if it is externalized, which means that it becomes less tacit and instead more explicit. This enables the information to move from being individual knowledge and instead to explicit, organizational knowledge (Nonaka and von Krogh, 2009). However, handling the step of moving knowledge to the general organization can be challenging and requires a system in place for conveying the information.

2.6.3 Knowledge conversion

Knowledge can be converted in many different ways. Nonaka et al. (1996) have developed a model containing four modes of knowledge conversion based on the interaction between tacit and explicit knowledge. The four modes are socialization, externalization, combination and internalization, in which all knowledge conversion is occurring (see figure 2.1).

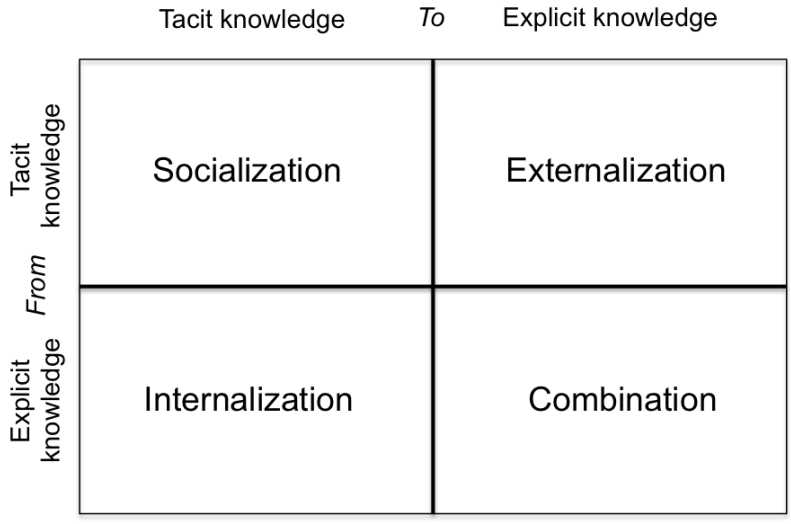

Figure. 2.1: Nonaka's et. al (1996) four modes of knowledge conversion.

Socialization means sharing experiences to create e.g. technical skills, making the knowledge conversion tacit to tacit. In externalization, tacit knowledge is converted to explicit knowledge by using language to create models and concepts. Combination includes creating a knowledge system of explicit knowledge by exchanging information, making the conversion process explicit to explicit. In the last mode, internalization, knowledge is converted from explicit to tacit by the concept of "learning by doing". This arises when shared mental models are created through the experiences gained from the three previous modes (Nonaka et al., 1996).

Often companies within the construction sector are better at capturing explicit knowledge, while they find it more difficult to have a systemized process of capturing tacit knowledge (Chen and Mohamed, 2010). Kamara et al. (2002) suggest that emphasis needs to be placed on developing an effective strategy that targets how knowledge learnt from projects is integrated into the organization, calling it the company's intellectual assets. This should be done by analyzing the organization's capabilities of currently using knowledge management frameworks. It is also important that they assess which level of preparedness they have of conceivably using it to a greater extent. The knowledge management strategy they thereafter choose should be linked to what problems the company has and their aims for their business, aligning them to form a structure which supports each other. This ensures that a company can maintain the intellectual property obtained from previous construction projects, being able to use it as an essential part of their competitive advantage (Kamara et al, 2002).

2.6.4 A framework for how knowledge guides behavior in an organization

A person's knowledge influences their behavior. Marmgren et al. (2015) have studied the relationship between an organization's knowledge and how it drives certain behaviors. They present a framework (see figure 2.2), which states that there is a clear relationship between spoken and documented knowledge and how this affects the behavior of a person. They say that a person acts upon both clear instructions and ideas, as well as by using their intuition to make fast decisions. Understanding this basic premise is essential to understand how people learn within organizations and how to plan for accomplishing change.

The spoken part of Marmgren's et al. (2015) framework refers to direct communication, meaning what is said verbally as well as what can be clearly observed, e.g. information put in writing with the purpose of being read instantaneously and a person's expressions such as body-language. The documented part refers to indirect communication and consists of written documentation as well as visual documentation such as charts and maps. While these two parts have a fairly strong bond and make up the explicit information that a person uses to decide on their behavior, another part of the framework shows the tacit guiding. Marmgren et al. (2015) further explain that while explicit ideas influence our tacit guiding, the final part of the framework, behavior, has the strongest connections to tacit guiding. They define behavior as a person's actions and the pattern they comprise. These are often fairly simple to observe. When planning and conducting a change process, they say it is essential to understand these relationships. This is because a lasting change can only be successfully achieved by improving a person's tacit guiding, which influences their behavior. This means that it is essential for a change or a new idea being implemented in an organization to be adapted to a person's tacit guiding. With this focus, it becomes important to implement the ideas in a different way, rather than just discussing the change or putting the ideas into documents.

Instead, more focus can be put on “learning by doing” where the ideas are put into practise and become a natural part of the company’s new way of working. They suggest that using this framework can help a company’s environmental work efforts and improve the knowledge transformations within the company.

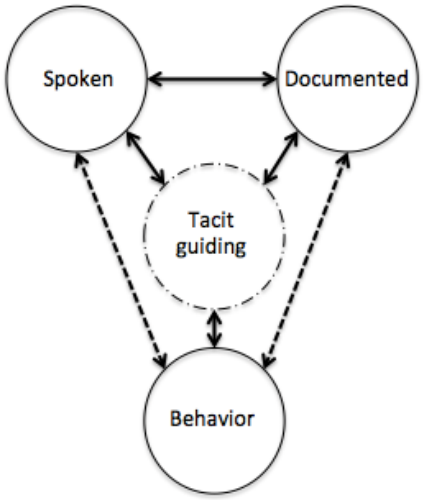

Figure 2.2: Marmgren’s et al. (2015) framework of how knowledge guides behavior.

3 METHODOLOGY

The general structure of the study's methodology is mainly based upon the frameworks provided by Bryman and Bell (2011), but additional literature has been used as complement. This section intends to present the methodology in a way that makes it possible for the reader to follow the procedure of the study and apply the structure to a similar study of their own. In addition, it contains discussions related to the project's trustworthiness, authenticity and ethical considerations, as well as the study's results.

3.1 Research approach

When conducting social research, some decisions influence the general orientation, such as the relationship between theory and research. For this research, Dubois and Gadde's (2002a) approach of systematic combining has been used. A central aspect of their approach is the movement between various research activities, as well as between theory and empirical findings. The idea is that theory and empirical findings are mutually necessary to create a full understanding. For this study, it meant that theory and empirical data was gathered continuously throughout the research process. Another important aspect of a research strategy concerns its epistemological considerations, i.e. what can be regarded as acceptable knowledge (Bryman and Bell, 2011). The subject matter of this study is people, with whom the researchers interacted with to understand their social world. This study's research strategy therefore follows an interpretivist approach, which means that a subjective meaning of people's actions is created (Bryman and Bell, 2011). Finally, there are important ontological considerations, or the nature of social entities, related to formulating a research strategy. The ontological position of this research's strategy is constructionism, i.e. social actors are seen as constantly influencing social phenomena and their meaning (Bryman and Bell, 2011).

3.2 Research method

First, a questionnaire was used where quantitative and quantifiable data consisting of multiple variables was gathered from construction companies of similar sizes in order to find patterns. Studying many cases is beneficial as it e.g. makes it easier to find variation in the data (Bryman and Bell, 2011). On the basis of this, approximately 200 companies were contacted. In addition, the research also used a case study design, meaning that a single case was studied more detailed and intensively (Bryman and Bell, 2011), by interviewing employees with different professions. The case study was intended to provide a deeper knowledge about a company operating within the construction sector than what could have been gained from only conducting a questionnaire. The research was executed by using multiple research methods and data sources, which is called triangulation, as it increases the credibility of the research (Bryman and Bell, 2011).

3.3 Literature review

A literature review was conducted continuously throughout the project. The review created an understanding of previous research in the area, helped formulate research questions and was useful to interpret the empirical findings, which are common benefits according to Bryman and Bell (2011). Most of the research was found by using online databases, such as Chalmers Library's databases and Google Scholar. A wide range of search words related to relevant topics to the research were used. These mainly concerned management systems, ISO 14001, the construction sector, sustainability, change management, and knowledge management. In addition, literature suggested by the supervisor at Effort Consulting and the examiner at Chalmers University of Technology was reviewed. By continuously reading books, articles and reports, a broad theoretical understanding of the research field was created.

3.4 Questionnaire study

For the cross-sectional research design, a self-completion questionnaire was used, i.e. the respondents answered the questionnaire on their own, which resulted in a broad picture of Swedish small and medium-sized construction companies' work with ISO 14001 (see Appendix A). This type of questionnaire makes administration quick and cheap, it eliminates the influence of an interviewer and makes it more convenient for the respondent to answer whenever he or she has time (Bryman and Bell, 2011). These benefits were considered to be valuable for this study, as the questionnaire would be sent out to several companies, which in turn would make it difficult and time consuming to meet everyone in person. On the other hand, Bryman and Bell (2011) explain that this method can limit the answers to what is directly provided by the respondent. For example, this meant that it was not possible to ask any follow up questions. It also might have reduced the response rate, which could have been higher if the questionnaire would have been personally handed out.

3.4.1 Design of questionnaire

The questionnaire was constructed through an iterative process in which it was revised based on what was found from theory and discussions with supervisors from Effort Consulting and Chalmers University of Technology. The questionnaire was created by using Google Forms, and its standard formats were used for the design. It automatically made the questionnaire as short as possible, arranged the questions properly and created a clear presentation, which are ways of improving the design of the questionnaire (Bryman and Bell, 2011). Some questions were designed with responses being answered on a Likert scale from one to five, whereas others had pre-made alternatives, sometimes including an option for the respondent to write their own answer. The answers were placed close to the questions, and instructions were given on how to respond, as it is helpful for the respondent (Bryman and Bell, 2011).

A pilot study of the questionnaire was conducted before it was sent to the respondent group. Three people with much knowledge about ISO 14001 were asked to answer the questionnaire, as well as seven persons with less or little knowledge. This was done to get feedback on the amount of time needed to finish the questionnaire. Also, possible errors could be discovered and addressed, such as asking too complex questions.

According to Bryman and Bell (2011), a low response rate decreases the representativeness of the sample that answers a questionnaire, which was considered prior to sending the questionnaire. It is therefore important to have this risk in mind when designing a questionnaire. They say that a good cover letter is beneficial, which was done by explaining the purpose of the research, its contribution and why the company was contacted in the e-mail. Furthermore, one reminder was sent out after one week as it also increases the response rate. In addition, they explain that the structure of the questionnaire itself, e.g. its length, instructions, layout, questions ordered by difficulty to answer and amount of open questions, influences the respondent's willingness to answer. These aspects were therefore incorporated in the designing of the questionnaire.

3.4.2 Sending questionnaire

The population of companies targeted were small and medium-sized Swedish construction companies, certified to ISO 14001:2004 at 2016-03-08. From this large group of companies, purposeful sampling was used, which is about identifying and choosing cases that have a lot of information to provide about a topic (Patton, 2002 in Palinkas et al., 2013). These companies were found on the webpage www.certifiering.nu, which is a search engine provided by accredited certification bodies and the Swedish Association for Testing Inspection and Certification (SWETIC) (Certifiering.nu, 2016b). Companies were filtered by an amount of employees between 10 to 199, certified to ISO 14001:2004 and operating within the website's industry categories *construction of houses* (Swedish: *byggande av hus*) and *construction work* (Swedish: *anläggningsarbeten*). This resulted in a list consisting of 218 companies. Two companies that had already implemented ISO 14001:2015 did not receive the questionnaire, as it focused on a future implementation. Studying these two companies separately would have been valuable for increasing the understanding the transition to the new standard, and attempts were therefore made to contact both companies. However, neither of the companies responded.

All companies' web pages were searched to find email addresses to environmental managers and CEO's, as well as general company email addresses. If email addresses to environmental managers were found, the questionnaire was sent to them as they were expected to have the best knowledge about ISO 14001. If not, an email was sent to the general company email address, asking to be forwarded to a manager with knowledge about the company's ISO

14001 certification. If there were no email addresses to neither the environmental manager nor the company, the questionnaire was sent to the CEO.

12 companies on the list did not receive the questionnaire due to missing contact information or because they were a part of a larger organization and therefore not small or medium-sized. 15 of the questionnaire respondents were unable to answer it for various reasons; five were not at work and replied with automatic responses, four e-mails were undeliverable, three had technical problems with answering the questionnaire, two were unable to answer at the moment and one answered that their company operated in another industry sector. This type of bias should preferably be removed, but it is difficult to completely avoid (Bryman and Bell, 2011). When unsuitable or uncontactable members of the sample were removed, the remaining total sample was 192 companies. Out of these, 56 responded to the questionnaire before it was closed. This resulted in a response rate of ~29 percent.

There are various reasons that could explain the response rate. The previously discussed limitations of a self-completion questionnaire could have had an impact. As many questionnaires were sent to general company e-mails, it is also likely that some did not receive the questionnaire. This means that it is impossible to actually confirm how many received the questionnaire, meaning that the real response rate could be higher. It was also difficult to motivate respondents to answer it, as they had no prior understanding of who the researchers were, and as it was difficult to present the purpose of the study as well as how their answers would be contributing. Bryman and Bell (2011) use Mangione's classification from 1995, which suggests a response rate of more than 50 percent. This was taken into consideration when drawing conclusions upon the empirical findings. However, the response rate is considered to be enough to identify patterns.

3.4.3 Data analysis of questionnaire

The data was collected in Google Forms and later transferred in the statistical analysis program JMP. By using JMP, it was easy to categorize data and create graphs that were representative. These were interpreted by varying different demographical factors of the respondents, such as their business roles, age and years within the company. By changing parameters, it gave the opportunity to remove irrelevant data that would not contribute to the results and analysis. The graphs were thereafter created in Excel in order to improve their visual quality. Since the sample size was rather small, and the response rate rather low, the data was decided to be analyzed qualitatively to observe general patterns. These findings were further analyzed by studying them in relation to the frame of reference.

To analyze the responses, categorizations were made. For example, three main areas of professions were identified; environmental managers, other managers and

CEO's/shareholders. The environmental managers include both the managers who only worked with environmental issues, but also those who have additional assignments, such as quality and safety. The group other managers relates to those managers who do not have the main responsibility for environmental issues and are not in the top management of their company. CEO's/shareholders includes all respondents being CEO's or owners/shareholders of their company. In addition to this categorization, the open answer questions were also grouped to better see a trend of the free text responses.

3.5 Interview study

For the case study, six semi-structured interviews were conducted with employees at a Swedish medium-sized construction company (see table 3.1). The company operates within real estate and have projects in many parts of the country. Currently, they are approximately 120 employees at the head office. A list of questions had been composed into an interview guide prior to the interview, and they were formulated in a way that allowed the interviewee to answer freely. Conducting semi-structured interviews also allowed the interviewers a certain degree of freedom during the interviews. For example, questions could be asked in a different order and additional questions could be asked, but a similar structure was kept throughout all interviews. Due to the varying knowledge about ISO 14001 within the company, it also made it possible to adapt the questions in this regard.

Table 3.1: Information about the interviews and how the interviewees are referred to in the text.

Reference in text	Professional role	Years within the company	Main assignments	Date of interview
Site manager A	Site manager	4	Economical responsibilities, coordination and responsible for working environment	2016-04-20
Site manager B	Site manager	1,5	Managing and coordinating work	2016-04-15
Site manager C	Site manager	1,5	Managing and distributing work, financial responsibilities, coordinating time plans	2016-04-20
Environmental manager	Environmental manager	1	Responsible for quality, environment and working environment	2016-04-13
Construction engineer	Construction engineer	3	Design and purchase affairs	2016-04-14
Department manager	Department manager	6	Managing the department, handling customer relations and project manager	2016-04-26

3.5.1 Design of interviews

Bryman and Bell's (2011) step-by-step model was used for formulating questions to the interview guide. Based on the study's general research area and its specific research questions, the interview topics concerned general company information, ISO 14001:2004 and the transition to ISO 14001:2015. Interview questions were constructed based on the interview topics. The questions were also made with regards to the questionnaire and its results, meaning that they were built upon what was asked during the questionnaire. Formulating questions was a continuous process, as the questions were revised and reviewed both by the researchers and their supervisors. This led to a recurrent reformulation of interview topics, and in turn to new interview questions. A pilot study of the interview guide was held with two management consultants at Effort Consulting. Some issues were identified from the pilot, related to e.g. the amount of questions, formulations and ideas for questions that also should be asked. This led to a new revision of the questions before the guide could be finalized. The final version of the interview guide can be found in Appendix B.

3.5.2 Conducting interviews

Before conducting the interviews, Kvale's (1996) list of ten criteria for a successful interviewer and Bryman and Bell's (2011) two additional criteria were used as a preparation to increase the quality of the interview. These aspects were important to reflect upon before the interview, as the discussions resulted in assigning suitable roles for each researcher. One researcher took the role of interviewer, another took notes and the third had the role as observer. All researchers asked follow-up questions when necessary. The data from the interviews was stored as audio recordings by using a microphone, which provided a more detailed analysis and a more correct gathering of the responses than only by taking notes. However, recording the responses of the interviewees is not unproblematic; it can for example lead to interviewees becoming more self-conscious (Bryman and Bell, 2011). When discussing what has been observed, it was concluded that the recording did not influence the interviewees to a larger degree, but one of the interviewees was a bit more reserved and careful. However, this could be due to the formal setting, in which the interviewee also acted as a representative of the company. None of the interviewees refused being recorded.

Notes were taken from conversations between the researchers' experiences immediately after the interviews were held. These mainly concerned thoughts about the results of the interview, information about where it was held, the specific environment of the interview, as well as more general feelings, as suggested by Bryman and Bell (2011). This made it possible to get different perspectives from the interviewee and the observers to better understand the results of the interviews.

