

CHALMERS



Knowledge Management in Construction:

An approach for best practice diffusion in Skanska Sweden AB

Master of Science Thesis in the Master's Programme

Design and Construction Project Management

MIKAEL ERICSSON

SEBASTIAN REISMER

Department of Civil and Environmental Engineering

Division of Construction Management

CHALMERS UNIVERSITY OF TECHNOLOGY

Göteborg, Sweden 2011

Master's Thesis 2011:57

MASTER'S THESIS 2011:57

Knowledge Management in Construction:

An approach for best practice diffusion in Skanska Sweden AB

Master of Science Thesis in the Master's Programme

Design and Construction Project Management

MIKAEL ERICSSON

SEBASTIAN REISMER

Department of Civil and Environmental Engineering

Division of Construction Management

CHALMERS UNIVERSITY OF TECHNOLOGY

Göteborg, Sweden 2011

Knowledge management in construction:
An approach for best practice diffusion in Skanska Sweden AB
*Master of Science Thesis in the Master's Programme
Design and Construction Project Management*
MIKAEL ERICSSON
SEBASTIAN REISMER

© MIKAEL ERICSSON, SEBASTIAN REISMER 2011

Examensarbete / Institutionen för bygg- och miljöteknik,
Chalmers tekniska högskola 2011:57

Department of Civil and Environmental Engineering
Division of Construction Management
Chalmers University of Technology
SE-412 96 Göteborg
Sweden
Telephone: + 46 (0)31-772 1000

Knowledge management in construction:
An approach for best practice diffusion in Skanska Sweden AB

Master of Science Thesis in the Master's Programme

Design and Construction Project Management

MIKAEL ERICSSON

SEBASTIAN REISMER

Department of Civil and Environmental Engineering

Division of Construction Management

Chalmers University of Technology

ABSTRACT

Within the construction industry, where competition triggers relatively small profit margins and projects are becoming increasingly complex, exploiting the most valuable asset of the firm; the knowledge of its employees, poses a desirable gain in performance. In particular, sharing and utilizing best practices can help organizations to avoid re-inventing the wheel, raise the performance of poor performers closer to that of the best but also to save costs through increased productivity and efficiency. Consequently, the Building Division of Skanska Sweden AB seeks to initiate an approach for sharing best practices within their organization.

Purpose – the aim of the master thesis is to develop a suitable best practice approach for the Building Division of Skanska Sweden AB.

Method – in order to properly address the purpose, two case studies concerning two separate knowledge management initiatives in Skanska Sweden AB have been conducted. In total, a number of 16 interviewees have acted as the knowledge base whereas literature concerning knowledge management and best practice diffusion constitutes the theoretical framework.

Findings and conclusions – deriving from the study, several aspects which highly influence the design, operation and success of a best practice approach have been identified. The objective of a best practice initiative and the implication of best practices influence how the approach is designed and conducted. A number of success factors have also been identified which, if achieved, lead to an increased probability of success; empowerment among the involved, local commitment and the fact that sufficient resources are allocated in order to minimize the burden for the involved personnel. The different aspects and success factors identified constituted a base in the work of developing a best practice approach for Skanska Sweden.

Key words: knowledge management, best practice diffusion, construction, productivity, sharing knowledge, success factors

Knowledge management i byggsektorn:

Ett tillvägagångssätt för att hantera normallägen inom Skanska Sverige AB

Examensarbete inom Design and Construction Project Management

MIKAEL ERICSSON

SEBASTIAN REISMER

Institutionen för bygg- och miljöteknik

Avdelningen för Construction Management

Chalmers tekniska högskola

SAMMANFATTNING

Den svenska byggindustrin är starkt präglad av konkurrens. Detta innebär små vinstmarginaler samtidigt som komplexiteten inom branschen ständigt ökar. Ett ökat fokus på att dokumentera och sprida den kunskap medarbetare besitter innebär en påtagbar potential att effektivisera verksamheten och därigenom öka konkurrenskraften. Att skapa normallägen; dokumentation av väl fungerande produktionsmetoder, och sedan sprida dessa medför ett minskat behov av att ständigt behöva ta fram projektspecifika lösningar. Genom att bruka normallägen kan kostnader kapas och därigenom produktivitetsökning uppnås. Med anledning av detta har Skanska Sverige AB utfärdat en målsättning att tillämpa och utveckla gemensamma produktionsmetoder; normallägen.

Syfte – syftet med denna magisteruppsats är att utveckla ett arbetssätt för normallägen, lämpligt för Husregionerna inom Skanska Sverige.

Metod – för att besvara syftet har fallstudier av två avdelningar inom Skanska Sverige genomförts med fokus på två olika sätt att dokumentera och sprida den kunskap vilken finns inom organisationen. Totalt har 16 personer intervjuats för att kartlägga dessa fall. Parallellt har en litteraturstudie med avseende på knowledge management genomförts.

Resultat och slutsats – genom studien har vi identifierat ett flertal faktorer vilka starkt influerar utformandet, genomförandet och framgången av ett arbetssätt för normallägen. Framförallt är målsättningen med ett normallägesinitiativ samt innebörden av begreppet normalläge av stor vikt då ett sådant arbete ska såväl utformas som genomföras. Vidare har ett antal framgångsfaktorer identifierats; möjlighet för berörd personal att ta egna beslut utan byråkratiska omvägar, ett starkt lokalt engagemang samt att tillräckliga resurser är tilldelade för att minska extra arbetsbörda bland produktionspersonal. Genom att beakta de resultat och slutsatser vi fastställt har ett förslag till tillämpning och utveckling av normallägen framställts.

Nyckelord: knowledge management, normallägen, byggbranschen, produktivitet, kunskapsspridning, framgångsfaktorer

Contents

ABSTRACT	I
SAMMANFATTNING	II
CONTENTS	III
FIGURES	V
TABLES	V
PREFACE	VII
1 INTRODUCTION	1
1.1 Background	2
1.2 Purpose of the study	2
1.3 Thesis disposition	3
1.4 Limitations	3
1.5 Presentation of Skanska Sweden AB and the case studies	4
2 THEORETICAL FRAMEWORK	7
2.1 Knowledge management	7
2.2 What is a best practice?	8
2.3 Benefits of best practice application	9
2.4 Difficulties of best practice diffusion	10
2.5 How do we know what practice is the best?	11
2.6 Create and improve best practices; teams and communities	12
2.7 Factors facilitating the best practice initiative	13
2.8 Literature conclusion	20
3 METHOD	21
4 FINDINGS	26
4.1 Case study Civil Division	26
4.1.1 The purpose of the best practice initiative	26
4.1.2 What is a best practice and how is it presented?	26
4.1.3 The early stages of the initiative	27
4.1.4 Organizational structure and functions of the best practice initiative	28
4.1.5 Best practice initiative – how are best practices developed?	32
4.1.6 Best practice format and distribution	35
4.1.7 Best practices at the construction site	36
CHALMERS <i>Civil and Environmental Engineering, Master's Thesis 2011:57</i>	III

4.1.8	Success factors	38
4.1.9	Challenges and future areas of improvement	39
4.2	Case study Building Division Western Region	40
4.2.1	The purpose of the initiative	40
4.2.2	The early stages of the initiative	41
4.2.3	The idea center – foundation for knowledge distribution	41
4.2.4	Application at the construction sites	43
4.2.5	Incentives for involvement	43
4.2.6	Success factors	44
4.2.7	Future development	44
5	DISCUSSION	46
5.1	Identification and creation	46
5.2	Best practice format and distribution	51
5.3	Application	53
5.4	Continuous improvements	55
5.5	Success factors and possible barriers	56
6	OUR PROPOSAL TO SKANSKA SWEDEN	60
6.1	The underlying organizational structure	63
6.2	Identification	66
6.3	Creation of best practices	68
6.4	Best practice distribution	71
6.5	Application	73
6.6	Continuous Improvements	74
6.7	Estimated financial implication of best practice application	79
6.8	Conclusive statements to Skanska Sweden	80
7	CONCLUSION	84
7.1	Recommendations for further research areas	86
8	REFERENCES	88

Appendix 1. Cost estimation – what could best practices generate?

Figures

Figure 1 Organizational chart of Skanska Sweden AB (Skanska Sweden AB, 2011).	4
Figure 2 Individuals attitude towards change (Rogers, 1962)	15
Figure 3 Increasing KMS sophistication.	19
Figure 4 A best practice of the Civil Division published at the Skanska intranet.	27
Figure 5 Organizational structure of the best practice initiative.	29
Figure 6 Process map of the different stages in best practice development.	34
Figure 7 An example of shared knowledge from the idea center.	42
Figure 8 Schematic organizational overview.	63
Figure 9 The process of developing a new best practice when approved at all stages.	69
Figure 10 Proposal of best practice content and layout.	71
Figure 11 The process of controlled improvements.	76
Figure 12 Production and contractor costs in a Swedish housing project (Sveriges Byggindustrier, 2009).	79

Tables

Table 1 The themes for the interviewees.	23
Table 2 Overview of the number of interviewees within each case and each profession.	24
Table 3 Typical best practice-related activities conducted during the first year.	78
Table 4 Focus areas during the first five years.	83

Preface

This master thesis is the result of two years of studies at the Design and Construction Project Management master program at Chalmers University of Technology. The thesis was conducted at the Division of Construction Management and was carried out at Skanska Building Division Gothenburg Region during the spring of 2011.

One of the objectives emphasized in the business plan of Skanska Sweden AB for 2011-2015, aims at developing and utilizing best practices, thus taking a step towards an industrialized construction process. Accordingly, we took on the task of developing a proposal for best practice diffusion suitable for the Building Division of Skanska Sweden.

Throughout this study, several persons have been supporting us and we are grateful for all the help you have given us. First and foremost, we would like to show our deepest appreciation to our supervisors; Petra Bosch at Chalmers University of Technology and Max Bergström from the Production Support Department of Skanska Sweden, who on a regular basis have provided us with useful feedback and support. Next, we would like to thank Skanska Building Division Gothenburg Region, particularly Jimmy Johansson, for providing us with the opportunity to carry out our master thesis. Moreover, we would also like to express our gratitude to Mathias Wilhelmsson at Astra Zeneca as well as the persons at Skanska Civil Division and Skanska Building Division Western Region who have devoted their time by participating in interview sessions.

Göteborg June 2011

Mikael Ericsson, Sebastian Reismer

1 Introduction

The Swedish construction industry distinguishes itself from other industries by having a slower rate of technological development as well as a lower productivity (Bygghögskolekommisionen, 2002). In particular, the industry struggles with low profitability levels where short profit margins complicate R & D, thus not leading to any real improvement of the construction processes. Measurements of construction productivity made on a Swedish national basis show that during 1963-1998, work productivity increases in the construction industry were 2,6 % on a yearly basis compared to the manufacturing industry where work productivity increased by 3,9 % yearly (Bygghögskolekommisionen, 2000). In particular, Lutz and Gabriellsson (2002) relate these low productivity numbers to the industry's low level of competence. Moreover, Josephsson and Saukkoriipi (2005) claim that waste, e.g. activities which consume resources but do not add any value, constitute a profound part of the construction cost.

In an on-site construction setting, personnel are daily faced with challenges and solving critical problems; problems which quickly emerge in the ever-changing nature of a construction project. According to Josephsson and Saukkoriipi (2009), individuals in the industry consider these conditions as a source of frustration. In addition; Josephsson and Saukkoriipi (2009) argue that the freedom which characterizes the industry is something which those acting within construction appreciate. Consequently, initiatives intending to raise productivity levels must seek to maintain the freedom that pervades the construction industry but still prevent aforementioned problems. Within other industries, e.g. manufacturing, the Swedish truck manufacturer Scania has developed its own production system, *Scania Production System* (SPS), which by utilizing the experiences and knowledge of its employee's seeks to improve productivity. By standardizing their production but still encouraging their employees to engage in continuous improvements, Scania has accomplished to prevent production disturbances but still managed to maintain freedom among its employees (Granath et al., 2009). In particular, Loforte Ribeiro (2009), argues that the competitiveness of a firm is directly related to its ability to create and share knowledge, particularly the knowledge of its most valuable asset; its' employees.

Within the construction industry, where competition triggers relatively small profit margins and projects are becoming more complex, the incorporation of sharing and utilizing knowledge of the employees poses a desirable gain in performance. However, the usual approach taken to handle urgent upcoming on-site problems is trial and error or using intuition deriving from one's own earlier experience (Gidado, 1996). Due to the urgency of such situations; the first possible solution is often applied, thus ignoring other possibly more correct alternatives (Love and Li, 1998). Hence, there is a risk that the applied solution does not imply the quickest and most cost-effective method (Yu et al., 2007). As the effects of such conditions, e.g. product quality problems and low productivity levels, are subject to increased attention throughout the construction industry, this could be interpreted as an industry problem. As a countermeasure, the Swedish construction contractor JM has developed their own production approach, *Structured Production*, which is based on JM craftsmen's knowledge and experience about construction production (Niklasson, 2011). By standardizing the construction production process in terms of methods, materials and

machinery; JM seeks to establish uniformity in their processes by adopting best practices thus preventing potential construction production disturbances. Reddy and McCarty (2006) state that sharing of best practices can help organizations to avoid re-inventing the wheel, raise the performance of poor performers closer to that of the best but also to save costs through better productivity and efficiency.

Although standardizing construction production processes by introducing best practices implies that several of the problems that occur in the on-site construction operations could be prevented, the identification and internal transfer of such knowledge is not an easy task. O'Dell and Grayson (1998) claim that the identification and transfer of practices is more complex and time-consuming than people generally believe.

1.1 Background

One of the actions taken towards an increase in productivity within the Building Division of Skanska Sweden is to develop an approach to make use of the knowledge existing in the organization. The aim is to develop a model where best practice construction production methods within the organization are identified, created, distributed, applied and continuously improved by their personnel. The production methods used today within the company are neither unified nor standardized but differ between projects and geographical locations. The fact that few common construction production methods exist forces each project group to develop their own methods. Hence, it is difficult to ensure sufficient product quality and reliable production capacities, thus resulting in fluctuating productivity levels and warranty costs partly deriving from inadequate production methods.

As there currently exist little documentation concerning how construction production activities are carried out, the aim of the best practice approach is to find one best method for a specific construction production activity and thus decrease the vast number of methods used. These best practices will be continuously improved to meet new requirements, take new experiences into account and strive towards an increase in productivity.

1.2 Purpose of the study

The overall purpose of this study is to develop a suitable best practice approach for the Building Division of Skanska Sweden AB.

Research questions

In order to properly address the purpose, the following research questions will act as a basis for our study:

Research question one: how should an approach for sharing practices be outlined considering the following four areas?

- The organizational structure of the initiative; functions and responsibilities.
- Practice availability and usability; distribution methods, content and layout.
- Selection criteria; practices suitable for diffusion.
- Ability for continuous improvement.

Research question two: what are the success factors and possible barriers for diffusion of practices?

1.3 Thesis disposition

The thesis is divided into six chapters which together constitute our knowledge base. The chapters are described below, giving the reader a brief explanation what the main content of each chapter is.

Chapter two - Theoretical framework – This chapter provides a theoretical framework based on a literature review. The main topic revolves around best practices – what they are, what adopting best practices leads to, factors for a successful initiative and other issues related to the notion of best practices.

Chapter three - Method– This chapter presents arguments for the selected research strategy, a brief background explanation of the investigated cases, which individuals were interviewed and which issues were emphasized throughout the interviews, how findings were compiled and how the discussion was conducted.

Chapter four - Findings – The *Findings* chapter aims at presenting the results deriving from the qualitative study. The chapter is constituted by two sections; one for each of the two cases studied where findings deriving from statements and arguments by the interviewees are presented.

Chapter five - Discussion – This chapter contains a discussion of the findings where the authors' analysis and argumentation are supported by the theoretical framework.

Chapter six - Our proposal to Skanska Sweden – Following the discussion is our proposition of a recommended approach of diffusing practices, suitable for the Building Division of Skanska Sweden.

Chapter seven - Conclusion – Concluding the report, this chapter aims at presenting the main conclusions deriving from the thesis study.

1.4 Limitations

As stated in the purpose, the thesis only considers; the design of a best practice approach, success factors and barriers, thus not putting focus on the implementation

required to permeate the approach to the extensive mass of end-users within all fractions of the organization. In addition, the diffusion of practices will only cover construction production activities thus not any other activities in the construction process. Finally, only one company is studied hence results cannot be generally applicable for the entire construction industry.

1.5 Presentation of Skanska Sweden AB and the case studies

Skanska Sweden AB is part of the global Skanska corporate group operating in the Scandinavian countries as well as parts of Europe, North- and Latin America. Below follows a short presentation of Skanska Sweden in terms of organizational setup, business plans and how operations are conducted. All information presented in this section is gathered from Skanska's common intranet, OneSkanska (Skanska Sweden AB, 2011).

Organizational setup

Skanska Sweden AB contains of three business units; Asphalt and Concrete, Civil, and Building. Besides these business units, there are also five support functions; Finance, HR, Organizational Support, Marketing, and Law. In addition, there is also a specific organization for *Nya Karolinska Sjukhuset* (hospital). The relation between these fractions of Skanska Sweden AB is presented in Figure 1. In year 2010, Skanska Sweden had a turnover of 25 billion SEK and approximately 9500 employees.

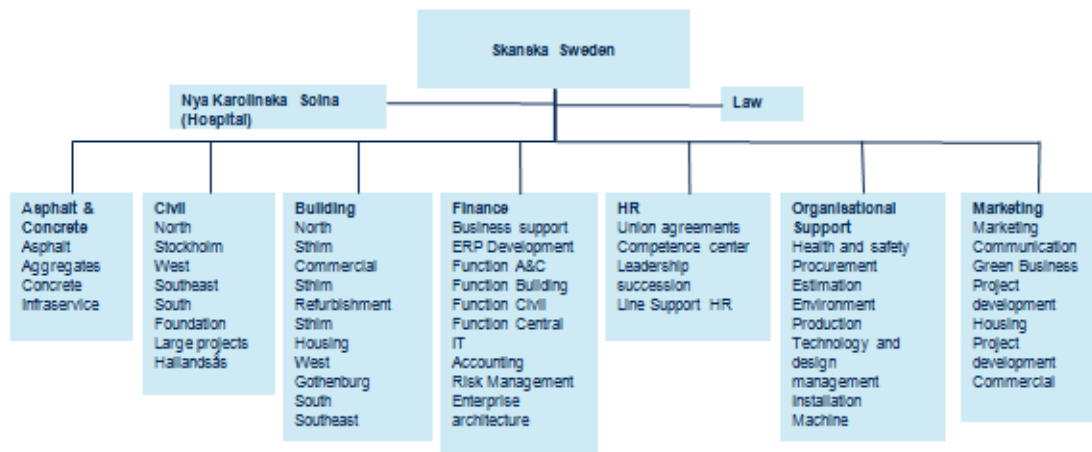


Figure 1 Organizational chart of Skanska Sweden AB (Skanska Sweden AB, 2011).

In this master thesis, the civil- and building business units of Skanska Sweden are studied. Both these business units consist of a number of geographical regions. To be more specific, our case study of the Civil Division examines five of the eight civil regions; North, Stockholm, West, Southeast and South. In this case, the focus of study is their best practice initiative. Next, for the case study of the Building Division, the Western Building region is investigated with a focus on its online idea center for

sharing practices. All in all, these case studies are conducted in order to gather descriptive information concerning how practices can be shared within a construction setting. Finally, our proposal to Skanska Sweden concerning how a best practice approach should be outlined, both in terms of organizational setup and an approach for operation, is aimed towards the eight regions of the Building Division.

Profitable growth 2011-15

In their overall business plan for 2011-2015, Skanska Sweden has outlined an objective to be the most profitable company within its industry as well as leaders within environmental construction and safety. Their vision is to become a role model within Swedish industries. To realize this objective, six focus areas are highlighted; people, safety, customers, green building, operational efficiency and OneSkanska. The subject of this master thesis, best practices, is emphasized under operational efficiency. Particularly, in 2015, Skanska Sweden has a goal to fully utilize common construction production activities, *best practices*, in all projects. This goal is also accentuated in the individual business plans for the eight Building regions. However, strategies for achieving this is rather fragmented as outspoken approaches differ between the eight building regions.

OneSkanska

Within the global corporate group of Skanska, a common intranet known as OneSkanska is utilized with the intention to facilitate Skanska's employees in their daily operations. As a means for communicating news, projects & procedures, strategies & policies but also to provide tools & services as well as organizational information, all Skanska officials have access to OneSkanska. Under the category projects & procedures, instructions how to conduct daily operations in terms of management related issues are presented in *Vårt Sätt att Arbeta* (VSAA). This operational manual is divided into two parts: first business plans presenting corporate objectives and strategies and secondly operational manuals intended to provide information of how to manage the construction process. In addition, there is also *Vårt Sätt att Bygga* (VSAB), which is intended to provide Skanska employees with information of well functioning technical construction solutions, e.g. detailed drawings, as well as procedures explaining the execution of construction production activities. In essence, the intention is that VSAA shall provide instructions of how to manage construction projects while VSAB seeks to explain how the construction production is carried out.

Production Support Department

Throughout the report, the involvement of the Production Support Department will be repetitively discussed. The role of this support function is to provide the Building- & Civil Divisions with tools and services which enables a decrease in production costs thus increasing productivity. To accomplish this, the department is composed of six development leaders as well as two individuals engaging in supporting construction production planning. In addition, the department is lead by one development manager.