3.5.3 Data analysis of interviews

The complete audio that was recorded during the interviews was transcribed by the researchers. This was a time-consuming process, both when doing the transcription and analyzing the large amount of text, but it was done as it guarantees the correct formulations of the interviewee's answers (Bryman & Bell, 2011). To facilitate time better, transcriptions were done continuously after each interview had been held. Each interview was written down literally, meaning that all words from both the direct answers to the questions as well as more general conversations concerning the subject were transcribed. All transcriptions were uploaded to the qualitative data analysis software NVivo. Each transcription was read through, and the text was marked into categories by the authors based upon commonly mentioned themes. When all interviews had been read through and marked, the program compiled the different categories into new documents that could be used for analysis. NVivo was useful for structuring the data clearly, which simplified the analysis process.

The approach used when analyzing the data was an iterative and recursive process, going back and forth between data collection and analysis. This means that literature was studied continuously throughout the interview process in order to interpret what the interviewees had said. This approach also made it possible to ask additional questions during the later interviews, as the analysis created more understanding and, in turn, generated more follow-up questions.

3.6 Methodological discussion

Bryman and Bell (2011) discuss that when research is conducted, it is important that the study can be evaluated according to two main criteria; reliability and validity. These are commonly used to evaluate quantitative studies, but qualitative studies often need to be evaluated differently. Therefore, they say a common way of analyzing the research is instead to look at two other criteria; trustworthiness and authenticity. These two criteria are based on the framework by Lincoln and Guba (1985), and together with ethical considerations, they form the basis of this research's methodological discussion.

The first criterion concerns the trustworthiness of the research. The criteria can further be broken down into four sub criteria; credibility, transferability, dependability and conformability (Bryman and Bell, 2011). In this section, the method of the research is discussed by each criterion separately.

3.6.1 Credibility of research

Credibility refers to the study coming to reasonable conclusions about the research participants which they can feel are agreeable, while also ensuring that good practice was used to conduct the study. A way to achieve reasonable conclusions is to use triangulation, which means using several data sources and methods to conduct a study (Bryman and Bell, 2011). This has been done by collecting information from theory written about the subject, reading previous studies, conducting a survey on a wide range of companies within the same industry as well as conducting interviews with a case company. All authors of this study read the core theory papers and discussed them to ensure that the main themes of the papers were understood in the same way, and that the theory was relevant and related to each other. Similarly, all authors of this study were present during all interviews, where different roles were assigned to each person; an interviewer, an observer, and a note taker. This ensured that all questions were answered and that the interviewees' views were thoroughly understood, while observations could be made. After the interviews, a discussion was held, where thoughts about the interview was gathered. This ensured that the researches had a similar mindset. The interview questions were revised several times and a pilot study was done on two people to ensure that the questions were interpreted as intended, while clarifying that

questions were asked during the interviews when needed. The survey was also revised several times and a pilot study was conducted on ten people with different roles and levels of knowledge to ensure the questions were all understandable and interpreted the same, which was especially important since the respondents were unable to ask clarifying questions.

3.6.2 Transferability of research

Transferability is similar to what is called external validity in quantitative research, meaning if the results of the study can be generalized to other contexts. This is more difficult to achieve in qualitative studies, as often only a single case study is conducted and the research is conducted in a specific setting with changing circumstances. Therefore, it is important to give clear and thorough descriptions of the studied settings and the culture therein (Bryman and Bell, 2011). This was done by providing a clear list of references used for the theoretical parts of the paper as well as explaining what keywords were used to find literature. The process of conducting both interviews and the survey have been carefully described, including who were interviewed and how the respondents were selected. All interviews were transcribed to ensure that no critical information was missed, which could provide the reader with a better understanding of the interviewees views. The interview guide and the questionnaire are attached as appendices to give the reader an understanding of the context in which the responses were collected. A range of roles within the company were chosen to be interviewed to get a better understanding of the general culture within the company of how they view environmental efforts and ISO 14001. When previous jobs were mentioned, the respondents were also asked questions about the culture at their previous place of works to get an understanding of the construction industry as a whole. The interviews were used to gain a deeper understanding of the general views within the construction industry than what could be gained from the questionnaire. It is possible that some results of the case study are similar to conclusions that could be drawn about other companies in the industry. However, a single case is not representative for a whole industry. Therefore, it would have been beneficial to study multiple cases. The survey contributed with some insight of the construction industry that the interviews later complemented.

3.6.3 Dependability of research

Dependability is related to the concept of reliability and means that even though the study cannot be repeated, the researchers should be clear about all steps taken in the process and what assumptions were made that guided the continuation of the research. They should also use auditors, i.e. external parts that view the work and who can establish if the necessary steps have been taken throughout the research (Bryman and Bell, 2011). This research contains a thorough methodology chapter, which aims to describe what decisions have been made throughout the process and how the study was conducted. This research used an abductive approach, which allowed the researchers to change focus when the data found guided them in

a different direction. All interviews were transcribed and both the interview and questionnaire questions are attached in the appendix, which means that the interviews could be repeated with the same questions. However, the interviews were semi-structured, which means that neither the follow-up questions nor the respondent's answers will be the same. Also, the settings in which the interviews took place differed. The programs used to process and analyze data, as well as the results obtained, are visualized to show the basis on which conclusions have been drawn. The study has been continuously guided by an examiner at Chalmers University of Technology and a supervisor at Effort Consulting, who have provided feedback regarding measures that have been taken during the research process. When necessary, texts and questions have been edited to clarify their meaning and ensure that the reader can easily follow the logic of the study. In the end of the study, the paper was opposed by other master's students at Chalmers University of Technology. The opponents provided feedback on the study's content and conclusions, which led to necessary changes and clarifications.

3.6.4 Conformability of research

Conformability means that the researchers should remain objective while conducting the research, and to the furthest extent possible, not let their personal values and beliefs influence the results of the study (Bryman and Bell, 2011). This study has been conducted by collecting as wide theory as possible about the construction industry, its environmental work and general theory about ISO 14001. Together with studying previous research conducted within the field, this helped guide the study and created the basis on which the questionnaire and interview questions were formed. During the interviews, the semi-structured format allowed for similar questions to be asked to all interviewees. While observations were a part of the interviews, all authors were present and discussed their observations afterwards, which helped avoid the analysis to be based upon one person's subjective views. The results of the questionnaire and the interviews are presented, and explanations are provided for how conclusions have been drawn. Furthermore, these results were analyzed on the basis of studied literature and it is explained why the authors made the connections between the theoretical framework and the results. Suggestions were thereafter made on this basis, where the reader should be able to follow the thought process. The method chapter thoroughly explains what steps have been taken throughout the study, and what implications these might have had is discussed.

3.6.5 Authenticity

Another important aspect of qualitative research is its authenticity. This concerns if the research gives a fair representation of the studied group and their points of view (Bryman and Bell, 2011). The questionnaire was sent to people within a defined group of the construction sector and with specific positions within these companies. Background questions were asked to be able to evaluate the results in relation to demographic factors, such as degree of

education, gender, years within the company etc. The results showed a fairly evenly spread variation of respondents, and the results are therefore more likely to represent the studied sector well. They were able to write certain answers by free-form and were also prompted not to answer questions of which they had no knowledge, to ensure that the results gave a fair representation of their knowledge and views. The interviews were conducted with people from different positions within the company, to help achieve a broader range of opinions and perceptions within the company. The interviews were recorded and later transcribed to minimize the risk that the interviewees' answers were misunderstood during the interview session.

3.6.6 Ethical considerations

When conducting a study that involves other persons or sensitive information, it is essential to handle ethical issues related to it, such as anonymity and confidentiality. Bryman and Bell (2011) mention four main areas of ethical principles proposed by Diener and Crandall (1978). The first principle regards *harm to participants*, which includes both physical as well as psychological harm, stress and harm to career etc. In the questionnaire, this was handled by receiving only anonymous answers, with no possibility to trace who had responded what. Regarding the interviews, no names of the interviewees were mentioned in the study, including the name of the case company.

The second principle, *lack of informed consent*, includes giving enough information about the study to the participants for them to decide whether or not they want to participate in the study based on this. Regarding the questionnaire, information about the project was given both in the sent e-mail as well as in the introduction of the questionnaire. Concerning the interviews, the background of the study was explained for the environmental manager, which was the first contact with the company. The environmental manager thereafter spread the information about the project to his colleagues and presented employees interested in participating in an interview. Each of the participants received an e-mail explaining the background and purpose of the project before any interview arrangements were made.

The third principle, *invasion of privacy*, was handled in both the questionnaire and the interviews by not asking any personal questions. This principle concerns the disregardment of personal values and the respondents' privacy (Bryman and Bell, 2011). By only asking questions relevant to the study and related to analyzed theory, none of the respondents should have perceived any invasion of their privacy.

The fourth and last principle regards *deception* which Bryman and Bell (2011) explain as when the researchers present information disconnecting from what it is in reality. This risk

was lowered by clearly presenting the aim of the project and by explaining that the research was conducted as a master's thesis at Chalmers University of Technology.

4 RESULTS

This section intends to present the main findings from the questionnaire as well as from the interviews. The data has been categorized based upon common themes that have been found to simplify the reading process.

4.1 Results from questionnaire

In this section, the results from the questionnaire are presented. From the results, four main categories were identified concerning the most essential findings of the questionnaire. These include Swedish small and medium-sized construction companies' interest in environmental sustainability and ISO 14001, their knowledge about the standard, how ISO 14001 impacts their businesses as well as how these companies are planning for the implementation of the new version. Each section includes data related to both the old and the new version of ISO 14001. The data from each question is presented individually, but also by comparing it to other questions. The results have also been studied in relation to the respondents' demographical backgrounds. A presentation of the final population can be found in Appendix C.

4.1.1 Interest in environmental sustainability and ISO 14001

The first questions of the questionnaire aimed to create a general understanding of the interest in environmental work within the construction industry in Sweden. It was also investigated whether the views on environmental work and ISO 14001 have changed. The results from the questionnaire show that the respondents believe that the interest for environmental issues has increased during the past ten years (see figure 4.1). As seen in figure 4.2, the interest for environmental issues within the construction sector is considered to be approximately three to four on a 1 to 5 scale, from no interest to a very large interest.

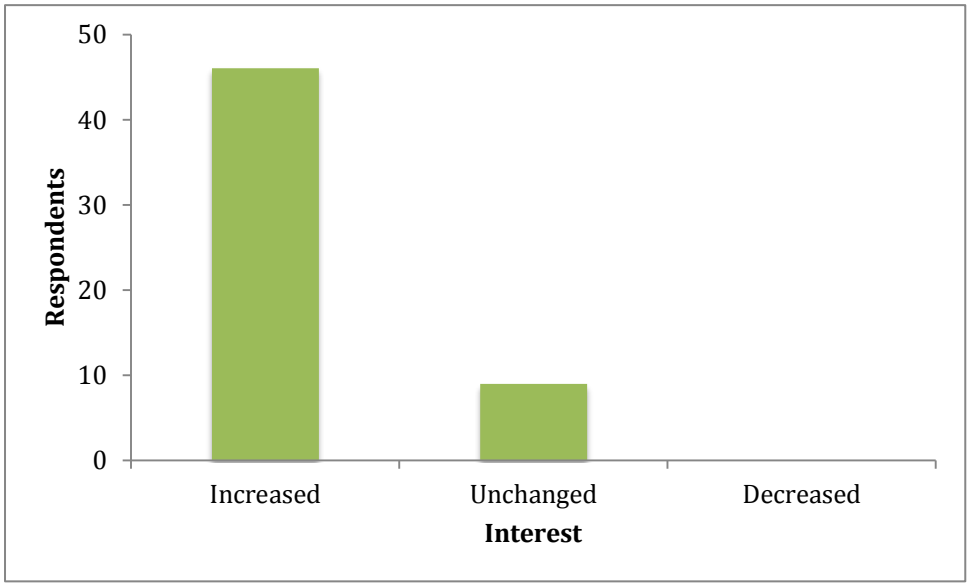

Figure 4.1: The respondents perceptions of whether the interest for environmental issues within the construction industry has increased, decreased or is unchanged during the last decade.

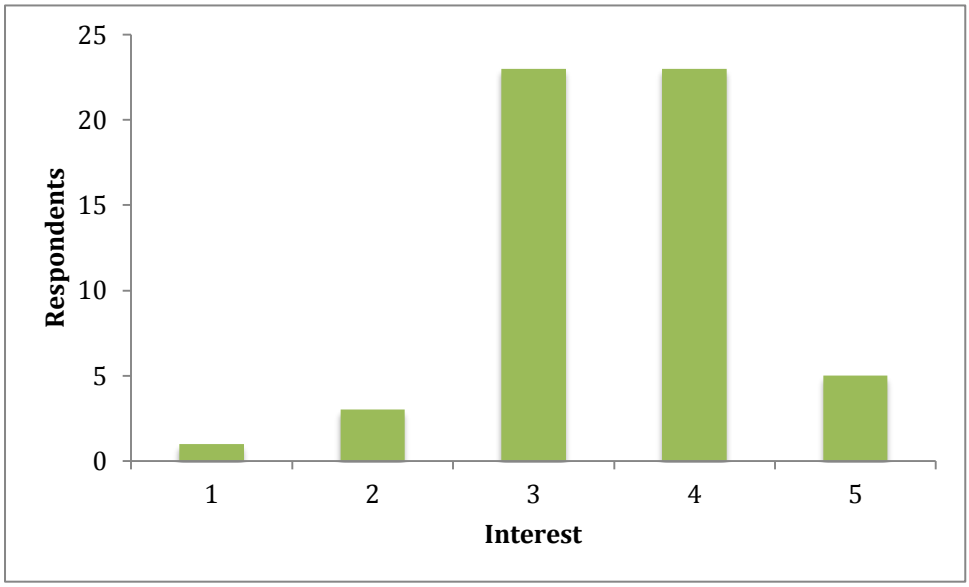

Figure 4.2: The respondents' perceptions of the interest of environmental issues in the construction industry, from no interest (1) to a very large interest (5).

From the questionnaire, it can also be observed that the interest in environmental issues differs depending on what position the respondents have. The group *Other managers* says that the interest has increased the most in comparison to the *Environmental managers* and *CEO's/shareholders*. The *CEO's/shareholders* constitutes the group with the most negative view on how the interest in environmental work is currently perceived within the construction industry.

The respondents were asked about how valuable ISO 14001:2004 has been for their company's environmental work. As can be seen in figure 4.3, being certified is perceived to have added positive value to the environmental work. A slightly larger part also says that ISO 14001:2004 has been a part of shaping the company's environmental efforts (see figure 4.4). It was also studied how important Swedish small and medium-sized construction companies think it is to be ISO 14001 certified compared to other common environmental certifications. A majority of the respondents say that being certified to ISO 14001 is more prioritized than other environmental certifications, e.g. BREEAM and Svanen (see figure 4.5).

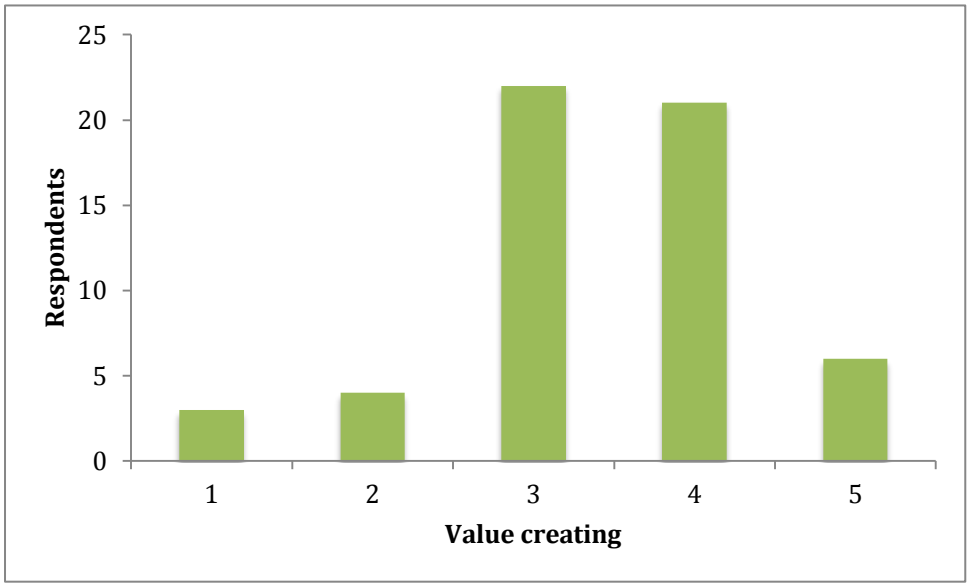

Figure 4.3: How value creating the respondents believe that ISO 14001 has been for their company's environmental work, from not value creating at all to very value creating.

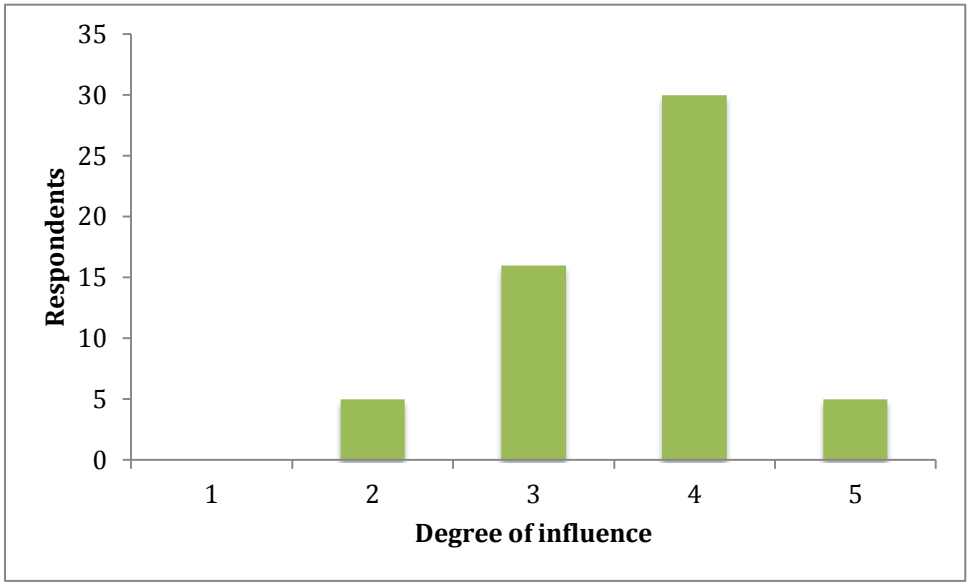

Figure 4.4: To what degree the respondent's perceive ISO 14001:2004 to have affected their company's environmental work, from not at all to completely.

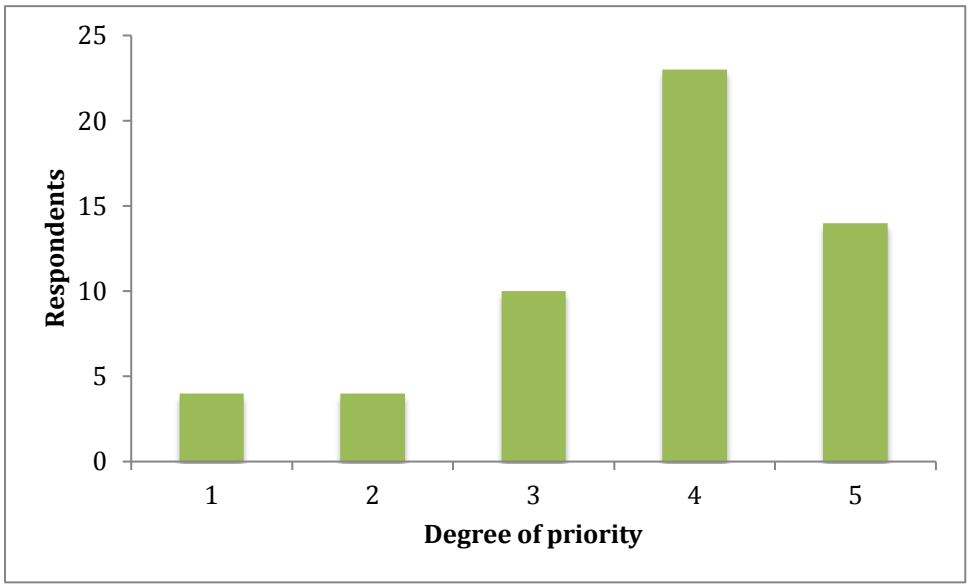

Figure 4.5: How much Swedish small and medium-sized construction companies prioritizes being certified to ISO 14001 in comparison to other certification, such as BREEAM and Svanen, from not prioritized at all to very prioritized.

In the questionnaire, the respondents were also asked about their customers' and subcontractors' work with ISO 14001. A majority of the respondents answered that they do not require their company's subcontractors to be certified to ISO 14001 to a large degree. In addition, almost all the respondents believe that their subcontractors do not require them to be ISO 14001 certified. However, when asked if they think that their customers set requirements on their company working in accordance with the standard, the results differ. On a 1 to 5 scale, most respondents answered two to four, meaning that customers are believed to some extent influence the company's decision of being certified to ISO 14001.

4.1.2 Knowledge about ISO 14001

One goal with the questionnaire was to study the current degree of knowledge about ISO 14001 in the Swedish construction industry. The responding companies educate their employees about ISO 14001 in different ways, most often by policy documents, oral information from managers or during meetings. However, the questionnaire shows that how this is done varies heavily among the companies. All companies educate their employees about ISO 14001 to some degree. When the respondents were asked about their own knowledge of ISO 14001:2004, most of them answered that it was moderate or above moderate (see figure 4.6). As can be seen, the *Environmental managers* have the highest knowledge about the standard. When studying how age and degree of education affect the knowledge about ISO 14001:2004, there is no clear distinction. However, there seems to be a relation with regards to the respondents' educational background; the higher the level of education, the higher the knowledge is about ISO 14001:2004 (see figure 4.7).

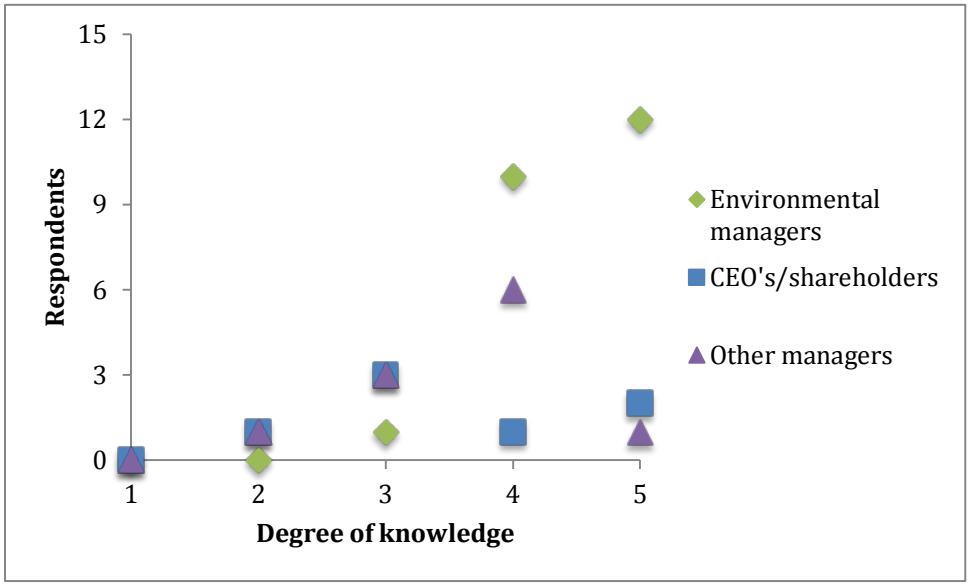

Figure 4.6: How respondents of different professions perceive their knowledge about ISO 14001:2004 to be, from very little knowledge to very large knowledge.

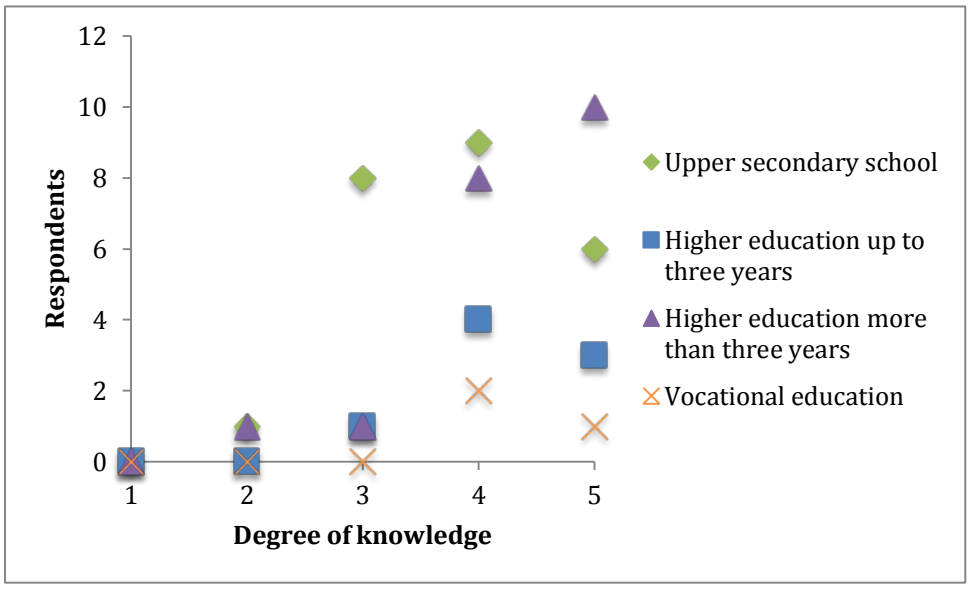

Figure 4.7: How respondents with different degree of education perceive their knowledge about ISO 14001:2004 to be, from very little knowledge to very large knowledge.

The second part of the questionnaire included questions about the new version of ISO 14001. To evaluate how companies can plan for the implementation of ISO 14001:2015, it was important to collect data regarding the general knowledge and perceptions about the new version. As can be seen in figure 4.8, a majority of the respondents have heard about the new version of the standard. The small amount of respondents that answered that they do not know

about ISO 14001:2015 have a high school degree as their highest education (see figure 4.9). Among these, most work as *CEO's/shareholders* at their company.

Figure 4.8: The perceived awareness of ISO 14001:2015 in Swedish small and medium-sized construction companies.

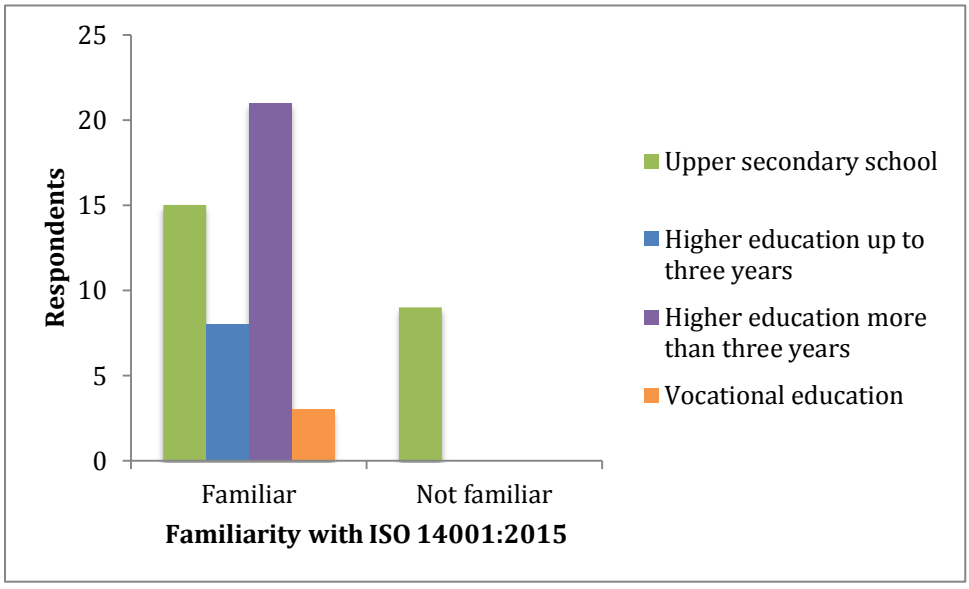

Figure 4.9: The perceived awareness of ISO 14001:2015 in Swedish small and medium-sized construction companies in relation to the respondents' educational level.

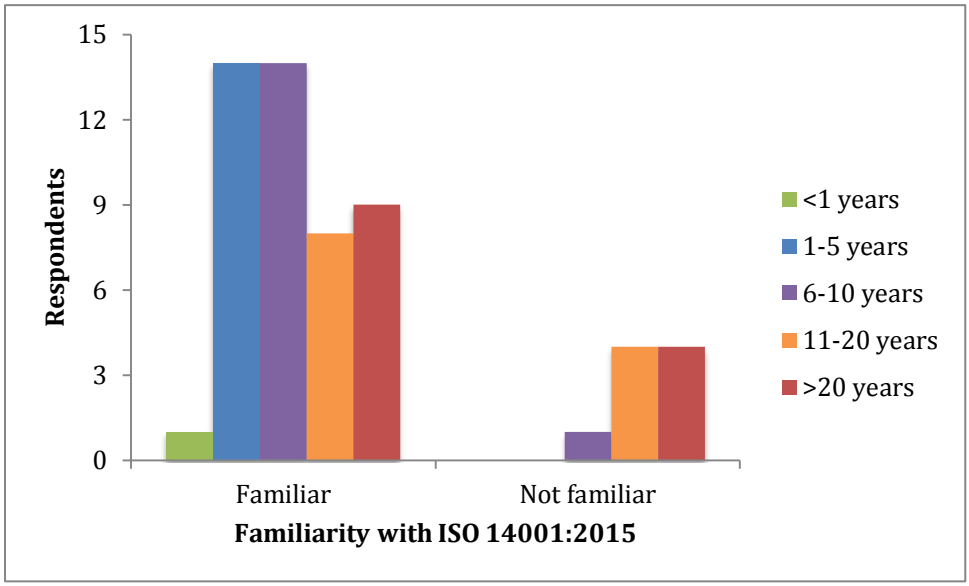

Figure 4.10: The perceived awareness of ISO 14001:2015 in Swedish small and medium-sized construction companies in relation to how long the respondents have worked at their companies.

The remaining group of respondents who answered that they have heard about ISO 14001:2015 were asked about their knowledge about the changes it comprises compared to the previous version. As can be seen in figure 4.11, the knowledge spread is relatively diffuse. A discrete pattern can be seen between the two groups *Environmental managers* and *Other managers*, where the former group generally seem to have more knowledge, whereas the latter have less. When combining the results, a majority say that they have a knowledge level of three or higher about the changes ISO 14001:2015 implies.

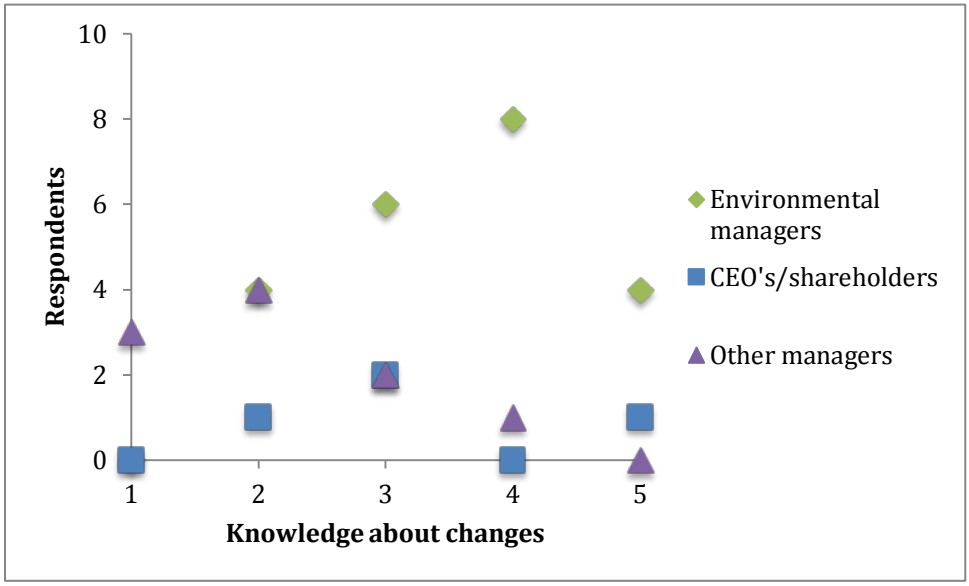

Figure 4.11: The degree of knowledge respondents of different professions have about the changes that ISO 14001:2015 brings with, from no knowledge to very good knowledge.

The respondents were also asked about how much knowledge about ISO 14001:2015 they thought existed at their company. None of the respondents answered that it was more than average (see figure 4.11). The group with the most negative view was the *Environmental managers*, closely followed by *Other managers*. When studying the degree of education of the respondents, it was the group with the highest education that perceived the knowledge about ISO 14001:2015 to be very low within their company.

4.1.3 Implications of ISO 14001:2015

For Swedish small and medium-sized construction companies to transition to ISO 14001:2015, they must adapt to the changes related to the new version. This requires knowledge not only about the future standard, but also about the current version. The respondents were therefore asked to rank a maximum of three main advantages and disadvantages with ISO 14001:2004 to gain an understanding of their experiences of ISO 14001:2004 (see table 4.1). They were able to choose from alternatives based on a literature review. Three advantages had a significantly larger amount of responses, e.g. the third most answered alternative had almost the double amount of responses as the fourth. The main advantage was *Strengthening company image*, which almost 75 percent respondents answered. This was followed by *Reducing company's environmental impact* and *Provides guidelines in how to construct the company's EMS*. Two disadvantages were answered by many; more than half of the respondents perceived *Requires a lot of documentation* as a main disadvantage, and almost as many thought that working with ISO 14001:2004 has been a *Time consuming* process. These were followed by approximately a third answering *Difficult to apply on all parts of the operations*.

Table 4.1: The main advantages and disadvantages that Swedish small and medium-sized construction companies have experienced from certifying their EMS to ISO 14001:2004.

Main advantages with ISO 14001:2004 (percentage of responses)	**Main disadvantages with ISO 14001:2004 (percentage of responses)**
Strengthening company image (76,8 %)	Requires a lot of documentation (53,6 %)
Reducing company's environmental impact (60,7 %)	Time consuming (50 %)
Provides guidelines in how to construct the company's EMS (42,9 %)	Difficult to apply on all parts of the operations (30,4 %)

In general, the respondents' experience that working with ISO 14001:2004 has had an influence on their environmental work, as can be seen in figure 4.4. On a scale from 1 to 5, where one means *Not at all* and five *Completely*, more than half of the respondents answered a four. None of the respondents answered *Not at all*. The views on to what degree ISO 14001:2004 has influenced companies differ between respondents depending on their profession. *Environmental managers* experience a larger influence of ISO 14001:2004 than *CEO's/shareholders* and *Other managers*. When analyzed with regards to how long the respondent has worked at his/her company, the questionnaire shows that those who have worked between 11-20 years at the company believe that ISO 14001:2004 has had less influence on their company's environmental work than other respondents.