One of the six development leaders is currently dedicating an almost full time job to the coordination of the best practice approach at the Civil Division. Hereby, this person is referred to as the project coordinator.

2 Theoretical framework

This literature section is primarily included to provide an overview of the main content found in literature, concerning the scientific field of best practices. To create a thorough understanding of the best practice area, this section sets out broadly explaining knowledge and knowledge management (KM) then proceeding with the implication of best practice diffusion.

2.1 Knowledge management

If organizations seek to effectively manage knowledge, Davenport and Prusak (1998) claim that there must be a shared implication of the terminology. Accordingly, the authors present three levels of knowledge. First, data is defined as discrete and objective facts about events without placing it in any context. Second, information is contextualized, categorized, calculated, corrected and condensed combinations of data embodied as a message between a sender and receiver. Finally, when combining the information with the experience and gut feeling of individuals, knowledge is created. To further clarify this distinction, van Beveren (2002, p.19) explains that: “knowledge cannot exist outside the human brain and that only information and data can exist outside of the brain”.

Continuing with the meaning of knowledge, the work of Nonaka and Takeuchi (1995) provides a distinction between tacit and explicit knowledge. While explicit knowledge is objective, rational and can easily be documented, tacit knowledge is subjective, experience-based and difficult to document. Moreover, Simard and Rice (2007) state that the greater the degree of tacit knowledge, the harder the knowledge is to share. For instance, explicit knowledge is effectively shared through documentation while tacit knowledge requires human interaction, thus making it more complicated (Reddy and McCarthy, 2006). Finally, Mohamed and Anumba (2006) argue that most construction knowledge is tacit wherefore appropriate KM mechanisms must be allocated.

Although there are various definitions of KM, the common denominator in most definitions contains the notions of creating, sharing and using knowledge. For instance, Davenport and Prusak (1998) state that KM is the process of capturing, distributing and effectively utilizing knowledge that already exists within the organization. While this constitutes the basis of the definition, scholars have their own additions and explanations. For instance, Scarbrough et al. (1999) add that the intention of KM is to enhance organizational learning and performance while Robinson et al. (2005) perceive the notion of KM as a vehicle for continuous improvements of organizational performance. In addition Mohamed and Anumba (2006) emphasize that within a construction context, KM mechanisms must address both management and craftsmen knowledge.

2.2 What is a best practice?

As one part of KM, the area of best practices concerns the sharing and usage of superior practices within an organization. American Productivity and Quality Center (1999) defines best practice as:

Those practices that have been shown to produce superior results; selected by a systematic process; and judged as exemplary, good, or successfully demonstrated.

Best practices are then adapted to fit a particular organization". O'Dell and Grayson (1998) discuss the meaning of "best" as the interpretation of best is strongly related to a specific situation and also a constantly moving target. Accordingly, they define best practice as "those practices that have produced outstanding results in another situation and that could be adapted for our situation" (O'Dell and Grayson, 1998, p.13).

In contrast to aforementioned best practice definitions, the international energy company Chevron defines best practice as "any practice, knowledge, know-how, or experience that has proven to be valuable or effective within one organization that may have applicability to other organizations" (O'Dell and Grayson, 1998, p.13). To support this definition, Chevron has set up four different labels of best practices. By dividing best practices into these four labels, no practice can immediately be awarded best practice.

- **Good idea:** Unproven idea that intuitively seems reasonable for improving organizational performance. If validated, this idea could be proposed for implementation at other locations.
- **Good practice:** A method or process that has been implemented and proved to improve organizational results. Validated by data gathered at the location and constitutes a candidate for companywide implementation.
- **Local best practice:** Practice that has been concluded as the most sufficient for all or most parts of the company. Validated through analysis of process performance data.
- **Industry best practice:** Practice that has been concluded as the most sufficient for all or most parts of the company. Validated through both internal and external benchmarking but also analysis of process performance data.

Jarrar and Zairi (2000) have developed a generic framework for successful development of best practices. By studying several successful best practice initiatives from various industries, this framework addresses the entire transfer process from the initial search for a best practice to the final routinization. Although the framework is rather theoretical and not very detailed, we believe that it provides an elementary view of the best practice transfer process.

- **Searching:** The purpose of this step is to find different practices available. To achieve this there is an abundance of sources to dig in to. These include literature, trade organizations, personal networks, site visits or research collaborations.

- **Evaluating:** This step is where the value of each practice is assessed in relation to its objective. Depending on what context, practices must be evaluated towards specific criteria.
- **Validating:** This step concerns a more in-depth evaluation of each practice in terms of expected benefits. However, the authors argue that some firms do not validate practices as this will be done later by the recipient.
- **Implementing:** To adopt and adapt best practices require effective management. The focus should mainly be on enabling attributes within the organization but also the transfer itself. This is most effectively done by managers highlighting a need for change as this call upon enhanced performance and communication.
- **Review:** This step seeks to decide upon whether implementation has resulted in improved performance or not.
- **Routinizing:** This final step has the intention to make the new practice a part of the culture. If this is achieved, the transfer is complete.

2.3 Benefits of best practice application

With the meaning of best practice clarified, this section aims at examining the intended outcomes of this management field. Szulanski (1996) explains that inter-organizational transfer of best practices has become one of the most critical issues of contemporary managers. If looking for sustaining their market position, Jarrar and Zairi (2000) argue that company leaders cannot afford to ignore the notion of best practice. In particular within construction, where increased competition triggers tight margins and project complexity is constantly increasing, competitiveness is directly related to the capability of creating and sharing knowledge within the organization (Loforte Ribeiro, 2009).

As one of the means towards improving organizational performance, adoption of best practices constitutes a profound potential (O'Dell and Grayson, 1998; Jarrar and Zairi, 2000; Reddy and McCarthy, 2006). By spreading superior practices throughout the organization, great gains could be achieved. According to Reddy and McCarthy (2006), the essence of creating and sharing best practices is to utilize already existing knowledge, learn from others and avoid waste. If adapting best practices, the organization could:

- Identify and replace poor performance
- Raise the performance of poor performers closer to that of the best
- Avoid reinventing the wheel
- Minimize re-work caused by use of poor methods
- Save costs through better productivity and efficiency (Reddy and McCarthy, 2006)

By utilizing methods or processes that from a holistic perspective are perceived as best practice, processes could be more value adding. Santos et al. (2002) argues that standardizing the best practice will reduce variability and also waste. In addition,

“whenever a process is subject to variability; the quality, delivery time and cost of that process will also vary” (Santos et al., 2002, p.25). Hence, standardizing the best practice will result in improved process predictability.

To emphasize the interrelation between standardization and best practices, Santos et al. (2002, p.27) explain standardization as “the development of pre-set procedures and referential material for performing a particular process or operation”. In addition, Imai (1997) argues that standards should represent the best, easiest and safest way to perform an activity where one of the greatest benefits is the organizational preservation of knowledge as knowledge stays within the company regardless of employee turnover.

Liker (2004, p.142) further discusses standardization as the foundation of continuous improvements and clearly emphasizes that unless a practice is standardized “any improvements will just be one more variation that is occasionally used and mostly ignored. One must standardize, and thus stabilize the process, before continuous improvements can be made”. Moreover, Liker (2004) argues the key to success lies in how standards are written as well as who develops them. Consequently, standards must be specific enough to provide useful information yet also leave space for individual adaption. Furthermore, very few appreciate being imposed to rules and procedures established by someone else. On the contrary, most people welcome hints and practices that are flexible enough to allow some personal customization. Hence, the people performing the work must improve the standards.

2.4 Difficulties of best practice diffusion

Although the idea behind sharing best practices constitutes a great potential for the organizational performance, it is not an easy task to conduct. O’Dell and Grayson (1998) argue that the identification and transferring of practices require more time and is far more complex than most people think. For example, Szulanski (1996) conducted a study together with member companies of International Benchmarking Clearinghouse where he found that it took, in average, 27 months for in-house best practices to be adopted within other parts of the same company. As an explanation to this, Szulanski (1996) argued that this long duration derives from three major reasons; ignorance, absorptive capacity and lack of relationship. First, ignorance meant that neither the recipient knew about what knowledge existed within the company nor did the potential sources of knowledge knew that someone was seeking his knowledge. Secondly, after becoming aware of existing knowledge, the second largest barrier was the absorptive capacity of the recipient; meaning that even though someone within an organization is aware of a better practice; he or she do not necessarily have the resources nor the practical skills required to implement it. Finally, also the relation between source and recipient is critical. Here, Szulanski (1996) mentioned the “not invented here” (NIH) syndrome which primarily concerns resistance of adapting practices which were founded within other parts of the organization.

Other scholars also point at the great difficulties best practice diffusion encloses; Simard and Rice (2007) claim that, in general, best practice initiatives are surrounded by “resistance, incomplete implementation and failure”. One issue mentioned by the authors is the difficulty of new practices to fit in the organization without affecting

too much of the culture and previous practices; the new practice must not be forced upon the employees but instead be embraced. Another concern presented by both O'Dell and Grayson (1998) and Simard and Rice (2007) is the over-reliance by companies on gathering knowledge in explicit form and publish these in a database, thus neglecting the ever so important tacit knowledge embedded in peoples' minds.

2.5 How do we know what practice is the best?

In order to harvest the fruits that a best practice initiative holds, despite the aforementioned complexities of the transfer process, companies must ensure that successful practices are found and effectively transferred throughout the organization. Accordingly, organizations must be able to decide upon what practices are successful enough to be labeled best practice. Depending on what context practices are intended for, there are aspects each practice must be measured against. There is little written about selecting and evaluating best practices, particularly within a construction context. Therefore we believe that the four overall objectives of on-site construction management could function as guidelines when developing new best practices. According to Nordström and Revai (2008) these are:

- Quality
- Health and safety
- Cost
- Time

Again, as there is little written about best practice evaluation we believe that the theory behind Lean production, the philosophy of the Toyota Production System, provides an applicable approach for assessing practices, especially from an efficiency point of view. By asking the question that pervades Lean production, "what does the customer want from this process" (Liker, 2004, p.27), the different parts of a process can be divided into three categories; value adding, necessary and non-value adding. First, the value adding activities are the only ones that add any value to the customer. Next, there are activities that have to be done in order to perform the value-adding activities. Finally, there are non-value adding activities, which are also known as waste. In other words, waste could be removed without affecting the creation of value (Liker, 2004). To improve efficiency, there are two possible approaches. The first approach is to focus on the already value adding work and to put efforts in making it even more efficient. As activities in some industries are often already pushed to their limit, such an effort holds a small potential of improvement. Controversially, the other approach is to focus on the removal of the non-value adding activities. This approach, which is the heart of Lean production, has the greatest potential as processes, in most cases, contain more waste than value adding work.

2.6 Create and improve best practices; teams and communities

Another issue of importance when initiating a best practice initiative is to decide upon what composition of individuals within the organization should have the authority to develop best practices. O'Dell and Grayson (1998) discuss the creation of best practice teams as one approach for best practice identification and transfer. These teams are ought to be multidivisional i.e. constituted of managers and professionals from different divisions. The teams' main task is to, on a regular basis, meet and discuss new potential best practices within each of the participants' fields as well as sharing issues and their own practices. Briefly, the authors divide the team's progress of developing best practices into four phases. As a start when investigating a practice it is necessary to:

1. Ensure that all members share an understanding of the practice and have a shared vocabulary.
2. Make sure that current practices are identified and benchmarked against each other to find one practice to consider the best.
3. Adapt the best practice to fit the organization.
4. Implement the new best practice.

When team members are assigned roles and responsibilities it is important that KM is not added as "another responsibility without increasing resources" (Robinson et al., 2005). Instead, sufficient time and monetary resources should be appointed the project and certain individuals should be assigned to the KM initiative. If team members' workload concerning KM is added on top of their normal job routines, Robinson et al. (2005) argue that the consequences might be severe and strong resistance may rise towards the KM initiative. McKenzie et al. (2001) also argue for the great importance of sufficient resources to be allocated to the initiative. On the contrary, Bishop et al. (2008) argue for new KM-related work tasks not to be too integrated into the employees daily tasks as this could pose a risk that time devoted to KM-work is taken from time that ought to be spent on the "real" work tasks.

Wenger (2004) describe another concept somewhat similar to the notion of best practice teams; communities of practice. These communities are not as formally managed as the best practice teams but instead their purpose is to bring professionals who have a passion for their specific fields together. These communities pose an opportunity to share experiences with other individuals in the organization who face similar issues and provide a useful forum to share and discuss experiences. Even though these communities do not work as controlled as the best practice teams, communities must be nurtured and supported by the organization; the communities are not unstructured sewing circles for discussions. Wolf et al. (2011) found in a study that the community leaders felt that the implementation of communities brought both advantages and drawbacks. One positive effect was that communities encouraged an open and constructive discussion on important issues among multiple divisions. Other findings were that via these discussions, new best practices were developed and decisions taken on what could pose as new best practices in the future. However, one of the negative effects was that the communities experienced lack of empowerment and guidance regarding the amount of authority they possessed.

2.7 Factors facilitating the best practice initiative

To increase the probability of a successful best practice initiative, it is of utmost importance to scan the organizational environment and the internal operations for factors facilitating the initiative. In this section we have summarized such factors that are re-occurring within literature.

Information technology (IT)

Loforte Ribeiro (2009) states that “IT acts as a supporting tool to provide a friendly environment for storing and transferring knowledge across project teams”, and furthermore, that knowledge repositories help knowledge sharing to become more effective. In three construction company cases, the IT systems used in these companies enabled the employees to share and receive experiences from other projects. Some IT-systems enabled a two-way communication channel both horizontally and vertically in the organization. Mohamed and Anumba (2006) argue that the main focus of KM is to codify information i.e. transferring explicit knowledge only through means of distribution such as IT solutions. In construction and particularly site management it is rather tacit knowledge which is used in order to manage everyday activities, but nevertheless explicit knowledge sharing is an important part where IT can work as a distributor.

Although IT-solutions are primary a mean for transferring explicit knowledge, it can still support the distribution of tacit knowledge by leading knowledge seeking individuals to the ones possessing certain knowledge. O’Dell and Grayson (1998) entitle such indicators of where to find knowledge within an organization as “pointers”. Davenport and Prusak (1998) refer to the concept of “knowledge maps” i.e. a guide accessible for everyone within the company advising whom to turn to for a particular field of knowledge. The map in itself is thus not a knowledge repository but rather an indication of where to find it. In addition, fragmented parts of these maps do already exist within the heads of employees but are not collectively compiled in one single location.

Jarrar and Zairi (2000) mention an adequate IT infrastructure as one of the critical success factors to succeeding with a best transfer initiative. However, one cannot rely on IT to achieve a working system (O’Dell and Grayson 1998). Technology is merely a part of the solution and the authors stress the danger of “placing technology ahead of the ability or the desire of people to use it” and that “IT makes connection possible, but does not make it happen”. When used correctly, IT makes knowledge easily searchable and available. However, there is a risk that an abundance of information is created which is impossible to make either use or sense of.

Managerial issues

Integration of a best practice initiative into everyday operations is what requires the most management attention and where most systems fail (Bishop et al., 2008). Apart from IT, another success factor to achieve a commitment for a KM initiative is claimed by the scholars to be top-level management support; a fact emphasized in

most literature regarding initiation and success of a KM project (O'Dell and Grayson, 1998; McKenzie et al., 2001; Simard and Rice, 2007; Sirkin et al., 2005; Nielsen and Michailova, 2007). Senior managers must strongly present a need for change, set an example of commitment and communicate the benefits to the employees in order to create staff buy-in of the oncoming initiative.

However, top management commitment for an initiative is not self-evident; it needs nurturing and creation of urgency just as for the employees. McKenzie et al. (2001) stress the importance of supplying senior management with business cases containing proof of knowledge management initiatives, which have provided organizations with positive results. They also argue that the strongest point for achieved commitment to KM initiatives is an understanding among employees for the value of the initiative. Stories and cases of successful KM initiatives of other corporations or divisions within the own company can work as efficient motivators (Bishop et al., 2008). The importance of early projects to produce convincing positive results is highly emphasized in literature. According to O'Dell and Grayson (1998), apart from not doing anything at all, failure to show quick results is the worst thing that could happen in the event of launching a best practice initiative. Robinson et al. (2005) claim that even though companies do perform demonstration projects, there often exist no system nor methods of monitoring, measuring or communicating the benefits why propagating a KM initiative via positive results cannot be done. McKenzie et al. (2001) also emphasize the effects of sharing success stories to build confidence among management and employees. Nevertheless, the authors also discuss presentation of failing initiatives as a means to bring learning from mistakes conducted in other companies or divisions.

Bishop et al. (2008) point at the importance of adapting a KM initiative to the company's culture and previous ways of doing things as well as fitting and aligning it with business objectives. Especially integration of strategic objectives into the KM initiative is important and Robinson et al. (2005) argue for the difficulty of pointing at benefits derived from a KM initiative to the senior management in cases where KM is not part of the company strategies and results cannot be connected to a certain strategic objective.

Once initiative commitment is established at top management, other issues follow to achieve acceptance and commitment amongst employees. Simard and Rice (2007) argue for the importance of *early adopters* and *opinion leaders*, i.e. individuals who quickly adopt and support the initiative as well as sharing their experiences and propagate the benefits to the large mass of end-users. Bishop et al. (2008), Jarrar and Zairi (2000) and O'Dell and Grayson (1998) describe the use of what is referred to as a KM champion which is a similar notion to early adopters and opinion leaders. The champion acts as a driving spirit, proclaiming the benefits of a best practice initiative, which support the initial stages and achieve commitment and buy-in among the end-users of the system. However, it is dangerous for best practices to become too closely related to a specific person (Bishop et al., 2008). Association of the initiative with a single individual is not desirable since it might cause employees to believe the initiative only functions in the organization where the champion has implemented the system and nowhere else. A fear may also arise that the champion is such an integral part of the initiative that if he or she would leave the company the system might fail. McKenzie et al. (2001) revealed that a number of companies studied put

“demonstrable leadership commitment” as low as the fifth most important factor for success and they too argued that a large focus on the initiative leaders may bring downsides; which downsides are not mentioned. Furthermore, McKenzie et al. (2001) argue for the importance of achieving committed middle managers as these people are often most affected by the change program and the potential of reaching the rest of the employees increases if middle managers have belief in the project.

Managing change

Even though change management is not the main topic of literature, features of change management clearly influence initialization of a best practice approach. One of these features is what Rogers (1962) refer to as understanding the needs of the five different user segments presented in Figure 2. In a diffusion process, individuals will react differently to a change in their environment and Rogers (1962) argue that it is possible to break up these individuals into five different segments, depending on their attitude toward change. First off are the *innovators* and *early adopters* who are the first to embrace and engage in the change. These individuals are proof to the rest of the organization that the imposed change is something positive and propagate it. The next segment is the *early majority* who will adopt the new change as “they are looking for simple, proven, better ways of doing what they already do” (Rogers, 1962). Equally large is the *late majority* who feel uncomfortable with the new change. It is a group of people who are influenced by the last segment, *laggards*, which predominantly see large risks with the new change and stand highly negative toward it.

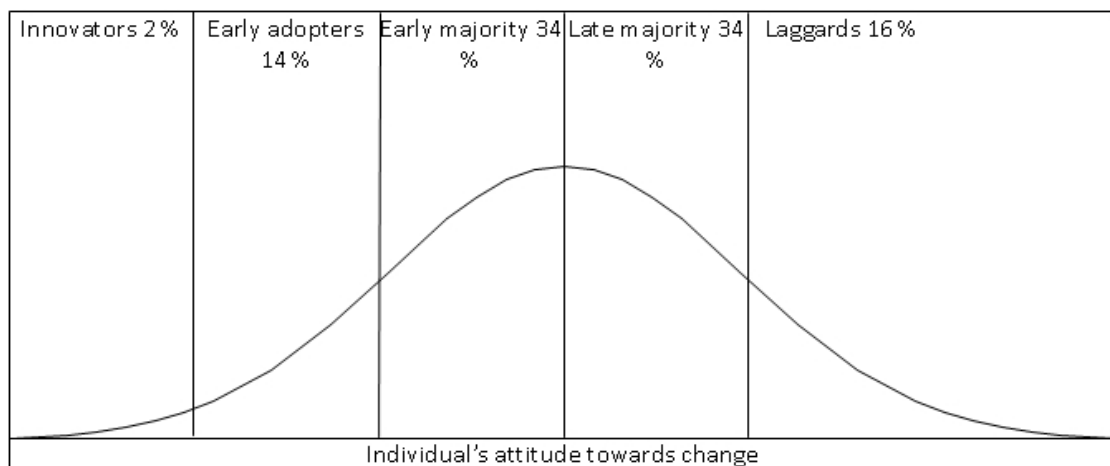


Figure 2 Individuals attitude towards change (Rogers, 1962)

Sirkin et al. (2005) present a theory concluding important transition success factors, which are different from what is normally presented by other researchers in the change management field. Sirkin et al. (2005) argue that the typical emphasis in such project is “soft” factors such as leadership and culture. These are, by no means, argued to be non-important but companies need to address the “hard” factors as well, otherwise the KM initiative is likely to fail. Derived from a study of 225 companies, four hard factors were identified which determined success or failure. These were named the DICE factors, presented below:

Duration: Many companies believe that the longer the duration of an initiative, the more likely it is to fail; a statement not supported by Serkin et al. (2005). It is claimed that the duration factor, which concerns not the total change project duration but rather the duration between reviews i.e. continuous follow-up, is of greater importance. Reviews should examine if the project is on schedule according to preset milestones. A suitable time between reviews is 2 weeks for a complex project whereas more “hands-on” initiatives should be reviewed every sixth week, thus not exceeding two months.