The respondents were asked if they see ISO 14001:2015 as an improvement from ISO 14001:2004 on a scale from 1 to 5, where one means *No improvement at all* and five *A very large improvement*. The questionnaire shows that ISO 14001:2015 is viewed as an improvement to a various degree. As can be seen in figure 4.12, approximately half of the respondents answered three, and almost a third answered a four. Only a few saw it as no improvement at all. Male respondents tended to see it as less of an improvement than female respondents. Another interesting pattern was that the older the respondent, the more he/she views it as an improvement. People with a university degree of more than three years also tend to see it as more of an improvement.

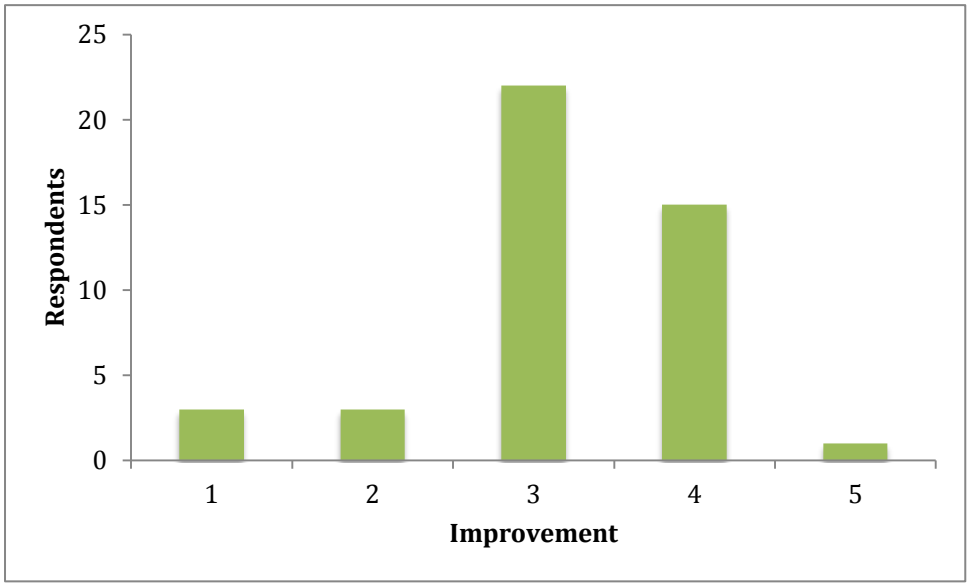

Figure 4.12: The degree respondents think that ISO 14001:2015 is an improvement compared to ISO 14001:2004, from no improvement at all to a very large improvement.

On their webpage, ISO summarizes the changes related to ISO 14001:2015 into six main categories (ISO, 2016a). Among these, the respondents were asked to choose a maximum of three alternatives that they thought would have the most influence on their company. The results show no change which is generally seen as more influencing, as the responses are spread out between the answers (see table 4.2). The most interesting pattern can be found if this data is viewed in relation to the respondent's profession. 57 percent of the environmental managers rank *A greater focus on leadership* as the most influencing change, followed by *Increased focus on sustainability in the company's strategic decisions* and *Include lifecycle based thinking in sustainability issues*. However, only 13 percent of the responding CEO's/shareholders thought that the focus on leadership was a top three change in terms of importance. Instead, this group ranked *Improve measureable results of the company's EMS* highest, followed by *Increased focus on sustainability in the company's strategic decisions* and *Actively work towards increasing the usage of sustainable resources and reducing environmental impact*. *Other managers* ranked *Actively work towards increasing the usage of sustainable resources* and *Do not know* highest, followed by *Improve measureable results of the company's EMS.*

Table 4.2: Shows what changes related to ISO 14001:2015 that the participants thought would be the most influencing on their company.

Changes related to ISO 14001:2015 (percentage of responses)
A greater focus on leadership (47 %)
Increased focus on sustainability in the company's strategic decisions (45 %)
Improve measureable results of the company's EMS (36 %)
Include lifecycle based thinking in sustainability issues (34 %)
Actively work towards increasing the usage of sustainable resources and reducing environmental impact (26 %)
Design a strategy for internal and external communication (17 %)
Do not know (13 %)

The respondents were also asked to describe what main advantages and disadvantages they expect ISO 14001:2015 will bring their company. Due to a current lack of research on the implications of ISO 14001:2015, no pre-made alternatives were provided in the questionnaire. Instead, the respondents were asked to write their answers freely. 19 respondents wrote about advantages and 15 about disadvantages. The answers were coded into categories. Due to the free-text form, the respondents could answer more than one advantage or disadvantage.

Main advantages with ISO 14001:2015 (amount of responses):

- Reduced environmental impact (5)
- Integrate the environmental work with the operations (5)
- Clearer responsibility in the management (5)
- Do not know (3)
- Increased knowledge about environmental impact (1)
- Improve image (1)
- Less documentation (1)

Main disadvantages with ISO 14001:2015 (amount of responses)

- None (6)
- Do not know (3)
- Win new assignments (1)
- Time consuming (1)
- More bureaucracy (1)
- Implementation costs (1)
- Understanding from employees requires more education (1)

4.1.4 Planning for organizational change related to the transition to ISO 14001:2015

The questionnaire showed that there is a large interest in becoming certified to the 2015 version of ISO 14001. Of the respondents who answered that they were aware of the new version, 94 percent said that their company was planning to become certified according to the new version. In fact, no respondents answered that they were not planning to become certified, although 6 percent answered that they were not certain (see figure 4.13).

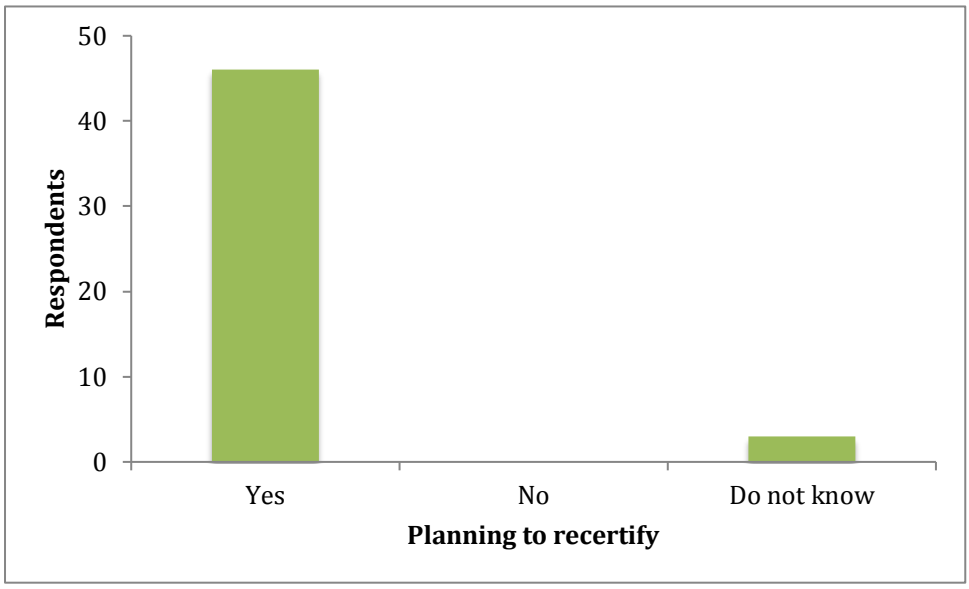

Figure 4.13 Amount of respondents who say their company plans to recertify to ISO 14001:2015.

The respondents were also asked if they knew if the company had a plan for how to become certified. The responses were varied, with 33 percent being aware of the plan, a slight majority of 40 percent responding they partly knew about the plan, while 27 percent were not aware of a plan (see figure 4.14).

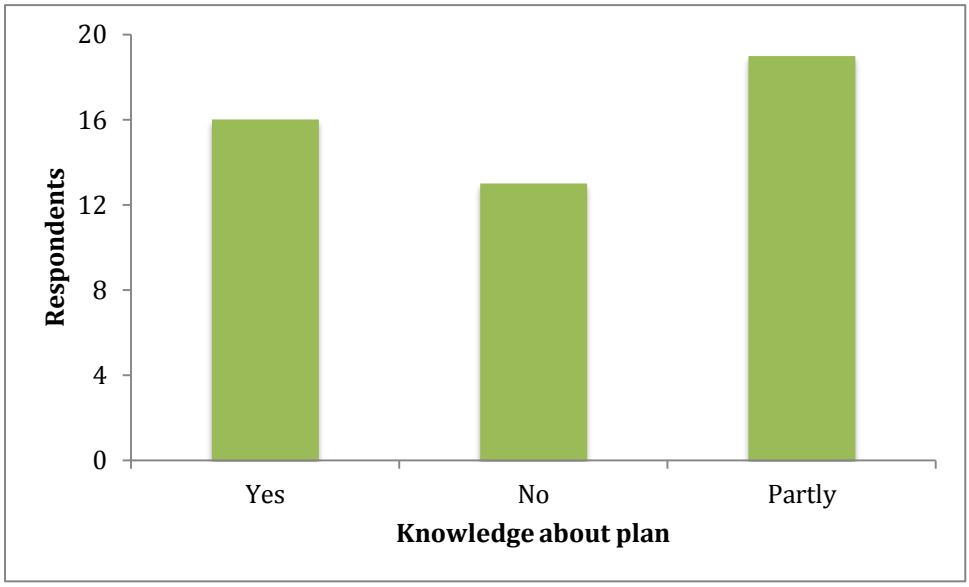

Figure 4.14 Perceived awareness of plan for implementing ISO 14001:2015.

The respondents were asked how closely they believed the plan would be followed. On a scale of 1 to 5, with one meaning the plan will not be followed at all and five meaning completely followed, three was the most common answer, closely followed by a rating of four and then five. These answers were then analyzed to see how they correlated to if the respondents were aware of the plan for implementing ISO 14001:2015. This showed that the participants who were partly aware of the plans tended to give a score of three or four, with only one person giving a score of five. Of the respondents who were completely aware of the plan, scores were higher, with four being a common rating and an even higher number of people scoring them a five (see figure 4.15).

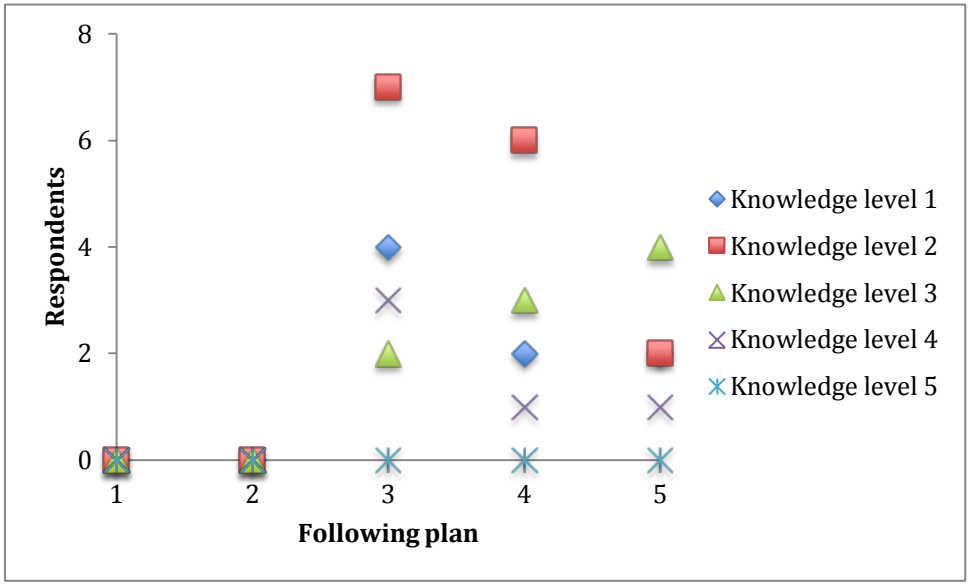

Figure 4.15. Perceived knowledge of plan for implementing ISO 14001:2015 compared to degree to which respondents thought the plan would be followed, from not at all to completely.

How well the company representatives thought the plan would be followed was also studied in relation to the respondents' backgrounds. This showed that while there was no clear difference between how men and women viewed the plan, some differences could be seen related to the person's role within the company and the number of years they had been working there. All the *CEO's/shareholders* thought the plan would be moderately followed, scoring it a three. *Other managers* and *Environmental managers* had mixed reactions, but were generally more positive, rating it more often four and five. The results also showed that the respondents who had studied at university for more than three years were significantly more positive in believing the plan would be followed. The respondents who had studied up to three years were the most negative, with a majority predicting the upcoming efforts a score of three. The study also showed that people working more than 20 years within their company were the most negative, with a majority believing the plan would only be moderately followed, scoring it a three.

How well the plan was expected to be followed was further analyzed according to how much knowledge there was about ISO 14001:2015 within the company. This showed that there was a varied degree of knowledge within the companies. While there is a slight trend of the plan being more closely followed if the company has a high degree of knowledge, it was not significantly higher. Therefore, it does not seem to be a deciding factor for how well the plan can be implemented at a company.

The respondents were asked to freely write what they believed were the most important parts of the implementation plan. The answers they gave can be seen in table 4.3. While companies' priorities for the plan were varying, some mentioned factors which involved analyzing the company's processes. The most mentioned categories were conducting a gap analysis and ensuring that top management increased their focus on the environmental management system. Even though the amount of responses were too few to represent the whole sample, they provide insights in how some Swedish small and medium-sized construction companies plan to become ISO 14001:2015 certified.

Table 4.3: Shows what respondents believe will be the most important parts of the ISO 14001:2015 implementation plan.

Most important parts of the plan when implementing ISO 14001:2015 (number of responses)
Increased focus on leadership (4)
Perform a gap analysis (3)
Planning and communication (2)
Increased education (2)
Execution time (1)
Perform a risk analysis (1)

The respondents were also asked when they thought the 2015 version would be implemented. A majority of almost half of the respondents answered within 1-2 years, while only one respondent answered more than three years (see figure 4.16). This means that if the respondents' predictions are correct, all companies except one would manage to implement the changes in time to achieve the certification, since the time limit for completing the implementation process is set to three years (ISO, 2016a). A majority of the respondents also believe that a not too much effort needs to be put on becoming recertified to ISO 14001:2015, scoring it a three on a 1 to 5 scale.

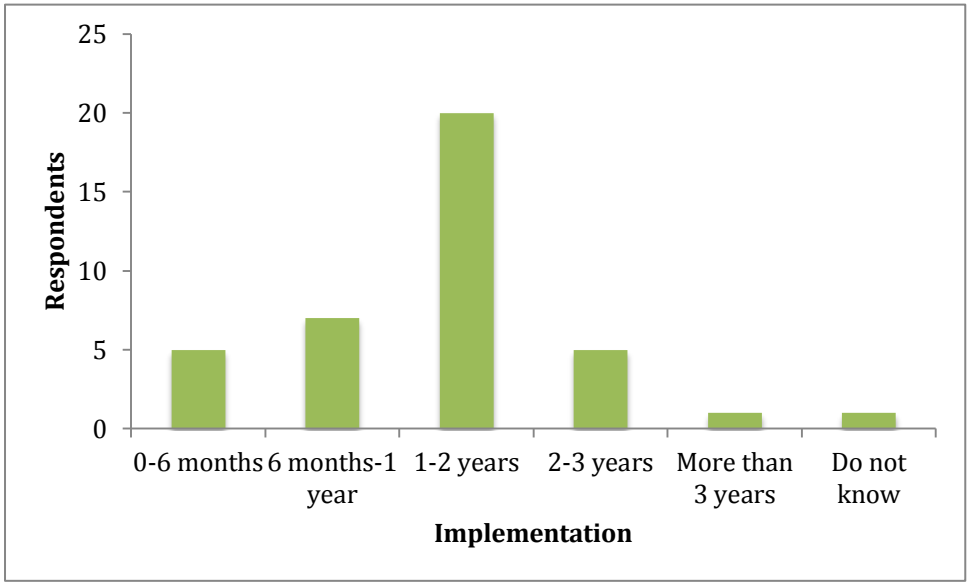

Figure 4.16 How long time respondents believe implementing ISO 14001:2015 will take.

4.2 Results from interviews

When the questionnaire had been conducted, a clearer understanding of companies' views on environmental issues and ISO 14001 was gained. To comprehend these in greater depth, interviews were held with questions based on the results of the questionnaire. A total amount of six interviews were conducted at a case company in Sweden (see table 3.1). Below follow the main findings, categorized according to different areas of relevance for the study.

The studied case company is a Swedish construction and real estate company which operates in all parts of Sweden. The company consists of approximately 120 employees and its head office is located in Gothenburg, which is the base of central operations. The construction is carried out at several project sites. The company is typically responsible for all stages of the building process, from the initial idea stage to planning, building and finishing construction.

4.2.1 The interviewees' professional roles and responsibilities

Of the six interviews conducted, three were held with different site managers, referred to as site manager A, B and C. These generally have the same responsibilities, which concerns managing and coordinating work at the construction sites. In addition, site manager A mentioned that he is also responsible for the working environment at the site. Their main task is to manage all the different parts of the project, with consideration to time and economical frame. The site manager is according to the environmental manager therefore most often highly respected by the site workers and perceived as the "*godfather*" or "*captain of the ocean*".

The environmental manager explained that his main responsibilities concern managing quality, environment and working environment. This includes spreading knowledge to the employees when a change should be implemented in accordance with his three responsibility areas. Also, he educates all new employees about the management system and the standardized work linked to his areas of expertise. The environmental manager exchanges ideas with the other employees, and therefore considers himself to be a "*spider in the web*".

The construction engineer handles the main project design and purchase decisions. He said that his work is like a puzzle, where many different pieces and aspects must be considered in each project, e.g. construction parameters, quality, and environmental aspects. However, according to the construction engineer, his two main priorities are costs and quality.