Integrity: this factor constitutes how well teams involved in the change initiative perform in the progress. The teams should be carefully assigned considering the participants’ abilities and knowledge. The authors mention that a competent team leader with good technical expertise is not certain to be a suitable leader in a change process. The team should be given clear instructions on their responsibilities and objective as well as ensure that sufficient time is allocated for the project, i.e. a certain number of days or hours to devote.

Commitment: commitment should be pointed towards two main parts of the company; senior management and end-users. As an abundance of authors argue, top management commitment is a key to success. However, a change process might entail negative aspects as well, such as layoffs and thus giving top management a hard time to fully proclaim the superior advantages of the project. Underestimating the manager’s role is a reoccurring mistake in change initiatives where managers are involved late and provided with an inconsistent message regarding their role and the main objective of the change project.

Effort: a huge issue in most organizations is the lack of time for even performing one’s everyday activities. A change project often puts extra workload on top of the normal amount of work, thus causing the affected employees to reject participation. Careful examination must be done by the initiative leaders to find a suitable amount of time required by the participants, however no more than 10% of their time available. It is important that everyday operations are not negatively affected by the extra burden. One way to cope with this issue is to relieve the employees of time-consuming trivial activities and instead reallocate these tasks to other people in the company, possibly retired managers or temporary workers.

Managing and studying these factors carefully will, according to the authors, point at the outcome of the change program. In fact it is stated that out of 1,000 change projects studied, DICE factors managed to predict the outcome better than no other method. The four factors described above constitute a framework for assessing project outcome. The factors are ranged 1-4 depending on their current status in the project, where lower is better. The numbers are multiplied and a total score is achieved dividing the project into a) probable success b) project with uncertain positive outcome or c) a project, which is likely to fail (Sirkin et al., 2005). This evaluation model will not be applied as an analysis tool in this master thesis, but is instead incorporated to emphasize what Sirkin et al. (2005) consider most important in a change process.

Empowerment

Empowerment is essential for corporations who want to become a learning organization, bringing improvements such as reduced cost and improved quality (Holt et al., 2000). According to various sources of literature, there is one definition of empowerment, which seems to be collectively accepted among academia:

The process of giving employees the authority to take decisions, relating to their work processes and functions, and within the limits provided by management, but requiring them to assume full responsibility and risk for their actions.

(Conger and Kanungo, 1988)

Nesan (2004) claims that employees must be given freedom and not be hindered by managerial permission seeking and obstacles in order to take decisions or else a company can never act in achieving a learning spirit. Nesan (2004) found in case studies that companies, which had developed an empowering organization, reported improved strategic and organizational performance such as increased turnover, increased quality, increased productivity and reduced construction time. Nesan (2004) however states that these improvements are not solely results derived from the empowerment initiative but that these occurred after such an initiative had taken place. As in any such change project, Holt et al. (2000) argue that the most critical period is the initiating process of an empowerment initiative; miscalculating the extent of change, too much bureaucracy and ineffective communication are some of the barriers.

Rewards – what motivate individuals?

As argued by several scholars, a reward system is a key aspect for ensuring a successful knowledge management initiative (Bishop et. al., 2008; Loforte Ribeiro, 2009; O'Dell and Grayson, 1998). However, Kerr (1995) explains that it is not uncommon that the overall goal of the organization differs from that of the individual. Consequently, the organization must ensure that the reward system aligns the behavior of the individual with the goal of the organization. Unless this is achieved, the performance of the organization will suffer. In addition, Stone and Eddy (1996) highlight the importance of employee input when matching individual and organizational goals in the reward system.

Rewards could be either intrinsic and/or extrinsic with the difference that intrinsic rewards come from within the individual while extrinsic from the outside. Herzberg (1987) gives examples of achievement, recognition and responsibility as intrinsic rewards and salary, status and personal relationships as extrinsic. Bishop et al. (2008) stress the importance of finding a balance between intrinsic and extrinsic rewards. Moreover, O'Dell and Grayson (1998) highlight intrinsic rewards as the key to success when initiating a best practice initiative and argue that unless the process of using or sharing best practices are not self rewarding, artificial rewards will not have any effect. Furthermore, if a certain practice makes the everyday life easier, people will participate.

In particular monetary extrinsic rewards are viewed as negative in a best practice perspective. For instance, monetary rewards could pose a risk of taking the best practice out of its context. When money becomes the largest driver instead of willingness to contribute to organizational knowledge, by sharing and using best practices, performance might be decreased. If incorporating monetary rewards, the organization must particularly find a balance between the shared knowledge and the quality of its contribution (Hackman and Wageman, 1995). Yet, in the long run, employees have to find the process of sharing and using best practices rewarding in itself (Simard and Rice, 2007).

Thompson (1998) claims that individual rewards are not enough, but also the efforts of the team need to be rewarded. To balance this equation, the focus should be on three levels: specific job performance, productivity of the team and individual contribution to the team. McKenzie et al. (2001) mention one team incentive to be publicly recognizing teams who successfully have been using best practices in the company. Simard and Rice (2007), specifically, point towards the importance of rewarding sharing of best practices as this in itself may not be as self-rewarding as the use of it. Hence, sharing must be inherently supported within the organizational culture. In this matter recognition from peers and improved organizational performance can stimulate the contributing individual.

Despite the question of what rewards to use, the fact that there exist rewards at all will increase the likelihood of a successful best practice initiative (Bishop et. al., 2008).

Organizational setup

When initiating an organizational best practice program, the environment of the organization could either work as a facilitator or a barrier. Loforte Ribeiro (2009) states that: “knowledge management requires an environment that allows workers to create, capture, share and leverage knowledge to improve performance”. In a study intending to find a connection between organizational setups and knowledge management (KM) performance, Nielsen and Michailova (2007) present four different knowledge management systems (KMS), see Figure 3. As KMSs are approaching the capability-based KMS, the more sophisticated is each KMS. Also, the likelihood of reaping the full potential of KM is increased as KMSs are approaching the higher levels. Nevertheless, Nielsen and Michailova (2007) argue that the transition from one KMS to another is very much related to the competitiveness and speed of innovation within each industry. If operating in a fast changing environment, closing in on the top levels of KMSs is very much a matter of corporate survival. On the other hand, if operating in a stable and predictable environment where competitiveness is not a matter of innovation but rather efficiency, firms can stay at lower levels but still maintain competitive.

In the fragmented KMS there is a shared view of knowledge as an object, i.e. something that can be stored within the organization. Explicit knowledge is dominant and there are no assigned KM roles. Efforts to store knowledge are unstructured and the knowledge flows are spontaneous, both vertical and horizontal within the organization. There is neither a reward system supporting KM activities nor any KM training conducted.

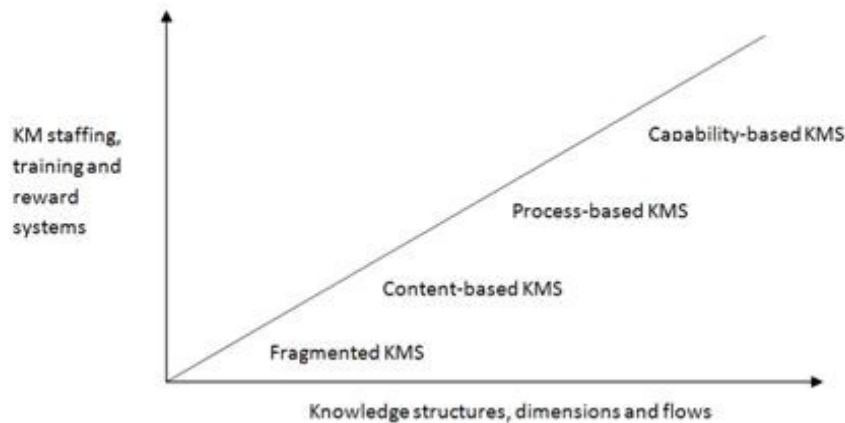


Figure 3 Increasing KMS sophistication.

Within the content-based KMS knowledge is still viewed as an object while the efforts to store and codify knowledge are structured. The knowledge flow is only top-down. There are specific KM positions within the organization and managers on middle level engage in KM systems. KM-training is initiated and reward systems are emerging as managers are becoming aware of its importance.

In opposite to aforementioned KMSs the process-based KMS views knowledge as a process. This means that knowledge is a process of applying expertise when acting. Moreover, the organization is systematically engaging in identification, sharing and usage of existing knowledge. Significant for this KMS is also the existence of direct horizontal knowledge flows and the committed involvement of top management. Also KM training programs are incorporated for both managers and employees and reward systems that promote sharing of knowledge.

At the top of the staircase is the capability-based KMS with the unique distinction of interpreting knowledge as a capability. In short, this covers both tacit and explicit knowledge and the capability is used for proactively influencing future actions. KM efforts are systematic and concern creation, sharing and utilization of new knowledge. Distinct from other KMS, there are direct and systematic flows of knowledge not only within the organization, but also externally. Also, reward systems seeking to promote learning are incorporated. Finally, training programs are designed by employee involvement.

Simard and Rice (2007) discuss the matter of institutional distance when sharing best practices. As the “best” practice is often contextual, factors such as organizational strategies, objectives and culture determine best practice adoption. The longer the institutional distance, less likely is the anticipated transfer success. In addition, to make knowledge valuable to the organization, Davenport and Prusak (1998) argues that it must remain accessible. For organizations to effectively manage collective knowledge, the size of the organization cannot exceed 300 individuals. This reasoning is aligned with the findings of Epple et al. (1996) who stress the importance of geography as knowledge is transferred more rapidly and easily between geographically close units.

2.8 Literature conclusion

Mainly, the source of reviewed literature has been scientific management journals with a focus on knowledge management and best practice diffusion. We soon realized that most literature concerned the effects deriving from applying best practices and other success factors facilitating best practice diffusion. However, there was little written about how best practices are identified, created, spread and continuously improved.

In conclusion, we consider the examined best practice literature to be of a, predominately, general nature digging very briefly into the different aspects of a best practice diffusion. Hence, we interpret this lack of substantial real life examples as a flaw in current literature. With this in mind, we believe that our study can provide tangible examples to the management field of best practices. Our main contribution to the field will concern how a best practice approach can be outlined and operated within a construction-context.