The department manager has assignments such as distributing staff to the projects, developing the skills of employees and managing customer relations. He compared his tasks to a turning

wheel, where the main parts are to collect new, manage and terminate projects. The department manager has the overall responsibility of the projects.

4.2.2 Attitudes towards environmental efforts

The attitudes towards working with environmental issues varied within the company. Some, like site manager A thought it was important to think of both the planet's and the children's future and therefore work more with environmental issues. Others, such as the construction engineer, felt that they could not affect decisions that had an impact on the environment and instead thought other concerns were more important. All the interviewees agreed that the company prioritized other factors, primarily economic, over environmental factors. They said that the customer sets the parameters, which the project has to work and comply with. If the customer does not prioritize the environment, which the interviewees agreed is common, it will not be a goal to which the project is evaluated by. However, all site managers said that they consider some environmental aspects in their job. These were all driven by economic reasons, where the environmentally best solutions were also of economic benefit. All the interviewees agreed this was a requirement for working with the environment. Related to this, the department manager said "*sure, the environment is fine to focus on if you can save a few bucks by doing it, you know*".

This was something the site managers worked with by e.g. recycling and minimizing the amount of transports. They all said that they have guidelines they needed to follow regarding forbidden materials. None of them found it difficult to adhere to these guidelines and were used to updates of laws and policies affecting their work. However, they all questioned if these laws and policies were correctly decided, which also the construction engineer agreed upon. They believed that certain banned materials might actually be better for the environment than the permitted materials, and were doubtful if their environmental impact was correctly evaluated. The site managers also said that they would not mind putting more emphasis on their environmental efforts, but this meant that less time could be spent on the actual construction project. This would result in the project both being more expensive and taking a longer time, which the customer usually disapproved of. As one of the site managers said: *"It's not exactly like environment is at the top of the list"*. The site managers and the construction engineer all agreed that it was the top management that needed to emphasize environmental efforts and create environmental goals that were weighted as equal to economic goals.

4.2.3 The role of the environmental manager

From the interviews with the case company, it was found that the environmental manager carries most of the responsibility related to environmental work. This includes having knowledge about laws and regulations, as well as important certifications and staying updated

to relevant changes they carry with them. The environmental manager is in this case responsible for the areas of quality, environment as well as working environment. Site manager A said that it is the environmental manager's role to inform the other employees at the company and explain how changes related to his area affect the others' work. He continued with saying that he has trust in the environmental manager to present a plan of how relevant changes should be implemented.

Regarding the organizational changes related to the implementation of ISO 14001:2015, the interviewees have confidence in the environmental manager and his ability to diffuse the necessary information needed. The department manager said that he believes that the environmental manager's knowledge about the new version of the standard is a ten out of ten. From the interviews, a general pattern of trust towards the environmental manager regarding environmental issues was found. Site manager C described the current environmental manager as having a genuine interest about environmental work. Similarly, the previous environmental manager at the company was also described by most of the interviewees as having a great interest for environmental work. In addition, she was very passionate about certifying the company to ISO 14001.

When the environmental manager was asked to describe his work, he explained it as being the spider in the web. He said that it is the management that sets requirements on the site managers and their work. An important task for him is therefore to inspire and engage the management so that the importance of environmental issues are highlighted from the top. The environmental manager also believes that to reduce environmental impact, necessary measures need to be taken already in the production. He has therefore started to set more project specific environmental goals. Conclusively, he wants to introduce more environmental thinking in all the project processes and highlight the importance of working more with the issues related to his area.

4.2.4 Knowledge about ISO 14001

Most of the interviewees were not aware of when the company became certified to ISO 14001:2004. When asked about why they thought the company had chosen to become certified, they saw various reasons. Most of the interviewees explained that an ISO 14001 certification is a common requirement from clients. This relates to marketing benefits, which was mentioned by site manager C. Site manager A said that it also is a way to make routines and the company more efficient, as well as a mean for quality assurance. Similarly, the department manager said that it assures that the company has routines, continually learns and improves. In addition, site manager B believed that ISO 14001 brought benefits not only to the customer, but also to the company as it increases the level of knowledge.

When estimating their level of knowledge, most interviewees said that their knowledge about both ISO 14001:2004 and ISO 14001:2015 was limited. Site manager A thought that reading the new version was a task for the environmental manager, who is also responsible for informing the rest of the organization. According to site manager B, their job is to relate to the construction description. He uses the company server and assumes that the regulatory documents have been, or will be, updated according to new version of the ISO standard. Similarly, site manager C said that there are guidelines to follow, and in case there are issues, he looks into the guidelines often by taking help from someone else. Furthermore, the department manager said that ISO 14001 was a responsibility for the environmental engineer. He thought that this person has full knowledge about the ISO 14001:2015, whereas the supervisor or the carpenter at the construction site has little knowledge about the standard. The environmental manager himself agreed that he, together with an internal auditor, have a lot of knowledge about the new version. In addition to them, another internal auditor has relatively recently been hired and is currently being educated about ISO standards by the environmental manager.

4.2.5 Perceptions of ISO 14001

The interviewees were asked about their opinions of working in accordance to ISO 14001. The answers they gave were varied, but all the interviewees agreed that a main reason for choosing to become certified to ISO 14001 was to gain a positive public image for the company. Several mentioned that it helped them structure their work processes. The department manager said that it made it easy to find the documents he needed in his work, while the environmental manager said they help when structuring the document system and to ensure that the company works according to set environmental standards. They both said that it can be beneficial during negotiations, especially for municipality negotiations, since it is sometimes a requirement or a strong advantage to have this type of environmental certification. When asked about previous certification processes, the interviewees said that certifying the company to ISO 14001:2004 had been relatively easy and not required any large organizational changes.

The site managers' views of ISO varied widely; site manager C felt that the certification was not adapted to the construction industry and that it was solely making his job more difficult. Site manager B was positive to having a system which helped the company reduce its environmental impact but saw a large disadvantage in it being expensive. Site manager A was the most positive. The certification had helped him to keep order of all documents necessary to know that he did has done his job correctly and ensured that he would not be personally liable if he missed important documents for the building site, especially concerning safety. However, he also said that it could become bureaucratic and time consuming to use the system, which all the other interviewees agreed with. They all mentioned that it meant a lot

more paperwork and more working hours. The environmental manager and department manager mentioned that it was costly to become certified, both financially and in terms of time. The environmental manager said that "*if it's not completely necessary in your industry to become certified, I'm not sure that I would recommend it*".

4.2.6 Impact of ISO 14001 changes

The interviewees were also asked how they thought the changes in ISO 14001 will impact the company. They all thought that it could be beneficial that the standard places emphasis on that the company should work continuously with sustainable issues. Some, as site manager B, said that it ensures that the environmental directives comes from the top management, which he says is essential when changes need to be made within the company. This statement was supported by the environmental manager, who mentioned that one problem with these types of systems is that it becomes only one person's focus, while the rest of the company is not fully engaged. He thought that the changes in ISO 14001 forces the top management to be more committed, hence inducing the whole company to be engaged. The construction engineer believed it could be beneficial to set up goals but that they needed to be relevant. Otherwise, it mostly becomes unnecessary paperwork; "*the certification becomes a paper tiger*". He also mentioned that the company's current focus is of economic and quality dimensions rather than environmental parameters, a statement most interviewees agreed upon.

All interviewees agreed that the customer was the main focus and drives what is prioritized within a project. Therefore, many were doubtful that ISO 14001:2015 would result in that environmental issues would be valued higher than before, an issue which was especially emphasized by all the site managers. All the interviewees except the department manager emphasized the importance of leadership courses. Site manager C thought it was especially necessary in some parts of the company and site manager B said he had requested these type of courses, since he believed a "*leadership focus is crucial*". Site manager A highlighted that the certification could enable sustainable decisions being made throughout the whole building process, from project planning to finishing the building, which would make the product more solid. He also thought it could ensure that the working environment would more often be taken into account, which can create a better and safer work environment. The interviewees saw different risks in regards to the changes in ISO 14001:2015. The construction engineer was worried that it would become too many policy documents, which would be impossible to follow, as well as create more work for everyone. Some thought the changes related to ISO 14001:2015 would not make a difference in assessing which risks the company faces. The department manager saw that it could be beneficial to be able to predict environmental risks that could have an economical effect on the company. These were mostly related to construction site accidents, which are important to avoid from both a legal and economic perspective. He was however unsure if the certification would help avoid these types of risks.

4.2.7 Procedures for managing knowledge and change

As the transition to ISO 14001:2015 requires companies to adapt to the changes of the standard, it was important to get an understanding of the case company's specific circumstances. Questions were therefore asked about how managers educate their employees, how knowledge is transferred and how change is managed. Due to this, the following sections are more general.

4.2.7.1 Education of employees

Education and continuous development of the employees is important in order to keep the company and its employees up to date with the laws and regulations that must be followed. The environmental manager is responsible for educating the employees within the areas of quality, environment and working environment. The environmental manager explained that this is currently done when new employees are recruited. If there is an update of the working structure that needs to be diffused, both internal and external meetings are held. Also, the interviewees said that e-mails are sent out regularly to the employees when there is an upcoming change that they need to be informed about. In the near future, the environmental manager plans to introduce an education day with regards to his area of expertise at the company.

Considering the education of ISO 14001, the environmental manager explains that presentations are available for the employees. Also, during the education conducted at the first days of employment, the complete management system of the company is explained, including the 16 national environmental goals. The environmental manager clarifies the company's documentation structure and processes related to these goals. Site manager B explained that it is during these meetings it is possible to see the red thread by knowing which folders and documents that should be used during different scenarios, acting like reference cards.

Not everyone at the company has been educated about ISO 14001. Site manager C claimed that he has had no education about the standard and the construction engineer said that he does not remember that he has been given any education about it. The remaining interviewees have been educated about the folder structure and the work necessary for the standard. According to site manager A, only supervisors and site managers are attending the relevant education. The environmental manager said that other workers at the construction site are generally not educated about ISO 14001.

4.2.7.2 Knowledge transfer

The company has many projects ongoing at the same time. The interviewees were therefore asked about how knowledge transfer is managed between the different projects. According to

the department manager, this is a classical problem formulation within the construction sector. The company has a management system to spread knowledge, but he thought that it could be improved and that this was a common problem for the whole industry due to the diversity of projects. From his perspective, it is essentially about creating a learning organization, in which new employees can reach the information, to which the management system is supposed to assist. Documentation in this system is supposed to be done in accordance with a certain routine or structure, which e.g. makes it possible to find information about an old project. However, the system might not be fully appreciated by everyone. The construction engineer explained that due to his long experience in the construction industry, he does not feel that he needs the support of the management system in his daily work. However, he saw its value for new employees. In addition, site manager C said that there is an experience bank, but he had only looked into it when he was new at the company. Furthermore, site manager A reflected on the fact that much work is becoming digitalized, while everyone are not comfortable with using a computer, even when it is a prerequisite. However, he still wanted more parts of his work to become digitalized, as this provides possibilities to create what he calls a forcing system. This would make it impossible to avoid certain steps in processes and thus guarantee that site managers work in the same way.

Communication is also spread through meetings. Four times a year, all site managers meet and bring up interesting issues for discussion. Site manager A also mentioned that when he had a new idea, he discussed it with another site manager to find a solution. In addition, he said that knowledge is spread through meetings with site managers at other construction companies due to an openness within the sector to share knowledge between companies. It was also mentioned by the department manager that cross-functional meetings are being held with site managers, supervisors, construction engineers, etc. Site manager B said that these meetings are opportunities to meet and discuss. Several of the interviewees also said that meetings are held when a project has finished. In these, the client as well as others who have been involved in the project participate to discuss what has been good and bad respectively, in order to find improvement suggestions. The environmental manager also participates during these meetings and takes notes. Site manager C mentioned that he had discussions with the environmental manager if meetings should be held continuously during a project, but this would require a resource who is able to consolidate it.

Some knowledge is continuously transferred in a more informal way. The department manager said that "*[...] it happens everyday. It might happen right now in the coffee break room*". However, the environmental manager explained that he almost only meets the site managers during the site managers meetings, and not in his daily work. The construction engineer believed that the company is small enough for people to small talk about things in

the corridors. He also believed that the small size of the company facilitates communication between different parts of the organization.

Other means for communication, such as e-mail and phone, are also being used. In order to avoid "*reinventing the wheel*", site manager C calls or e-mails people he knows who have experience from working with a similar issue. Site manager A explained that he can just lift the phone if something is missing on a blueprint, because the company works with turn-key contracts and not general construction, meaning that they project everything by themselves. Both site manager B, site manager C and the environmental managers usually sum up what has been good and bad both during and in the end of an project, and hands it in to the department managers, who become responsible for spreading it within the organization.

4.2.7.3 Managing change

The interviewees were asked about their perceptions of the company's routines for managing different types of change. Both the department manager and site manager C explained that the process depends upon the nature of the change. For example, the department manager said that when there is a policy change, an e-mail is sent out to officials and information is presented on pinboards at the construction sites. Site manager B exemplified this with a changed pregnancy policy, where the e-mail provides instructions on how to find the policy at the company's server. Other changes can be of a larger scale. For example, the ownership of the company was transferred this spring, which according to site manager C was a matter for top management. This was presented during a company information meeting to which all employees were invited. The company also has a yearly Midsummer lunch with a high degree of participation by officials and construction workers, which has functioned as an opportunity for the CEO and other managers to talk in general about major changes. Site manager C also explained that information related to changes is presented during department meetings, and during meetings with supervisors as well as with site managers.

Some changes can be managed by the site managers themselves. This was exemplified by site manager A, who mentioned a specific problem related to the roofs of the buildings. This had often lead to additional problems due to the roofs' high levels of details. In this case, he discussed the issue with another site manager, which led to a trial of a new product that later was evaluated. He also explained that some changes come externally, such as during visits at the company's various construction sites or by visiting other companies.

All changes do not seem to be appreciated by everyone. Site manager A commented that "*Yes, there you have the whole spectra - those who think it is okay, and others who will crumple it and throw it directly in the trash bin [...]*", meaning that some accept changes, whereas others reject them. For example, in the case of new policies being published on the

server, he believed that the resistance could correlate with age due to older employees being less comfortable with computers. Site manager B also mentioned that he had experienced resistance to change when he had created a time plan, which others had been negative towards. However, when he simplified and explained it, the construction workers understood it and saw how it benefitted their work. The construction engineers believed that an obstacle to change can also be related to how long one has worked in the company. He said that he has his regular routines of working and therefore seldom looks into manuals. He explained that the reason for this is his long experience in the industry, which he admitted also could be hindering him from learning new ways of performing tasks. However, the company might also have strengths that assist them during change processes. Site manager C said that change can be easier at his company than at others, as there are structures and resources available, such as construction engineers and supervisors, which had not been the case at his previous place of work.

5 ANALYSIS AND DISCUSSION

To understand the findings of the interviews and the questionnaire, they have been interpreted in relation to previous research. The empirical data was also evaluated and analyzed in relation to each other. This aimed to create a better understanding of how Swedish small and medium-sized construction companies can plan for the recertification of ISO 14001 and answer the study's research questions.

The construction industry is currently changing towards having a more positive view on environmental work. Previous studies published in the early 21st century present a fairly negative view, which e.g. can be seen by only a small amount of companies within the construction industry having implemented an EMS at that time. The environmental management system concept was relatively new within the sector and few organizations globally had received the ISO 14001 certification (Christini et al. 2004). However, in a study by Marimon et al. (2011), results from a worldwide survey based on the number of ISO 14001 certifications by sector was presented. It was concluded that the construction sector was the fastest growing sector with regards to the number of ISO 14001 certifications. Also, in an international review of the construction industry by Zutshi and Creed (2015), it is argued that having an EMS is becoming a basic necessity for survival within the sector. Hence, from the literature it can be concluded that the construction industry is changing towards working more accordingly with environmental efforts.

From the questionnaire, a similar pattern can be seen. A majority of the respondents claim that there is an increased interest in environmental issues within the construction industry. Most of the interviewees at the case company also agreed with that statement. When comparing the literature of previous studies, it can be concluded that the construction industry still follows a positive trend towards increasing their environmental efforts. However, it should be taken into account that the majority of the respondents from the questionnaire only said that the interest in environmental issues is approximately 3.5 on a 1 to 5 scale. Also, the results indicate that the interest in environmental issues has been low during the past, and the results that it has increased is therefore not as representative.

5.1 Implications of ISO 14001:2004

In order to plan for the recertification of an ISO 14001 EMS, it is important to study not only what the new version requires, but also evaluate implications of the current certification. All companies participating in this study were certified according to ISO 14001:2004. Much research is available related to both ISO 14001:2004 in general, but also more specifically to construction companies and their work with the standard. By analyzing the findings from this

study in relation to past research findings, it is possible to create a larger understanding of the transition process' potential implications.

5.1.1 Knowledge and attitudes towards ISO 14001:2004

Many companies have been certified to ISO 14001:2004 for years. It was therefore of interest to study what degree of knowledge exists within the group of studied construction companies. The questionnaire showed a varying estimated degree of knowledge at the responding companies, but a majority answered that it was moderate or slightly above. It also differed heavily depending on the respondent's profession, and to a certain degree on their educational level and age. In addition, the interviews showed a relatively low degree of knowledge about ISO 14001:2004. Most of the interviewees were unaware of when the company had become certified, and they had different views on the reasons behind the decision. When estimating their own level of knowledge, most questionnaire respondents regarded it as low. From all the respondents, CEO's/shareholders believe they have the lowest knowledge about both ISO 14001:2004. This is interesting, because it is often the top management that has to make the decisions of whether environmental factors should be valued higher than others. If they do not have enough knowledge about the advantages of being ISO 14001 certified, they might only see it as a necessity because of sector specific and governmental demands. However, both the environmental manager himself and the other interviewees considered his knowledge about ISO 14001:2004 to be large, in similar to the results from the questionnaire. A more successful implementation of ISO 14001 in financial terms can be achieved by having employees who are trained, involved and aware of the standard (De Vries et al., 2012). Thus, working according to the standard is not only a concern for the environmental manager, but for the whole organization, because having employees who engage in and prioritize environmental work is beneficial for successfully implementing an ISO 14001 EMS (Rodríguez et al., 2011). The differences in knowledge among different professions could therefore be seen as a disadvantage for Swedish small and medium-sized construction companies.