3 Method

When conducting our literature review we explored some areas which had little coverage and where data was of a general non-depth character. Hence, with lack of substantial data and the fact that our main purpose was to design a suitable best practice approach, the choice of methodology fell on conducting descriptive multi-case studies (Yin, 2003). This type of case study was chosen as we wished to:

1. Investigate and describe the approaches of two divisions.
2. Conduct a comparison between the two.

A qualitative research was chosen since it provides the ability to study people's perceptions and experiences of a given research issue. It gives the "human" side to an issue and helps understand complex real-life situations (Mack et al., 2005). As for the interviews themselves, semi-structured interviews were conducted. This is the most used approach of data-collection in a qualitative study and is a "particularly useful research tool in situations where little is known about the topic of interest" (Adams, 2010); i.e. a tool suitable for the topic of this master thesis.

Case studies

Two divisions within Skanska Sweden, the Civil Division and the Building Division Western Region have initiated two separate KM initiatives with the aim to make use of the employees' knowledge. As our purpose was to develop an approach for the entire Building Division, we decided upon investigating these two cases in order to draw experiences and get insight into the processes and structures embedded in the approaches. However, due to their different approaches to KM, the intention from the start was to focus upon the Civil Division as the main case and use the Building Division Western Region case as a complementary case. To perform our case studies, in what we considered the best way, we decided to start the interviews at the bottom of the organization to grasp the two initiatives from the user perspective. Later on, individuals on a management level were interviewed in order to explore the initial phases of each initiative, map the organizational structure and internal processes as well as the reasoning behind.

The first case study concerned a national covering best practice initiative of the Civil Division of Skanska Sweden. This initiative was initiated three years ago and relied on a rather high level of sophistication, both in terms of organizational setup and the approach for best practice diffusion. Within the Civil Division, 25 individuals were participating in the best practice teams as well as there was one person working nearly full time managing and coordinating the approach; the project coordinator. Their best practice database contained, at the time of our study, 29 best practices and it should be noted that this is a constantly growing number.

Our second case concerned a less structured knowledge management approach at Building Division Western Region, commenced four years ago, where an online idea center was used for internal sharing of construction practices. The Building Division Western Region has chosen another approach for sharing practices than the Civil Division and it is not possible to determine how many individuals are participating in

the initiative as all employees are meant to participate. Their approach is more open and less structured than the Civil Division and there is no emphasis on sharing best practices but rather good ideas and good practices. However, as the idea center contained over 400 good ideas, tips, practices and guides at the time of the study, this fact gives a hint that many employees are contributing to the idea center.

Additional feedback sessions

In order to properly address our main purpose; to develop a suitable best practice approach for the Building Division, we also utilized the experience of four individuals who were engaged in a previous development project where a number of best practices were produced. This project was conducted one and a half year ago, within the Building Division, where the main purpose was to develop educational material to raise the awareness among production personnel on air tightness and moisture safety in buildings. Six best practices related to air tightness and moisture safety were developed as part of the education program; thus, even though the purpose was not to find a suitable best practice approach, experiences were gained among the involved. We conducted interviews as well as one session with these individuals to present our findings and proposals to obtain their feedback and opinions. As a second source of input and feedback we presented our proposed best practice approach for two development groups at the Building Division, Gothenburg Region. One group constituted of site management whereas the members of the other group were craftsmen. These two occasions let us discuss our thoughts on best practices where we also received useful feedback and comments.

Qualitative interviews

Depending on the profession or function of each interviewee approached in the case studies, specific questions were posed in order to focus each interview occasion to the background of each interviewee. The interviewees were selected key personnel who had great insight in the knowledge management initiatives. The number of interviews at the Building Division, Western Region was small in relation to that of the Civil Division, mainly due to the fact that we wished to utilize this case as a complementary one instead of an equally large comparison case.

As for the two case studies, the following six themes made up the basis for our interviews; themes which we argue to cover most aspects of the KM initiatives.

- **Broad issues related to the initiative:**
This topic investigated various areas such as a general description of the initiatives, the interviewees' roles in the initiative, their general opinion of the initiatives as well as perceived benefits and challenges.
- **Management-related issues:**
Intended for the development staff, this topic aimed at obtaining how the interviewees viewed commitment, level of initiative ambition, reasoning why the initiatives are designed the way they are as well as a description of the various processes taking place in the best practice development. The aim was

also to map the process of best practice development as well as track the initial stages of the initiative.

- **Production-related:**
The focus of this topic was to understand how good ideas and best practices were applied at the construction sites, what encourages site personnel to share and utilize knowledge as well as how top-management promote KM initiative involvement of the end-users.
- **Best practice teams:**
Main concerns of this theme were to map the organizational structure of the best practice teams, their responsibilities and tasks and how the members interacted. Focus was also on creation and the process of continuous improvements.
- **Success factors and barriers:**
All interviewees were asked on what they perceived as the main success factors and possible barriers to the initiatives.
- **Distribution methods/knowledge databases**
The last topic concerned how the interviewees perceived the functions of the databases and if these managed to communicate information well enough. Further concerns were the format of the material as well as what future functions that could be implemented into the database interfaces.

The interviewees were not questioned on all the above topics; instead, the themes were chosen for each function to best fit their professions and involvement in the initiative. Presented below is Table 1 showing what themes that were directed to what function:

Table 1 The themes for the interviewees.

Themes Function	Broad issues	Management-related	Production-related	Best practice teams	Success factors and barriers:	Distribution
Production personnel/best practice team members	X		X	X	X	X
Management-staff	X	X		X	X	X

The following Table 2 shows the number of individuals interviewed within each profession or function within the two cases. Our feedback sessions with participants of the educational development project described earlier are also presented in the table under *Education project*. We conducted eight interviews at the Civil Division, four at the Building Construction Division, Western Region and four less structured interviews with the participants of the education project.

Table 2 Overview of the number of interviewees within each case and each profession.

Civil Division		Building Construction Division		Pilot project	
#	Function	#	Function	#	Function
3	Production support	2	Site manager	1	Production support
2	Site manager	1	Regional manager	1	Project manager
2	Site supervisor	1	Union representative	1	Site manager
1	Site engineer			1	Technology and design

The interviews lasted between one and two hours and were recorded to facilitate the dialogue and ability to add attendant questions. Later, recordings were transcribed, however not word by word, to answer the questions incorporated in the themes. Recording the interviews might have affected the respondents' answers but we did not consider this a problem as the focus of the interviews was not on personal reflections but rather facts and structure, i.e. issues not depending on personal comments.

Presenting and discussing the findings

Our findings, and what we have interpreted as important issues, are presented in the findings section where the opinions and statements presented are derived directly from the interviews. We present each of the two cases individually and, where possible, present features which can be found in both cases; e.g. the early phases of each initiative. In order to clearly guide the reader, the *Findings* chapter is divided into sub-sections. In the *Discussion* section, we analyze our findings by pointing at the differences and/or connections that the findings have with literature. To furthermore create a lively discussion, we incorporate our own interpretations and opinions in combination with the case study findings and literature.

Our proposition to Skanska Sweden

At the point where the case studies were conducted and analyzed, our study had resulted in providing us with an understanding of the different attributes that characterizes a successful best practice approach. As the literature review covered the field of best practice diffusion to a small extent, it was clear that our proposition of a suitable best practice approach for the Building Division of Skanska Sweden was to be based mostly on our case study findings and our own opinions. However, even though literature did not give much detail on issues such as organizational functional design or best practice processes, literature provided us with the important features that surround and support a best practice initiative. Our final proposition of a best practice approach is thus based on; literature, case study findings, knowledge about

the organization of Skanska Sweden, input from the two development groups of the Skanska Gothenburg Region as well as our own opinions and interpretations.

4 Findings

4.1 Case study Civil Division

The following chapter presents the best practice initiative conducted by the Civil Division of Skanska Sweden AB. The chapter contains an explanation on how the initiative was initiated as well as how it is utilized and how improvements are maintained. In addition, the chapter also highlights the success factors, challenges and future areas of improvement, which the interviewees argue to be important.

4.1.1 The purpose of the best practice initiative

The Civil Division of Skanska Sweden AB has introduced a national best practice initiative. As a means towards raised productivity, the potential of internal best practice diffusion was realized when the production support department found severe fluctuations in performance between civil projects. While some projects executed parts of the production very efficiently, others were performing the same activities with less efficiency. By spreading best practices, the low performing departments would be able to get closer to the best performing units. However, there were no mechanisms for diffusing best practices. Also, although there were manuals explaining how to manage civil projects, there was no documentation explicating how to perform the actual construction works. Consequently, individual employees within different projects and departments were very much used to apply their own methods when conducting a production activity. With these circumstances in mind, the civil division decided to commence a best practice initiative in order to increase the uniformity of their projects by creating documentation explaining how to, in the most efficient manner, conduct the production activities and by wide application of these, raise the productivity of the division.

4.1.2 What is a best practice and how is it presented?

Most of our interviewees shared a common view of the meaning of a best practice, an implication very much aligned with the best practice definition of Skanska; “currently, the best known way of conducting a specific construction production activity”. The concepts of continuous improvements, quality and cost-effectiveness are what pervaded most of the interviewees’ best practice definitions. One of the interviewees stated “a best practice is the best possible way we know today regarding how to perform an activity, with the addition that today means that it shall be continuously improved” while another claimed that “it does not necessarily need to be perfect right from the start, but it is best from what we know today”. In contrast to aforementioned reasoning, one interviewee claimed that a best practice is something that you document with the implication that you do not necessarily have to remember how you performed a particular activity but also with the advantage that you will not be forced to start from scratch the next time. “It is a tool that not necessarily will give all the answers but it will trigger thoughts and ideas”. Today best practices are diffused via the Skanska intranet and they are available for all employees. In Figure 4

an example of a best practice published at OneSkanska is presented. The best practices predominantly enclose three different parts for information distribution;

- A movie showing what is done within each step of the activity.
- A work method statement explaining each step of the activity in greater detail but also highlighting prerequisites, risks and countermeasures. In addition it also states what resources are required in terms of labor, machinery and materials.
- An introduction containing capacity (e.g. m³/h), prerequisites, a short list of tips to remember and finally pros and cons.

The screenshot shows a web page from Skanska Sverige. The main content area is titled 'CCB.31 - Träpålning'. It includes a video player with a play button. Below the video, there are several sections of text: 'Kapacitet:' followed by a redacted area, 'Förutsättning:' describing the shaft requirements, 'Tips & Trix:' providing advice on using excavators and stoplogs, 'Fördelar:' listing the benefits of a shallower shaft, and 'Nackdelar:' listing the disadvantages of manual excavation. The left sidebar contains a navigation menu with various project categories.

Figure 4 A best practice of the Civil Division published at the Skanska intranet.