As the requirements put by the standard influences all employee's work, it is also important to consider what attitudes that exist within the organization towards the standard. The questionnaire showed that most Swedish small and medium-sized construction companies perceived working with ISO 14001:2004 as being valuable and more important than other environmental certifications, as well as influencing the company's environmental work. Having this positive outlook on working with ISO 14001 within the whole organization is a valuable asset. Rodríguez et al. (2011) explain that a more successful implementation ISO 14001 can be achieved if the organization feels engaged in and prioritizes environmental work. However, some site managers from the interviews were more critical to the standard's influence on their daily work. These thoughts could not be collected from the questionnaire,

since no site managers received the questionnaire. It is therefore possible that the attitudes towards the standard differ depending on the profession of the person who is influenced, which could have been a disadvantage for Swedish small and medium-sized construction companies. In similar, the questionnaire results showed that the interest in environmental issues differed among various professions.

5.1.2 Organizational implications of ISO 14001:2004

As ISO 14001:2004 influences the whole organization, respondents were asked about how they have been affected by the standard in their work. ISO 14001:2004 has influenced Swedish small and medium-sized construction companies' environmental work to a rather high degree, especially from the perspective of environmental managers and employees who have worked for a shorter time at their company. This result is perhaps not that surprising, because environmental managers are likely more influenced by ISO 14001:2004 due to the content of their work tasks. In this research, the implications on the employees' work in terms of advantages and disadvantages have also been studied more specifically. From the questionnaire, Swedish small and medium-sized construction companies tend to view an improved company image as the main advantage of the certification. All interviewees agreed upon this. In a literature review by Tarí et al. (2012), a better image was one of the most commonly identified advantages. Several of the interviewees stated that an EMS certified to ISO 14001 can be beneficial when negotiating new contracts with customers. In that sense, a better image can also become a competitive advantage for the certified companies. This also goes in line with the findings by Tarí et al. (2012), who say that that the certification can become advantageous during negotiation situations, make customers more satisfied and improve stakeholder relations. In addition, Swaffield and Johnson (2005) found that being ISO 14001 certified can improve the competitiveness of construction companies. Christini et al. (2004) also saw that an ISO 14001 certified EMS puts pressure on others, i.e. competitors, customers and regulators, to improve their environmental work. ISO 14001:2004 therefore seems to function as a competitive marketing tool for Swedish small and medium-sized construction companies.

Another major advantage concerned reduced environmental impact of the company. This goes in line with previous research, where e.g. Tarí et al. (2012) found environmental performance as being a top three advantage for certified companies. Implementing an ISO 14001 EMS has e.g. shown to lead to less usage of energy and reduced waste (Zobel, 2015). This was also mentioned during the interviews, where it became clear that the studied company focuses heavily on recycling and reducing energy costs. However, in a much larger study by Hertin et al. (2008), a certified EMS was not found to improve environmental performance, which contradicts the findings of this research. This is interesting to consider with regards to the qualitative research approach of this project. The respondents perceived environmental

performance to be improved, but it was not studied quantitatively. Therefore, people could potentially perceive a certified EMS as a means for reducing environmental impact without knowing the actual environmental effects of the certification itself.

An ISO 14001:2004 certified EMS was also found to provide guidelines of how companies should construct their EMS. Similarly, some interviewees said that ISO 14001 had been beneficial for structuring their work processes, mainly by improving the documentation system. However, many respondents from both the questionnaire and the interviews mentioned disadvantages with the certification; implementing and maintaining a certified EMS is said to be a process that is time consuming and requires a large amount of documentation, which also had been found by Tse (2001) and Turk (2009). Tarí et al. (2012) say that efficiency is one of the main advantages with an ISO 14001 certified EMS, but it seems to be more of a double-edged sword for Swedish small and medium-sized construction companies.

Applying ISO 14001:2004 to all parts of operations and adapting it to the construction industry was found to be difficult, according to the questionnaire respondents and the interviewees. This could be due to the project-based structure of the sector, which requires a large degree of coordination to preserve and diffuse knowledge gained from different projects and the risk of tension between task performance and learning opportunities (Sydow et al., 2004). Additionally, it is also difficult to spread knowledge in companies operating in a project setting, as the employees have to operate in combination with the set procedures for managing projects and work with time limitations (Bresnen et al. 2004). Furthermore, Gluch and Räisänen (2012) also found that the work of environmental managers have a rather low degree of status among construction workers, which could further complicate spreading knowledge in construction companies. As the studied group of companies are SMEs, it is also possible that they could have lacked the necessary resources for integrating ISO 14001 on all parts of operations. However, as the companies are smaller, knowledge has to be spread among less people, which in turn could have facilitated the integration.

The standard is created to suit all types of businesses around the world (ISO, 2016d), and a vast amount of research has been conducted regarding the standard within different sectors. For example, Swaffield and Johnson (2005) and de Vries et al. (2012) studied the financial benefits of the standard within the construction sector, and found positive effects of being certified. De Vries et al. (2012) suggest a list of interventions for increasing the financial benefits of the certification, such as having committed managers on all levels, training and involving employees and stakeholders, defining responsibilities clearly as well as creating an awareness among employees. This could indicate that it is possible to implement an ISO 14001 EMS successfully in all parts of Swedish small and medium-sized construction

companies, and that there are methods for spreading the knowledge.

One of the highest ranked benefits by Tarí et al. (2012) concerned profitability, which was not directly mentioned as an important advantage in this study. Research by both Swaffield and Johnson (2005) and de Vries et al. (2012) also show positive financial implications of certifying an EMS to ISO 14001. On the contrary, certifying an EMS to ISO 14001 was said to be costly during the interviews, where even the environmental manager questioned whether or not he would recommend it to others unless the industry they operate within requires a certification. Increased profitability was not included as an alternative in the questionnaire. However, one alternative concerned lowering costs, but only 12,5 percent considered this to be a top advantage. During the interviews, the certification was rather described as a cost than as a means for profitability. One could argue that strengthening company image correlates with profitability, because a stronger image leads to increased competitiveness, and, in turn, more money. However, profitability was not mentioned by itself, which was somewhat surprising. Therefore, knowledge seems to be missing concerning the financial benefits of being ISO 14001 certified in the construction industry. This can be related to Gluch's et al. (2013) findings that many construction companies lack an understanding of how environmental work can, such as an EMS, can contribute to profitability.

5.2 Managing the transition towards ISO 14001:2015

To achieve the certification for the revised 2015 version of ISO:14001, it might be necessary to make certain changes to the organizational structures and processes at companies. As previously mentioned, the main changes in the 2015 version of ISO 14001 concern e.g. that environmental issues have a more prominent role in strategic decisions, a stronger focus on leadership and an increase in life cycle based thinking (ISO, 2016a). What implications this will have on construction companies is challenging to predict, since there are few studies within the field regarding the newest version of ISO 14001. It is also unclear how construction companies are planning for these changes. The questionnaire showed that there is various knowledge about the plan for implementing ISO 14001:2015 and companies seem to value different parts of the plan. In addition, the version was also launched recently, which means that there are only a few other companies within the construction industry which a company can benchmark towards and gain inspiration from. This was found in the interviews to be a common way for companies to gain knowledge, e.g. they often ask other companies how they have experienced working with new types of materials or procedures. In fact, when searching among companies in the selected sector at Certifiering.nu (2016b), it was found that only two companies were certified according to ISO 14001:2015. A possible reason for this, at least according to the interviewed environmental manager's understanding, could be that few certification auditors had received the education needed to be allowed to certify companies. Instead, a company wishing to understand the implications of becoming certified

can study other changes conducted within their own and in other organizations. This can increase the understanding of how the change influences employees' behavior and motivations.

The questionnaire showed that most people thought the certification process would require only a moderate or lower amount of effort, which the interviewees agreed with, even though the knowledge of the new version was considered low. It seems that most agree that the changes will not be big in the new version, especially if the company already works according to the current ISO 14001 standard. It could also mean that the degree of learning anxiety is lowered, since the employees are used to changes in for example policy and documentation. These type of changes seem to be a natural part of companies' ways of working, where processes are constantly changed and new directions can come from several stakeholders, ranging from the customer to the top management and governmental regulations. In a sense, this also creates a form of survival anxiety; in order to remain in the business, you have to adapt. It is common that for example certain materials become prohibited or new working laws come into effect. Adapting to these changes quickly is essential for the company to remain competitive and ensure that they do not create problems during the building process. Therefore, it seems like both survival anxiety has been heightened while learning anxiety has been lowered, which according to Schein (1996) are important factors in achieving lasting change.

If the employees are used to quickly adapting to new directions and changed circumstances, it is especially helpful when implementing this type of change, since this might become a behavioral pattern. In effect, this can be said to have become part of their tacit guiding, which is essential for a lasting change (Marmgren et al., 2015). The attitudes towards implementing change were not studied further in the questionnaire. However, during the interviews, it was mentioned that there are always people who tend to embrace changes in their work less well, where some reject it immediately. Having this kind of no-culture, where people avoid all risks by not doing anything, is an obstacle for change (Garvin and Roberto, 2005). Managers play an essential role in convincing people with these attitudes to change their behaviors (Concepción López-Fernández and Serrano-Bedia, 2007). There are various ways for this to be done. For example, Schein (1996) suggests, among other things, cognitive restructuring. This would mean that managers e.g. could explain that the change can mean something else than what the employees first believe or that it can be seen from a wider perspective. However, another common obstacle to change is that leaders often evade problems themselves by avoid facing challenges (Garvin and Roberto, 2005). The methods for changing behavior could therefore be useful not only for managers to change their employees' behaviors, but also, if necessary, to change their own. This means that it is essential that both

employees and managers are willing to change in order for the change towards ISO 14001:2015 to become successful.

5.2.1 Knowledge of ISO 14001:2015

There seems to be a limited degree of knowledge regarding the 2015 version of ISO:14001. In project-based organizations, it is common that knowledge remains in a project and is difficult to transfer between different construction sites (Sydow et al., 2004). Both in the survey and interviews, it was clear that the overall knowledge level varies. The questionnaire showed that the environmental managers had a much higher knowledge than the rest of the organization, which was confirmed by the interviews. From the interviews, only the environmental manager, and perhaps the internal auditor, were aware of what the revised version entails. Currently, the employees at the interviewed company perceive the work with ISO 14001:2004 differently. Some feel that it helps structure their work and readily use the documentation available, whereas others do not think it is adapted to their job and see it as a complicating formality. Therefore, there seem to be knowledge differences that need to be targeted when teaching the employees about the 2015 version. Argote (2015) says that knowledge consists of both declared facts and procedural knowledge, which both need to be targeted in the teaching of the 2015 version. ISO (2016b) also states that a management system should be conveyed both by communication and through improving how employees continually work with it.

Since the environmental manager has the most knowledge about ISO 14001:2015, he will be a key person who should communicate his knowledge about it to all relevant stakeholders in the organization. Haapalainen (2009) says that this is important in a change process and can be challenging for many construction companies. Nadler and Tushman (1990) further emphasized the importance of having a charismatic leader in charge of the change. The environmental manager will be an important person by having a leading position, in which he needs to convey the vision and convince employees of the benefits of the change. If he can be seen as a charismatic leader it could make these undertakings easier, as he could facilitate an effective learning throughout the whole organization.

5.2.2 Transferring knowledge within the organization

The construction industry faces certain challenges compared to other sectors, since much work is performed in projects. This can create a risk that knowledge disappears when a project is finalized and the team dissolves (Kamara et al., 2002). The questionnaire did not include questions about knowledge transfer, but the interviews conducted confirmed that there is possible risk of losing knowledge after project completion. The site managers seem to have gained much tacit knowledge at the construction site and, in turn, manages staff who have tacit knowledge of their work, e.g. in knowing how to construct building walls. Many of the

site managers had worked with practical tasks at the building sites previously and therefore understood how the work was done. This means that they potentially collected the same knowledge and worked similarly as a best practice, even though it might not have been said explicitly, just as Brockmann and Anthony (2002) describe is common. The company has solved this by having several meetings throughout the project and one with several stakeholders once the project is finalized. This provides a structure for transferring knowledge from projects and transform it into organizational knowledge, which Kamara et al. (2002) suggests. However, it might not be sufficient in capturing all knowledge developed during the project, and especially the tacit knowledge. Diffusing and managing knowledge is challenging in project-based organizations, due to their structural conditions that are difficult for employees to operate in, and tensions can appear when e.g. time, costs and quality have to be balanced (Bresnen et al., 2004). It is therefore important for Swedish small and medium-sized construction companies to develop a strategy on how to integrate knowledge from projects as a natural part of the organization, which must be connected to the company's goals and problems in order to create a supporting structure (Kamara et al., 2002).

All interviewees agreed that the time frame was narrow for each project and that there was little time to reflect after each project was completed. However, if any specific knowledge was gained after a project, it sometimes resulted in revised documentation or a new procedure for how to conduct a certain task. This means that the knowledge was used to improve the company's strategy and at least to a degree maintain intellectual property learnt from projects, which Kamara et al. (2002) say is an important factor for a company aiming to achieve a competitive advantage. Documenting knowledge gained from projects in this form can be said to create a database of lessons learnt, such as Senaratne and Malewana (2011) suggested companies should have. They also say that it should enable a culture of organizational learning. The company's documentation structure does help in spreading knowledge between projects, even though all the interviewees admitted that all documents are not used by everyone and it is not a guarantee that a revised document will mean that employees change their work habits. This could be due to the fact that people often avoid changing if the change both presents a risk and it can be easier to work around it until they are forced to adhere to a new procedure (Garvin and Roberto, 2005). However, having a documentation system could also be an a helpful tool when conducting a change. It can be used as what Schein (1996) describes as scanning, where people search for information themselves. In turn, it can make people feel more psychologically safe and change their mindsets, which leads to a trial-and-error behaviors that enables them to change. There is also an informal knowledge transfer structure in place at the case company, where employees and especially site managers often call each other asking how to solve issues. This type of tacit knowledge conversion by socialization makes it easier for the workers to gain valuable experiences as well as creates an increased understanding between the workers (Nonaka et al., 1996). Brockmann and Anthony

(2002) said that to spread tacit knowledge, structures need to be in place that enable communication. It seems like the company has achieved these structures and that employees use both their own intuition and these paths of communication to make decisions.

5.2.3 Different views of environmental issues dependent on role

The questionnaire showed that there seemed to be some connection between business role and ambitions for environmental efforts, e.g. when studying the interest in environmental issues. The reasons behind this connection were further studied during the interviews. These showed that the views on environmental issues differed a lot. The environmental manager, as well as some of the site managers, shared a positive view, compared to e.g. the construction engineer, who mainly valued economic factors. In the study by Gluch et al. (2009b) where organizational obstacles for sustainable construction were identified, it was found that the environmental managers are trusted to have the role as the mediators of environmental efforts. They were expected to be experts within the environmental area, as well as having knowledge about the construction process. If the environmental manager did not participate enough in the building process, it created mistrust among the site workers. What was found from the interviews can be related to this view. Several of the interviewed site managers mentioned that the environmental manager has a passionate interest for environmental issues. If the environmental manager is seen as a distantly located person, it may be difficult for him to reach out to the rest of the company, reducing their interest to work more with environmental issues. This has shown to complicate the implementation of ISO 14001 (Rodríguez et al., 2011). To change this pattern of behaviour, it is important that the environmental manager is integrated in the company culture and educates the employees in an inspiring way. Also, as the interviewed environmental manager already does, educating newly hired employees during their first days of employment help create a basic understanding of the company's environmental work. This will contribute to a more established environmental awareness, which can be further built upon in the future. Having committed managers and employees who are engaged in the company's environmental work contributes to a more successful implementation of ISO 14001 (Rodriguez et al., 2011).

5.2.4 Roles during the implementation

The questionnaire showed that the environmental managers have most knowledge about the changes in ISO 14001:2015. This was also confirmed during the interviews, where the general consensus was that it is the environmental manager's responsibility to ensure that the ISO 14001 standard is being followed and integrated into the organization's processes and document structure. This can have both positive and negative implications. Nadler and Tushman (1990) explain that a change needs to be integrated into all the organization's processes. They also say that it is important to have a convincing leader who can guide the organization through the change. The environmental manager can be beneficial for both these

cases, since he can oversee the structure of the system and be the key person to follow through the change. At the interviewed company, he is also enthusiastic about environmental work, which can help convey the vision of the change to the whole company. However, he is not completely convinced that ISO 14001 is the best certification for the company to improve their environmental work, which can be problematic when convincing others to adhere to it.

Another interesting issue is the implications of when a leading figure leaves during a change process. For example, at the studied case company, the previous environmental manager was perceived as enthusiastic about making the company certified to ISO14001:2004. She had a strong vision and was responsible for driving the change. When she left the company and the current environmental manager took over the responsibility of this change process, it could potentially result in the organization feeling unsettled because of losing that enthusiastic key person. When a key person of the change is lost, it is necessary that they are replaced by a dedicated person, who is knowledgeable regarding what changes have been made and ensure that the change process continues along the right path (Kotter, 2007). At the interviewed company, the environmental manager had not worked there for long, which could mean that he is less knowledgeable about the company's processes. This can can further make the implementation difficult. However, this should not be an overall issue for the Swedish small and medium-sized construction companies, as a majority of the questionnaire respondents who worked as environmental managers had worked at the company for more than five years, and only one person had been working less than a year. This, along with the fact that they work at SMEs which is often a smaller company and communication is easier and people often work more in a more tight-knitted way, should improve their chances of knowing how the company is structured.

The fact that the environmental manager is seen as the main person responsible for implementing the 2015 version can, however, also be problematic. De Vries et al. (2012) found that it was essential that top management was committed and that employees were both trained and involved in the change. This seemed to be an issue according to the interviewees. They felt that the top management was not involved and that the environmental manager's responsibility was to integrate ISO 14001 into the organization. However, without support from the top management, this can become difficult.

5.3 Previous experiences regarding ISO 14001

Both the questionnaire respondents and the interviewees expressed some concerns regarding ISO 14001. A majority of the questionnaire respondents answered that ISO 14001:2004 has strengthened their company image. The interviewees expressed a concern that the certification is something needed to ensure the company's image rather than improving the company's actual environmental work. Several interviewees were also doubtful if the certification was truly adapted to their industry and that it was not tailored enough for their company's circumstances and needs, which goes in line with the findings from the questionnaire. These views could be problematic during the recertification process for ISO 14001:2015. However, the questionnaire showed that being ISO 14001:2004 certified is perceived to have been valuable for and shaping Swedish small and medium-sized construction companies' environmental work. Garvin and Roberto (2005) say that for a change to be successful, it is important that employees see it as necessary. They also emphasize that top management is an important factor in the change process, where they need to both convince the employees of the benefits of the certification, but also behave according to it. At the studied company, everyone was aware that the certification might be necessary to gain contracts, but the views varied regarding how beneficial ISO 14001 is in their daily work. As one of the main changes in the 2015 version is that environmental aspects should be more integrated in strategic decisions, it is important that companies streamlines their views on the purpose of being certified.

Another issue mentioned in both the questionnaire and the interviews was that the certification requires too much documentation and is regarded as time consuming. These disadvantages were also found in several studies, e.g. by Tse (2001). This can create a barrier when trying to make people adapt to the new version, since it does not necessarily reduce the documentation and will require time to both learn and in the daily work. However, dissatisfaction can also be an effective base on which to build change (Schein, 1996). Creating a sense of urgency (Kotter, 2007) and convincing employees that the change is necessary (Garvin and Roberto, 2005) are important aspects to consider when initiating a change. For example, the interviewees viewed the purpose of being certified differently and sometimes saw it as unnecessary. The certification process can therefore be an opportunity to collectively evaluate the system and create a more integrated approach towards the environmental management system, as Nadler and Tushman (1990) say is important during a change process.

Kotter (2007) describes that a team consisting of employees from different positions and levels in the organization should be responsible for achieving the change. The questionnaire showed that the standard requires a lot of documentation, which was also supported by the interviews. The documentation process could be revised by a mixed team where the

documentation process could perhaps be simplified and where knowledge can be shared between the different roles in the company. This creates a chance for employees to share their tacit knowledge and turn it into explicit knowledge, which is a rare opportunity in many companies, according to Brockmann and Anthony (2002). They also say that these type of discussions can help define best practices in the company. From the interviews it also became clear that the site managers used the system differently and some saw stronger benefits than others. Revising the documentation structure would give an opportunity for them to spread these benefits to the rest of the organization and show how it can improve their daily work. This would create a better opportunity for change, since it is important to involve people in the change process who are convinced of the vision of the change and who can show how it creates positive gains and short-term wins (Kotter, 2007).

5.4 Impact of changes in the 2015 version of ISO 14001

According to ISO (2016a) there are six main categories of changes in the 2015 version of ISO 14001. Each category was ranked by the respondents of the questionnaire in accordance to their perceived importance. The changes are:

- increased focus on sustainability in the organization's strategic decisions;
- increased focus on leadership;
- increase use of sustainable resource and reduces environmental impact;
- improve measurable results of the company's environmental management system;
- increase life cycle thinking in strategic decisions;
- design a strategy for internal and external communication.

Improved evaluation of potential risks was discussed at the interviews instead of *design a strategy for internal and external communication*, because this change was considered to be of greater importance after discussions with the supervisor. Many questionnaire respondents thought that there would be few necessary changes to be made at their companies. Thus, the transition to ISO 14001:2015 would require a low degree of effort. This was supported by the interviewees, of whom many thought that the company already had worked similarly to the requirements of the new version. Out of the six changes that ISO 14001:2015 constitutes, there were four which the questionnaire and the interviews showed might affect Swedish small and medium-sized construction companies to a higher degree. These are *improve measurable results of the company's environmental management system, increased focus on leadership, increased focus on sustainability in the organization's strategic decisions* and *increase life cycle thinking in strategic decisions*, which were analyzed more thoroughly.

5.4.1 Improve measurable results of the company's environmental management system

Having clear goals seem to be essential when trying to reach a lasting change. To achieve this, there seems to be a need for a more integrated approach where everyone is involved in defining the work necessary for recertifying to the new version of ISO 14001. The questionnaire respondents thought that *Improve measurable results of the company's environmental management system* was one of the main changes with the new version of ISO 14001. However, it was not further studied how this change could affect their companies. The interviews showed that the goals, especially financial ones, are traditionally set by top management. These influence the site managers' parameters for the project and how they structure it, but they felt that they could not influence these decisions. At the same time, the site manager is the person in charge at the building site. He or she is also the only person who knows the possibilities of that site and which opportunities they bring, along with what compromises need to be made to adhere to certain financial and environmental goals. The managers often have to adapt to the site manager's view of the situation and might have to adjust the goals set according to their opinions. Therefore, there seems to be a knowledge gap between the roles within the company and a communication pattern that does not fully convey the reality of each situation. According to Gluch (2009a) it is common that it is difficult to coordinate and communicate the environmental information between the different groups in a project-based organization and, as in this case, it can be difficult to implement environmental strategies across all areas of the organization. This can further be related to what Kamara et al. (2002) say is especially important in construction companies; knowledge gained during construction projects does not remain tacit among the site managers, but is instead integrated into the organization's decisions and structures. This would also ensure that knowledge learnt from one project can be transferred to another, which is especially relevant to achieve a solid, increasing organizational knowledge and a structure where business targets are based on relevant numbers (Kamara et al., 2002). In this way, top managers are able to set both financial and environmental, accurate goals which the site managers feel they are able to meet.

Conducting the change in this way would also mean that people from several levels of the company will be involved in the change, which according to Nadler and Tushman (1990) is important to anchor the change in the organization and create a lasting system change. The interviewed company had already seen benefits of certain environmental practises, e.g. by focusing on waste disposal, which Swaffield and Johnson (2005) found was a common benefit for construction companies with an ISO 14001 certified EMS. In addition, they found that it could help the company win more project negotiations, which is of high value for a construction company. De Vries' et al. (2012) study further found that the certification can bring several financial benefits, which exceed the implementation costs. This should help

convince the top management to focus to a higher degree on the environmental parameters of their operations and give higher respect to the environmental manager's position, as financial gains are highly regarded within the company. This should also help integrate the work necessary for certifying according to ISO 14001:2015 in the company, especially as an essential part of this type of change is the commitment of top management (de Vries et al., 2012). If the top management shows that this is an important practice and act accordingly, this will further cement the environmental benefit consciousness in the company. This is because top management serves as role models and their behavior will help guide the rest of the organization, ensuring that everyone is committed to the change (Garvin and Roberto, 2005).

5.4.2 Increased focus on leadership

Another of the main changes of ISO 14001:2015 is an increased focus on leadership. This was by some seen as one of the most influential changes according to the questionnaire. A majority of the environmental managers saw it as the most important change. However, only 13 percent of the CEO's/shareholders thought it was one of the main changes. This was similar to what was found in the interviews, where everyone answered that it was important and reacted positively to the possibility of improving the leadership qualities within the company, except the department manager, who placed less emphasis on this change. A successful implementation of ISO 14001 benefits from having both committed top and middle managers (de Vries et al., 2012). These reactions could therefore become challenges, but they can also be seen as possibilities.

Kotter (2007) says that for change to be possible, the people it concerns must feel motivated and understand how it will benefit them. Schein (1996) also says that a change that can help realize unfulfilled hopes and improve what people currently experience as dissatisfying. Leadership development is something many of the employees have been asking for and if the certification process can involve this it will likely be appreciated by the employees. They might then see the benefits of the certification and possibly be more positive towards other changes it involves. Leaders are also an important force when implementing a change (Concepción López-Fernández and Serrano-Bedia, 2007). They need to convince other employees that the change is imperative and guide them in new behavioral patterns that adhere to the changes (Garvin and Roberto, 2005). They also need to have much knowledge about the area that should be educated, as this benefits the implementation of ISO 14001. However, coordinating work between the permanent and temporary organization is one of the largest challenges for construction companies (Gluch, 2009a). Therefore, focusing on improving leadership could also help e.g site managers to better communicate the implications of ISO 14001:2015 at the building sites, allowing for the change to spread throughout the whole organization. It could also help improve the construction workers

perceptions of the company's environmental work and help them see its benefits, since it is common that they find an EMS to be complicating rather than useful (Rodríguez et al., 2011).

The interviewed department manager and the questionnaire respondents within the category CEO/shareholder's views of leadership not being a main change can however make this part of the change problematic. If they are not committed, it can become less of a priority and result in too little emphasis being placed on leadership improvement. This could potentially lead to dissatisfaction from the employees if they had become hopeful that they would receive more leadership training and lead them to feel more negatively towards the certification. Furthermore, to institutionalize a change and ensure it results in lasting improvements, leadership development is an important aspect (Kotter, 2007). There seems to be an additional risk that leadership will not become more focused upon, since it according to Sunding and Ekholm (2015) is common for companies in the construction sector to focus more on organizational structures and documentation rather than human relations and organizational behavior.

5.4.3 Increased focus on both sustainability in strategic decisions and life cycle based thinking

In this chapter, both the change *increased focus on sustainability in the organization's strategic decisions* and *increased life cycle based thinking* are analyzed since these issues are believed to impact companies simultaneously. The decisions an organization takes are often affected by their stakeholders. Gluch et al. (2009) showed that the main stakeholders in the construction sector are managers and clients. This became clear in both the questionnaire and interviews conducted. The interviewees claimed that the customer makes the final decision, where the parameters the customer valued were emphasized in the project, and other parameters significantly less considered. In the questionnaire, most respondents said they placed little to no value on if the subcontractors were ISO 14001 certified. However, they also said that the customers opinions whether their company was certified or not mattered. Regarding the requirements of including more life cycle based thinking in the new version of ISO 14001, this becomes contradictory. If the subcontractors are not believed to emphasize being certified, while the customers require this from their clients, the company working on the specific project might get torn between the two groups. It is therefore essential that the companies are clear about what requirements they have on each subcontractor so that these can match the customers and other stakeholders involved. As mentioned by Bremmers et al. (2004), the government is the most relevant stakeholder for SMEs. It can therefore be essential to introduce more governmental regulations concerning life cycle based practices to avoid the mismatch between the subcontractors and customers of a company.

The interviewees were clear that while it could be good publicity and beneficial to gain a contract for an environmentally friendly project, they were not in a position of saying no to projects. This would therefore not be a deciding parameter for what projects they worked with. They also seemed to place little emphasis on the sub contractors' environmental work. Together, this makes both the ISO 14001:2015 change regarding an increased life cycle thinking as well as the change regarding increased strategic focus on sustainability more difficult to achieve. To truly improve the life cycle of a process and increase sustainability, Pitt et al. (2008) say that the construction industry should work in collaboration with stakeholders and together reduce their impact on the environment as well as their resource usage. It seems to be difficult for individual construction companies to achieve this, due to the highly competitive situation. Instead, they can focus on their owning part of the construction process by choosing environmentally friendly materials and reducing energy consumption. This could e.g. be achieved by using LCA as a tool, as it makes it possible to measure emissions and use them to compare different processes and their environmental impact (Baumann and Tillman, 2004).

The lack of collaboration further affects the life cycle of a building when the construction is finished. Construction companies in Sweden are responsible for their buildings during 10 years after completion (Sveriges Riksdag, 2016). This can potentially create a situation where it is not rewarded to regard the long-term impacts of the building. It can also create a lack of incitement for environmentally friendly choices, especially under the pretext of tight budgets, which especially the site managers witnessed. However, they all said that if they were to focus on environmental issues more, it needed to come from either the client, top management or from government regulations. They also said that they were able to quickly adapt to new parameters of which to work towards. In their research, Bremmers et al. (2004) concluded that to achieve a change of how medium-sized companies operate, directions need to come from government with firmer goals that the companies need to adhere to. These type of changes could likely create stronger incentives for companies to strategically focus on sustainability and improve the complete life cycle of the building, which by extension can increase their adherence to ISO 14001:2015.

6 CONCLUSION

The main objective of this project was to investigate how Swedish small and medium-sized construction companies can plan for organizational and managerial effects due to a future transition to ISO 14001:2015. This was intended to create an increased knowledge of how organizational change can become an integrated part of companies' management systems as new revisions of ISO 14001 standards are released.

Overall, there seems to be a positive attitude towards including more sustainable and environmental work within Swedish small and medium-sized construction companies can be seen, and it seems to be increasing. If this has to do with governmental regulations, sector competition, or just a marketing trend is difficult to explain. However, much of the environmental work within the industry seems to be based on using the concept as a marketing tool to acquire new projects and customers. Even though the root cause for certifying an EMS might not be based upon reducing environmental impact, it makes the industry move forward towards including more environmental thinking in the everyday business.

Being certified according to ISO 14001:2004 has brought both positive and negative organizational and managerial implications. Swedish small and medium-sized construction companies believe that it has strengthened their brand, as well as increased their competitiveness, e.g. during negotiations. They also think that it has reduced their environmental impact. However, this is a matter that should be verified in numbers. ISO 14001:2004 has helped Swedish small and medium-sized construction companies structure their work processes, but has also been time consuming and required employees and managers to spend a lot of time on documentation. In addition, it seems to be difficult to apply ISO 14001:2004 on all parts of the operations and adapt it to the specific context of the construction sector. This could be a result of construction companies' project-based organizational structures. However, by intervening through e.g. creating an awareness among employees and having committed managers on all levels, Swedish small and medium-sized construction companies may have had a generally more effective implementation of ISO 14001:2004 in their organizations. The knowledge about ISO 14001:2004 within Swedish small and medium-sized construction companies varies among managers, which has been a disadvantage for successfully implementing ISO 14001:2004. However, the certification is said to have been valuable for and shaped their environmental work. This is advantageous, since when an organization feels engaged in and prioritizes environmental work, the implementation of ISO 14001 is usually more successful.

These findings about ISO 14001:2004 are important to consider when planning for the implementation of ISO 14001:2015. As companies are starting to recertify to the new version, there are several factors that should be considered to make the transition as successful as possible. Generally, Swedish small and medium-sized construction companies do not perceive the change as requiring any major efforts, which will likely simplify the transition process. The process will also benefit from the fact that people tend to view working in accordance to the requirements set by ISO 14001 as valuable for their company's environmental work.

However, there are also obstacles that may impact the organization negatively when transitioning to the new standard. With few Swedish small and medium-sized construction companies currently being certified to ISO 14001:2015, it will be difficult to benchmark the work necessary for recertification. In June 2016, only 114 of all companies in Sweden were certified to ISO 14001:2015 (certifiering.nu, 2016a). This will require additional resources to create an understanding of the future change. Transitioning to the new standard also requires knowledge about the changes. This is currently limited and varying among Swedish small and medium-sized construction companies, and transferring knowledge related to environmental strategies is difficult due to their project-based organizational structures. In addition, managers are also essential during the transition. They perceive the change as not equally valuable, while it is important to have committed managers on all levels. Not having a fully committed management could make the implementation of the new standard to be perceived as less valuable, which in turn creates resistance and less motivation to the change among the employees. Currently, much responsibility is put on the environmental manager and not on the top management, who also plays an essential role in the transition. However, as the 14001:2015 standard requires a larger focus on leadership, managers could become better at communicating the company's environmental work and thus increase the organizational knowledge about how to work in accordance to the standard. In addition, having negative attitudes towards ISO 14001:2004 could become a barrier for change, as previous issues related to the standard can make people avoid the change and see it as less necessary and less valuable.

With knowledge about how the new standard could impact construction companies, there are aspects to consider when planning for the implementation of ISO 14001:2015. First, Swedish small and medium-sized construction companies should consider previous implementations of changes to take advantage of their experiences. This could also function as a way for the whole organization to become involved in the transition process. Companies should create change teams consisting of people with different hierarchical positions to increase the involvement. These teams will also be useful when formulating environmental goals that suits everybody. A culture of openness between managers and other employees facilitates knowledge sharing related to the standard. Some employees have previously been resistant to

ISO 14001, e.g. due to it being time consuming. This barrier could be used as a trigger for change by showing how the transition will benefit their work and not become another task to perform. It is therefore important to focus on human relations and organizational behavior in addition to organizational structures and documentation for everyone to become satisfied.

The organizational knowledge about ISO 14001:2015 can further be enhanced by integrating knowledge sharing as an integral part of the organization's structures and decisions, since this makes it possible to create environmental goals based upon facts. To ensure this, a knowledge management strategy should be formed. It should address how knowledge can become an integrated part of the organization by connecting the company's goals with its problems, and thus create a supporting structure for transferring knowledge, including both explicit and tacit knowledge. It is essential that all employees are taught about what the new standard means for their work. The relevant stakeholders, such as the subcontractors, customers and regulators should also be included in the transition process. With increasing demands to include more life cycle thinking in companies, it is important that everyone takes responsibility and sets requirements on their relevant stakeholders.