4.1.3 The early stages of the initiative

As the potential of the best practice initiative was first realized at the production support department, emphasis of the production support department was initially to create commitment to the initiative and a sense of urgency among top management within the Civil Division. To achieve this, top management was gathered at a convention where movies of two different methods for the same production activity were shown. While one movie showed top performance the other one showed a less efficient method. In conclusion the high performing activity was three times as quick and executed at half the cost. As this particular activity was reoccurring in all infrastructure projects and in great volumes, this triggered discussions among the participating managers – what if this is possible for other activities too? During this

session, commitment was achieved and a demand was established among the majority of top management, which later agreed upon proceeding with the initiative.

The next step was to decide upon for what activities best practices should be developed. With no specific parameters given, district managers from Infrastructure districts throughout Sweden decided upon ten activities to focus on. As district managers sought financial payoff, activities of great volumes were selected. Besides these, the project coordinator also decided upon some less complicated construction activities in order to introduce the method for developing best practices. In particular, the focus was upon agreeing upon one practice rather than finding the “best” practice. To develop the first ten best practices, a national covering group of experienced site managers from different civil regions were selected with the guideline that each participant ought to respond for at least one best practice. The site manager responsible for each best practice was titled “process owner”. In addition to developing best practices, this also contributed to the establishment of an important network of site managers from Skanska Civil. Even though there were no best practices available for particular production activities, the network enabled communication and exchange of experiences between people that earlier were not aware of each other and what expertise there existed in the organization.

As the first ten best practices were launched at the intranet, the best practice volume was steadily growing. As volume grew, so did the number of process owners, which in turn would constitute the best practice teams processing authority of deciding upon new best practices. At this time, the selection of what activities to develop best practices for was made out of the activities and components included in road construction.

In these early stages of the initiative, the format of the best practices was not as broad as it is today. Instead, the format of the best practices was initially rather simple but grew steadily as additional documentation was requested by the civil projects. As one of the cornerstones of the initiative was to take small steps, this rather simple best practice format was not a coincidence. By letting the civil projects govern the format of the best practices, no additional and unnecessary documentation was imposed.

4.1.4 Organizational structure and functions of the best practice initiative

As the best practice initiative has a national coverage a clear structure of functions is required to keep things together despite long geographical and organizational distances. Basically, the organizational structure is constituted of three functions; the project coordinator from the production support department, the best practice teams and the civil projects where production personnel function as users of the best practices. Each function has its own responsibilities and purpose. A visualization of the best practice initiative organizational structure is presented in Figure 5 and a description of the tasks and purpose of the inbound functions follows.

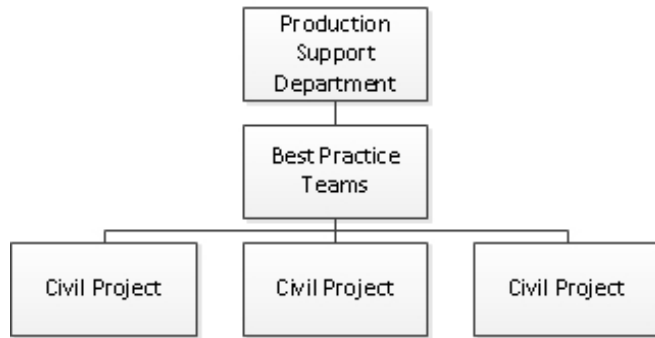


Figure 5 Organizational structure of the best practice initiative.

The production support department

The production support department is the function that, at the beginning, had the overall responsibility for initiating and designing the outline of the initiative. Today, its' main tasks are managing and developing the best practice initiative, thus making sure that best practices are continuously improved and new best practices are added as well as to spread the best practices to the large crowd of personnel who have not yet embraced the idea of best practices. One person employed at the production support department acts as a coordinator and devotes most of his working time to the initiative. Whereas the department itself manages issues on a more strategic level, the coordinator focuses on the practical tasks related to keeping the best practice teams together and supporting their work. Supporting the members of the best practice teams in the development of best practices is an integral part of the coordinator's work. Site management is often under pressure; time is limited and shared among a widespread of activities. In these occasions the coordinator supports the projects with documentation of the work process. The coordinator also acts as the driving spirit of the initiative. With the risk of site personnel losing focus of best practices due to the vast amount of other tasks related to their main activity; production, the coordinator must constantly push and encourage its team members to continue developing best practices. One part of this constitutes managing communication between the best practice teams to make sure that relevant information such as best practice updates and drafts are communicated throughout the teams. The coordinator also organizes the best practice team meetings i.e. plan, conduct and follow up on meeting decisions.

As one of the best practice cornerstones is the video, naturally this requires video documentation. This documentation task is time consuming, as it not only contains the filming itself; editing the video and adding information to it requires time as well. The interviewees mention that, naturally, the best option is if personnel on site is able to record the process, as they possess the greatest knowledge on critical parts and what should be highlighted in the video. However, if site personnel cannot find the time to do so, the coordinator supports in this activity. Some of the interviewees argue that without the coordinating function, which acts as glue, keeping the entire best practice initiative together, the initiative would not have reached as far as it has today.

The best practice teams

Even though the coordinator is an integral part, the basis of the initiative is the best practice teams. These groups form the part of the initiative from where knowledge and experience derive and who produce the best practices. The interviewees gave a unified picture of what the purpose of the work undertaken in these groups is; to find and develop new best practices as well as continuously improving existing best practices. Furthermore, it was explained that the teams are fully empowered regarding deciding what work methods should constitute a best practice, what it ought to contain as well as, in cooperation with the project coordinator, deciding on what new best practices that are desirable to develop.

The groups are constituted of experienced and competent site personnel, site supervisors and site managers, thus not containing any other professions. One interviewee stated a reason for why this is the case; best practice is a tool for enhancing productivity only and production personnel is thus sufficient for ensuring that the best practice is the most productive method. The interviewee furthermore mentioned that there exist better tools to improve other aspects such as environment and safety. As for team disposition, it is the responsibility of the region to choose suitable team participants based on their knowledge, personal attributes and willingness to participate. The current team members have been handpicked based on the attributes mentioned above and assigned to the initiative by their respective regional management and it is thus not entirely voluntarily to engage in the best practice initiative. Nevertheless, some interviewees state that the honor of being hand-picked is often sufficient for participation as it is the most skilled personnel who develop best practices and being picked as one of these creates dedication in itself. No craftsmen are members of the best practice teams. Nevertheless, their valuable experience and know-how of actually performing a construction activity is incorporated in the best practices, not by a team membership but by their participation in the planning phase and development of the work method statement.

Today, 25 persons are what constitute the teams; five to seven persons in each. These teams have a national coverage, i.e. members originate from all geographically spread regions within the Civil Division and the aim is that each group should contain at least one person from each of the five geographical regions. Some interviewees claim that such a diversified group is preferred over a group constituted by regional members only since there are many differences considering construction prerequisites, culture and climate-related issues between the different geographical regions. When producing a best practice, it is important to consider the effects of these different aspects as they will affect the work process. A best practice only considering the specific climate conditions of a specific region is not usable throughout the country. Furthermore, some interviewees say that the likeliness is higher that procedures for the same construction activity differ between regions than for activities conducted within a single region. One interviewee mentions another issue regarding keeping best practice teams on a regional level; there are a smaller number of people available for selection to best practice teams, thus not utilizing the vast amount of knowledge spread around the organization.

Almost each and every one of the team members are process owners of one or several best practices; i.e. these people are responsible for a specific best practice in regards to producing it as well as continuously improving it. However, these process owners

are not the sole source of all the knowledge embedded in a best practice. The process owner's task is rather to produce a draft version of a best practice for a specific construction activity and then utilize the other members' knowledge in refining the draft version to make sure it actually contains all inputs and knowledge existing in the best practice teams. Some interviewees argue that one member producing a draft version is a great way since it provides an amount of material to discuss and develop. Starting from zero is more difficult.

Apart from continuous mail and telephone correspondence, the teams engage in meetings four or five times a year, lasting half a day to two days each. At these gatherings, either the teams meet separately or all teams meet together. The discussions of the meetings primarily revolve around three topics:

- 1) Existing best practices: Are they used in any project? Are there any potential improvements, either suggested by the team members or suggestions that have been sent from people using the best practice? Each process owner discusses his or hers best practice(s).
- 2) New best practices under development: What is the status update of the best practices that are under development, i.e. not yet published on the intranet?
- 3) Forthcoming best practices: Are we aware of any work process that we should produce a best practice for? The process of finding areas for new best practices is described in section 4.1.5.

An issue discussed by many of the interviewees is the fact that meetings of this sort both cost a lot of money in terms of travels and accommodations as well as time spent on the initiative and thereby time not spent on the members' main activity; production. To cope with this issue, the production support has recently begun a test conducting these meetings using online video techniques and telephone. If these meetings turn out to be sufficiently efficient as opposed to physical ones, a portion of the meetings will be conducted using IT instead. However, the interviewees emphasized the importance of conducting physical meetings as a means to "know the person behind the picture" and that it was easier to contact someone in the best practice teams if they had previously met in person.

The production personnel i.e. best practice end-users

The last function in the three-way interaction of the initiative are the end-users i.e. craftsmen, site supervisor and site managers which are not members of the best practice teams. These are the people who eventually will perform the construction activities on site according to what is considered the best practice within the company. In addition, production personnel also have an important responsibility of reporting suggestions for improvements; prerequisite for continuous improvements. The usage of best practices in day-to-day construction operation will be further described in section 4.1.7.

4.1.5 Best practice initiative – how are best practices developed?

Skanska Civil Division has developed a well-structured approach regarding how to identify, create, distribute, apply and improve best practices. The sections above have explained the structure of the initiative, functions which are involved and in what way they contribute in developing best practices. The following sections will in greater detail explain how the process works and which steps it contains, ranging from the selection of a construction production activity a best practice should be developed for to its' final publication on the intranet.

Decision factors for evaluating best practices

It is no easy task to define activities for which a best practice should be developed. Some of the interviewees claim that it is not a reasonable target to develop best practices for all construction activities as this would most likely cost more than it would generate. Many activities constitute either a small part of the production budget or are seldom performed. It is therefore an intention to find the activities, which are money and time consuming and is carried out in as many of the larger Civil projects undertaken each year as possible.

There is a clear view among the interviewees what the main decision factor is for, among different activities, determining the best practice. The main decision factor, is capacity; if a construction activity can be performed with increased capacity, e.g. m³/hour, opposed to previous ways of conducting the activity it should be chosen as best practice. However, as a second decision factor, the proposed best practice should also be cost effective meaning that the activity imposing the lowest total cost should be elected as best practice. Nevertheless, there are several other criteria a best practice must meet; criteria which are not acting as a basis for choosing a best practice but rather functions as a threshold, which the best practice must reach or else it cannot be considered best practice. These criteria are environment, quality and work environment; a best practice must not contain elements which in any way conflict with, or do not fulfil requirements set either by Swedish laws or Skanska's corporate regulations.