Finally, all managers should become more committed to and involved in the change by receiving training and education about the new standard. It could therefore be beneficial to provide them with leadership training to become better at communicating the changes to their employees, and thus increase the organizational knowledge. Managers must also convince the organization that the change is important, e.g. by explaining the financial benefits of working in accordance to ISO 14001:2015, since they function as important role models who guide the behavior of their employees. The environmental manager is especially important as the key change person to make the transition become successful and sustainable. It is therefore essential that this person shows enthusiasm and is passionate for environmental work and the new standard to inspire and motivate employees. However, it is also important for managers working at the construction sites to take an active part in the change process. This requires the organization to put efforts into educating and training the site managers about the changes and how to manage them. It could also help reduce the distance between the construction site workers and the main office, where the environmental manager often is located. In turn, it should make the change less intimidating, since the workers will feel more included in the process.

6.1 Future research

While conducting this study, ideas for future research were generated. These are based on both what gaps in literature have been found, as well as on this study's findings. Overall, there is a need for more research about how construction companies can implement an ISO

14001 EMS, especially in SMEs. In this section, some of these ideas are presented and reflected upon by the authors.

This study used a qualitative approach, in which the participants were asked about their subjective views. This has provided valuable insights about the perceptions of employees and managers at Swedish small and medium-sized construction companies concerning their organization's past, current and future work with ISO 14001. However, it is also important to emphasize the subjectivity of these insights, as they could to be based upon the participants' opinions and beliefs. Future research should therefore study the actual effects of the standard, e.g. by having an increased focus on using quantitative methods, which can show the organizational implications of ISO 14001. Some interviewees questioned the actual value of an ISO 14001 certified EMS, while previous studies have found the certification to be financially beneficial (see e.g. Tarí et al., 2012; de Vries et al. 2012; Swaffield and Johnson, 2005). It would therefore be interesting study the financial implications in relation to the costs of implementing the standard for Swedish small and medium-sized construction companies, both to see if ISO 14001:2004 has been valuable and if the transition to ISO 14001:2015 is worth the costs. Furthermore, the findings of this study show that ISO 14001 has had a positive effect on Swedish small and medium-sized construction companies environmental impact, while previous research shows various results concerning this (see e.g. Zobel, 2015; Tarí et al., 2012; Hertin et al., 2008). Future studies should therefore look at what environmental benefits Swedish small and medium-sized construction companies could gain from certifying their EMS to ISO 14001.

Future research should study the actual organizational and managerial implications of implementing ISO 14001:2015 in construction companies, as the standard has not yet been widely implemented. This can be done within a few years when there is a sufficient amount of certified companies to study and for the standard to have been fully implemented in their organizations. It would also be interesting to study the major changes of the revision separately. One of the main changes in ISO 14001:2015 concerns a greater focus on leadership, which is a theme that often has been discussed in this study. Future research should therefore study how it can become an integrated part of a certified EMS and what roles different managers have in construction companies' environmental work. It may also be of interest to more specifically study the role of the environmental managers and how their roles could differ depending on e.g. if they have multiple areas of responsibility or how closely located they are to the permanent and temporary organization. These aspects of the environmental manager were not considered in this study, but previous research shows that it could have an impact on the implementation of ISO 14001 (see e.g. Rodríguez et al., 2011).

7 REFLECTIONS

Reflections have been made continuously throughout the research process. These thoughts concerned reflections of the study, concerning how different decisions might have influenced the results of the research. In addition, reflections of how the research process itself has influenced the study have also been made. These aspects are therefore discussed in the following section.

7.1 Reflections of research approach

Some choices that have been made during the research process are believed to have affected the results of this study. These concern both actively made decisions, as well as factors that could not have been influenced. In this section, the reasons behind the decisions, how they were managed and what implications they might have had on the results are discussed.

Before the project was initiated, the authors had low knowledge about the construction industry and its relation to environmental issues, as well as EMS and ISO 14001. This required much time to be spent on studying relevant literature to gain a basic understanding of the issues and concepts. Due to this, the research project could not be fully started until enough knowledge had been gained. It would have been beneficial to have another researcher involved in the project with more knowledge and experience of the construction industry and environmental work. This would have made it easier to understand the problems within the sector earlier in the research process. It is likely that these circumstances also made the research more general, where ISO 14001 in the construction industry became the context in which organizational change and knowledge management was studied.

Due to the limited amount of prior knowledge, the aim of the study was changed after it first had been formulated. The initial purpose of the master thesis was to evaluate the organizational and managerial effects of implementing ISO 14001:2015 in Swedish small and medium-sized construction companies. However, in an early literature review, it was discovered that not many small and medium-sized construction companies in Sweden had yet become certified according to ISO 14001:2015. Due to this, it would not have been possible to find evidence for actual organizational and managerial implications. The focus was instead directed towards studying the planning for implementing ISO 14001:2015. With previous experience of similar projects, the researchers were aware that this probably would occur, and therefore, relatively flexible frames of the study were set. The aim and research questions were reshaped to fit to the gap in the current literature of the area.

The questionnaire and the interviews were intended to complement each other quantitatively and qualitatively. Therefore, the questionnaire was sent to a large amount of Swedish small

and medium-sized construction companies. The data was interpreted qualitatively, showing possible indications and general trends that were supported by the results from the interviews. A disadvantage of this is that it is unclear who did not choose to answer the questionnaire and why. It could e.g. reflect the respondent's interest or knowledge in environmental issues and ISO 14001, or another aspect of their personality that in turn would have affected the results of this study. However, the amount of responses was considered to be large enough to identify interesting patterns.

In addition, when studying the responses of the questionnaire in relation to demographical data, the respondents were sometimes categorized into small groups, e.g. few CEO's representing the whole group's opinions. Also, the respondents were categorized into larger groups. For example, an environmental manager was treated as equal as a manager responsible for quality and working environment in addition to environmental issues. This could lead to a larger spread of results in each category than what would have been found if they were categorized into smaller groups. In this study, it was not possible to make larger categories due to the small amount of respondents. The small amount of participants also influenced the amount of responses received from free text questions. These types of questions usually have a lower response rate, which also was the case of this study. However, the results can be seen as indications, and they are also rather confirmatory to other findings.

In the study, individuals representing one case company were interviewed. This means that they acted as representatives of the studied group of Swedish small and medium-sized construction companies as a whole from a qualitative perspective. Different results could have been found if interviewing another or more companies. This lowers the generalizability of the research. It would therefore have been interesting to study multiple cases. However, as the results collected from the interviews are similar to those found from the questionnaire, it could indicate that they are somewhat representative. The interviews were conducted with managers and employees with four different hierarchical roles. This gave the opportunity to get an overview of how views differed in the various levels of the company as well as who had the main impact and final decisions on environmental issues. However, the group of interviewees was a relatively homogeneous group, in terms of e.g. gender and age. It would therefore have been interesting to include employees with different backgrounds to avoid possible subjectivity of the results. It would also have been interesting to interview employees with various positions, such as an audit and an economist. Additionally, it was not possible to interview subcontractors and customers of the case company due to time constraints. It would have been interesting to get their perspectives, as the interviews showed that they also seemed to have a relatively important role in the case company's environmental work. In addition, this could have made it possible to find more correlations between the questionnaire and the interviews. Furthermore, it would also have been interesting to interview the two companies

already being certified to ISO 14001:2015 to get their views on the transition. However, despite trying, it was not possible to get in contact with them.

7.2 Reflections of research process

The focus of this study was initially formulated by the examiner and the supervisor of the project. However, as previously mentioned, this had to be altered when the project had been initiated. Even though this required more time being spent on defining the purpose of the project, it gave the research group the opportunity to reflect upon what the research actually could contribute with to current literature. In turn, this also created a larger understanding for the research group of what the actual problems were within the construction industry related to EMS.

The research group had a large degree of freedom to develop and conduct the project by themselves. This was advantageous as it required a thorough literature review being done, which created an understanding of the research field. However, having too much freedom made it difficult to narrow the limitations and focus of the project, e.g. due the limited amount of knowledge about the construction industry. As a consequence, the questionnaire and the interviews were conducted late in the project and less effort could be put on analyzing the data. In addition, it also resulted in that less time could be spent on reformulating the frame of references. This would have been beneficial to increase the understanding of some findings from the questionnaire and the interviews.

Initially, this research project was supposed to result in two publications with different focus, but sharing the same basis. However, when the research process was initiated, it became clear that it would be unwise to separate the studies into two reports as the literature review and data collection was conducted together throughout the research process. In addition, it was also assumed that the research would benefit from being published in one report, where different views would complement each other. It also made it possible to exchange ideas and benefit from the knowledge and experience that each individual possessed. The decision was supported by both the supervisor and the examiner.

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Appendix A: Questionnaire

In this appendix, the questionnaire that was sent out to construction companies is presented. The questionnaire has been translated from Swedish to English.

Questionnaire study about environmental work and ISO 14001

We are three students from Chalmers that are conducting a master's thesis project about companies' environmental work within the construction sector. In the light of this, we want to do a study about your opinions about environmental management systems and ISO 14001. Your answers would be of great use for our work and we are very grateful for your help. The questionnaire consists of 25 questions and takes approximately 5-10 minutes to answer. Leave the response field empty if you feel that you cannot answer a question.

Your answers are completely anonymous and will be treated confidentially.

Best regards,
Christina Säther, Shanna Moen Bondesson och Robin Jensen

1. How large do you perceive the interest for environmental issues to be within the construction industry today?

No interest 1 2 3 4 5 *A very large interest*

2. How do you perceive that the interest for environmental issues has changed within the construction industry during the last ten years?

Increased *Unchanged* *Decreased* *Do not know*

3. How prioritized do you think it is that your company is ISO 14001 certified in comparison to other certifications (e.g. BREEAM, Svanen)?

Not prioritized at all 1 2 3 4 5 *Very prioritized*

4. To what degree does your company require its subcontractors to be ISO 14001 certified?

Not at all 1 2 3 4 5 *To a very large degree*

5. How large is the proportion of your company's customer that you think require your company to be ISO 14001 certified?

Not any 1 2 3 4 5 *All*

6. How large is the proportion of your company's subcontractors that you think require your company to be ISO 14001 certified?

Not any 1 2 3 4 5 *All*

7. How does your company educate its employees about the company's work with ISO 14001? (*Possible to choose more than one alternative*)

Checklists *Training sessions* *Job descriptions* *Process maps*
Policy documents *Plates* *Meetings* *Conferences*
Oral information from managers *Oral information from colleagues*
Is not communicated *Do not know* *Other*

8. How large do you perceive your knowledge about ISO 14001:2004 to be?

Very little knowledge 1 2 3 4 5 *Very large knowledge*

9. To what degree has ISO 14001:2004 shaped your company's environmental work?

Not at all 1 2 3 4 5 *Completely*

10. How value creating do you perceive that ISO 14001:2004 has been for your company's environmental work?

Not value creating at all 1 2 3 4 5 *Very value creating*

11. What do you think has been the main advantages with ISO 14001:2004 for your company? (*Choose maximum three alternatives*)

Lowers the company's costs
Strengthens the company's image
Creates possibilities to compare the company's environmental work with other companies'
Demands customers and suppliers to work more environmentally friendly
Provides guidance in how to shape the EMS
Improves the communication within and outside the company

Improves the cooperation between involved parties
Reduces the company's environmental impact
Helps to minimize risks
Do not know
Other

12. What do you think has been the main disadvantages with ISO 14001:2004 for your company? (*Choose maximum three alternatives*)

Time consuming
Expensive
Requires a lot of documentation
Requires a lot of training sessions for employees
Does not contribute to reducing the company's environmental impact
Forces the company to communicate sensitive information about the operations
Difficult to apply on all parts of operations
Difficult to control if the requirements are fulfilled
Difficult to understand
Do not know
Other

The new version of ISO 14001

During the autumn of 2015, a new version of ISO 14001 was adopted that implies certain changes of the requirements being put on an EMS. It is called ISO 14001:2015.

13. Have you heard about ISO 14001:2015?

Yes *No (Go directly to Background questions)*

14. Does your company plan to be certified according to ISO 14001:2015?

Yes *No* *Do not know*

15. How large is your knowledge about ISO 14001:2015 and the changes it implies?

No knowledge 1 2 3 4 5 *Very good knowledge*

16. Which of the following changes that ISO 14001:2015 brings with do you think will have the largest impact on your company's work? (*Choose maximum three alternatives*)

Increased focus on sustainability in the company's strategic decisions
A greater focus on leadership
Actively work towards increasing the usage of sustainable resources and reducing environmental impact
Improve measurable results of the company's EMS
Include lifecycle based thinking in sustainability issues
Design a strategy for internal and external communication
Do not know

17. To what degree do you think that ISO 14001:2015 is an improvement in comparison to ISO 14001:2004?

No improvement at all 1 2 3 4 5 *A very large improvement*

18. How much knowledge about ISO 14001:2015 do you think that there is within your company?

No knowledge 1 2 3 4 5 *Very good knowledge*

19. Do you know if your company has a communicated plan for how ISO 14001:2015 will be implemented?

Yes *Partly* *No (Go directly to Background questions)*

20. What do you think are the most important parts of the plan? (*Free text question*)

21. To what degree do you think the plan will be followed?

Not at all 1 2 3 4 5 *Completely*

22. When do you think ISO 14001:2015 will be implemented in your company?

0 - 6 months *6 months - 1 year* *1 - 2 years*
2 - 3 years *More than 3 years* *Do not know*

23. How large effort do you think will be necessary for your company to be ISO 14001:2015 certified?

Very small effort 1 2 3 4 5 *Very large effort*

24. What advantages do you think that ISO 14001:2015 will bring to your company? (*Free text question*)

25. What disadvantages do you think that ISO 14001:2015 will bring to your company? (*Free text question*)

Background questions

26. Gender?

Man *Woman* *Do not want to express*

27. Age?

<25 years *25-35 years* *36-45 years* *46-55 years* *56-65 years* *>65 years*
Do not want to express

28. Highest level of education?

Elementary school *Upper secondary school*
Vocational education *Higher education up to three years*
Higher education more than three years *Do not want to express*

29. Profession? (*Free text question*)

30. Amount of years you have worked at your company?

<1 year *1-5 years* *6-10 years*
11-20 years *>20 years* *Do not want to express*

31. What is your company's main business area? (*Free text question*)

Thank you for participating!

If you are able to participate in a short phone interview, then it would have been highly contributing for our study and we would have been very grateful. If so, please leave your phone number and/or your e-mail address and we will contact you shortly. (*Free text question*)

Appendix B: Interview guide

In this appendix, the interview guide that was used during the interviews with the case company is presented. The interview guide has been translated from Swedish to English.

General questions

1. What is your profession and how many years have you worked at company X?

2. In many companies, different people could view environmental work in different ways. How does the view on environmental work differ between different people within the company?

3. You have many projects ongoing at the same time. How do you generally manage knowledge transfer between the different construction projects?
   a. What difficulties are there to spread knowledge regarding environmental issues between the projects?
   b. Do you take care of the experiences you gain in projects and transfer these to other parts of the company?

4. How does the company generally manage changes?
   a. Do you usually follow the plans that you put of for implementing an improvement?

ISO 14001:2004

5. Do you know when you became certified according to ISO 14001:2004?
6. Why did you choose to become certified according to ISO 14001:2004?
7. How does your company educate its employees about your work with ISO 14001:2004?
8. How well do you perceive that your company's work with ISO 14001:2004 has gone?

ISO 14001:2015

9. How much knowledge do you have about ISO 14001:2015?
10. How much knowledge do you think there is about ISO 14001:2015 within your company?

11. How do you plan to implement ISO 14001:2015?
    a. When do you think that ISO 14001:2015 will be implemented at your company?
    b. Have you taken care of the experiences of how the implementation of ISO 14001:2004 went in the company?
    c. How have you taken care of experiences from other projects in general?

d. How will you educate your employees about ISO 14001:2015?
e. What risks do you think are associated to the implementation?

12. What advantages do you think that ISO 14001:2015 will bring to your company?

13. What disadvantages do you think that ISO 14001:2015 will bring to your company?

14. This is a list of some changes that are associated with the new ISO. How do you think that they will affect you and how will you manage them?

a. *Increased focus on sustainability in the company's strategic decisions*
b. *A greater focus on leadership*
c. *Actively work towards increasing the usage of sustainable resources and reducing environmental impact*
d. *Improve measurable results of the company's EMS*
e. *Include lifecycle based thinking in sustainability issues*
f. *A clearer assessment on what risks the company faces*

Appendix C: Questionnaire population

- *Gender*
  - Male: 57.1 %
  - Female: 42.9 %

- *Age [years]*
  - < 25: 0 %
  - 25-35: 12.5 %
  - 36-45: 25 %
  - 46-55: 50 %
  - 56-65: 12.5 %
  - > 65 %: 0 %

- *Highest level of education*
  - Elementary school: 0 %
  - Upper secondary school: 42.9 %
  - Vocational education: 5.4 %
  - Higher education up to three years: 14.3 %
  - Higher education more than three years: 37.5 %

- *Profession*
  - Environmental manager: 41.1 %
  - CEO's/shareholders: 14.3 %
  - Other managers: 21.4 %
  - No response: 23.2 %

- *Years worked at company*
  - <1 year: 1.8 %
  - 1-5 years: 25 %
  - 6-10 years: 26.8 %
  - 11-20 years: 21.4 %
  - >20 years: 23.2 %
  - Do not want to express: 0 %
  - No response: 1.8 %

Appendix D: Division of work

All researchers have contributed to all parts of the report. The literature was sourced both as a group and separately, and relevant findings were later discussed. When necessary, the responsibility of writing parts of the text was divided between the researchers, thereafter all text was reviewed by the other members of the group, who also added relevant information. Due to the researchers' educational backgrounds, Christina focused more on environmental work while Robin and Shanna had a larger organizational focus. In the frame of reference chapter; Christina had the main responsibility for Environmental management systems, Robin for Change management and Shanna for Organizational knowledge. During the interviews all researchers were active and responsible for two transcriptions each. Thereafter the results, analysis and discussion were discussed together and primarily written collectively.