Today, it is the project coordinator together with the best practice teams, who identify the construction processes for which best practices are desired. The current approach is that a database has been compiled which contains production budgets from projects conducted during the last five years. Each entry in the database contains an accumulated sum of money for each construction production activity conducted during these projects, e.g. gravel fills, surfaces, asphalt, piling etc. These activities are sorted by the amount of money they constitute of the entire production budget where the entries, i.e. construction activities, which correspond to the largest parts of the production budget are decided as the ones for which a best practice is needed. The coordinator in the production support department states that 20-25% of the activities correspond to 75% of the budget.

The process of developing a new best practice

Derived from the interviews we have identified the process of developing a new best practice, which contains nine stages; a process, which is described in both text and a process diagram (See Figure 6 succeeding the list).

Stage 1 The process of developing a best practice starts with an identification of a construction production activity in need of a best practices. This identification is either done by the project coordinator or by the members of the best practice teams. In general, these activities are identified using the accumulated production budgets described in the section above.

Stage 2 This stage concerns allocating the responsibility of creating the best practice draft to a process owner. If a given construction activity is to be performed in a team member's project, or carried out in a project not belonging to a team member for that matter, an assignment is issued that the project in question should document and create a draft for best practice for the specific activity.

Stage 3 The site supervisor or site manager given the responsibility to develop a best practice draft generates two documents based on a template; a work method statement and an introduction statement (see section 4.1.2). These documents are created during the planning phase of the activity where the activity is not only described in detail but also contains relevant experience regarding methods, pros and cons, capacity and prerequisites. The work method statement is designed in such a way that it serves as a "manuscript" for the video documentation.

Stage 4 The two documents are transferred to the coordinator via e-mail, which in turn submits these documents for comments to the rest of that particular best practice team. The other members study these documents critically and suggest alterations or additions based on their experience.

Stage 5 All opinions are then transferred back to the original author who, sometimes supported by the coordinator, modifies the two documents using the new input given.

Stage 6 The updated documents are submitted for examination to the work environment support function, which verifies that the proposed work methods are aligned with corporate (and national) safety regulations. If corrections are necessary these are transferred back to the coordinator to update the documents once again.

Stage 7 The documents, now considered to contain the best-known way to perform the construction activity make up the basis for video documentation. It is either site personnel who carry out the video documentation or, in the case of heavy work load, the coordinator travel to site to assist with this time consuming task. The same goes for video editing; it is either performed by site personnel or the coordinator.

Stage 8 The edited video is submitted to the work environment support function that once again verifies the correctitude of the performed activity according to safety regulations. If corrections are needed, these are performed by the coordinator.

Stage 9 The video, the introduction statement and the work method statement are published on the intranet. The coordinator makes an announcement to the best practice teams that new additions to the intranet have been made.

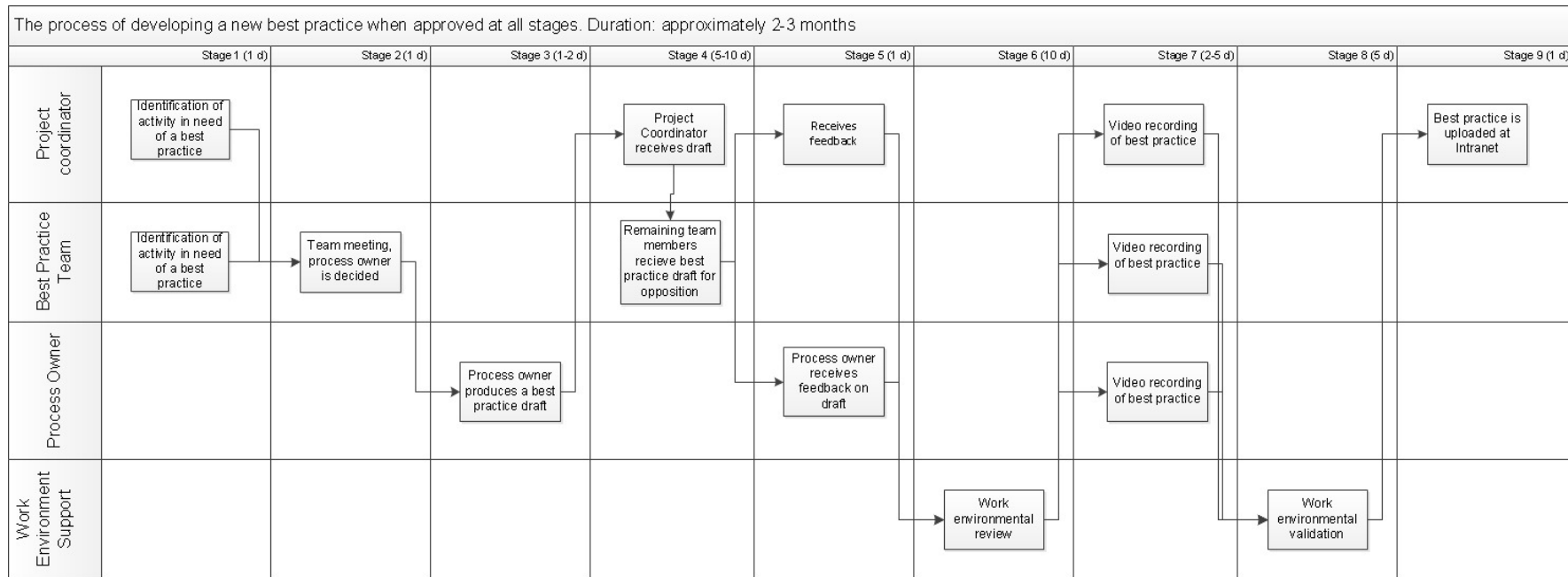


Figure 6 Process map of the different stages in best practice development.

The process of improving a best practice

As continuous improvements are of high focus, best practices must continuously be revised in order to stay valid. There are primary two ways how new input can be incorporated and the best practices improved. The first appears during the best practice team meetings where a standing topic is whether or not the team members have ideas of improvements to the existing best practices. The other way is if site personnel, which are not involved in the best practice teams contact the coordinator and suggest improvements. However, it should be pointed out that the coordinator states that no suggestions of improvements have been submitted other than from members of the best practice teams. Despite the source of improvement, the best practice team discusses whether the new knowledge should be included in the best practice or not. If a decision is made to update the best practice it can either be updated instantly in the case of a minor improvement or the process owner redesigns the best practice in the case of large improvement. In the last case, the updated best practice undergoes stage 3-9 in the process description above to ensure that the new knowledge included fulfils a sufficient level of quality.

4.1.6 Best practice format and distribution

The distribution of best practices is integrated into OneSkanska. For further information regarding OneSkanska, see Section 1.5. In particular the distribution of best practices is based on one-way communication, i.e. it is only possible to view existing best practices; online interaction to the best practice is thus not possible.

The general opinion among the interviewees is that the current way of distributing best practices sufficiently communicates the information necessary to conduct the best practice. When first initiating the best practice initiative, it was end-users, i.e. site personnel, who decided what a best practice should contain. As the content was governed by needs, instead of management forcing a format, the best practices only contained information that site personnel feel relevant, thus decreasing the risk that the amount of information overwhelming. However, for the new best practices developed today, format and requirement of information is controlled.

Most interviewees claim that video, in most cases, is the best way to communicate a work procedure. However, some drawbacks were also mentioned regarding video as a format; a film is difficult to edit and bring as a document out on the construction site. Another drawback is the fact that the content of a film is depending on whoever was filming the activity and that the perception of what should be incorporated in the video differs among people due to different levels of experience. An experienced person might miss important aspects of the construction activity due to the perception that it is self-evident and of general knowledge whereas it might be a crucial step to a less experienced person who needs more thorough information. Some interviewees state that the quality of the best practices and information available vary, why more focus should be put on this in the future and create a coherent format. Two interviewees even suggest that the video documentation should be carried out by professionals to increase the probability of a coherent, clear and pedagogic material.

Considering the amount of data available for each best practice, the opinions deviate on what the appropriate level of information is. Some interviewees claim that it must not be too detailed as it might create a best practice that is too “heavy” to use, thus creating a risk it will fall unused. Others proclaim a higher level of detail and instead let site personnel sort out themselves what information they need. A detailed best practice would also pose a greater support for newly employed who have not performed the activity before. Indeed, as one interviewee mentions, for some complex activities such as large excavation dumps, a lot of information is necessary otherwise the best practice would not be useful.

When questioned regarding the possibility of adding opportunities for two-way communication on the best practice system, all interviewees responded positively. Suggestions on what functions that could be added revolved around feedback such as commenting and grading as well as an easier way to contribution of potential improvements online. However, some thoughts arise among the interviewees that such features could create an abundance of information and extra administration if not controlled correctly. Keeping the best practice system simple and easily available is of uttermost importance, some interviewees state.

To enhance a simple and logical browsing of the best practices these are categorized using Sweden’s national AMA-codes. AMA is a framework describing the requirements for materials, execution and final result of various construction production activities. Each of these AMA-codes corresponds to specific activities that are used in all civil works and the best practices are codified, thus matching the AMA-coded activity they are supposed to cover.

4.1.7 Best practices at the construction site

So far, we have mostly focused on presenting the underlying structure of the best practice approach and how it functions on a rather deep and managerial level. This section aims at explaining in what way the existing best practices are applied on the construction sites. First off, it was made clear during the interviews that using best practices is not mandatory. However, as a manager of development stated:

If a best practice suitable for the construction activity about to be undertaken exists, and if the best practice is not utilized, good arguments should be presented for why it is not used.

Furthermore, if the best practice is not used, the reason *should* be that the project has an even better way of executing the activity; and if they do, this work method should instead become the new best practice. This is the foundation of continuous improvements. Another interviewee argued that even though it is not mandatory to use a best practice, a thought should arise in every site personnel’s head what best practices that could be applied. In the early phases of a project, a type of goal document is used; containing a topic where project managers consider what future construction activities will be undertaken and if there exists a best practice for any of these activities. By setting a “best practice ambition level” early, this ensures that best practices are incorporated in future site planning of activities.

Best practices are seldom possible to apply without modification; prerequisites and conditions differ too much among the construction projects. However, application without alteration is not the aim of the best practices. If made so detailed that the best practice is able to cover all diverse aspects and differences among civil projects it would contain a huge amount of information. Instead, the purpose is to provide information on a rather broad level and let the site personnel adapt the best practice so that it fits the specific conditions of the project. Even if the conditions bring an impossibility to use the specified work method of the best practice, experiences, hints and tricks can still be drawn from the best practice.

We found a unified procedure on how best practices are used in the projects studied. If the site personnel consider a best practice to be suitable for use in their project, all the documentation is examined which in turn provides an easy way of learning the major steps of the work method as well as drawbacks, advantages and hints based on experience. During a site planning meeting, where site management and craftsmen participate, the film acts as the basis for discussion in combination with the work method statement and introduction statement. All in all, the site personnel find this to be a quick and effective way of understanding the work method. They also argued that the information provided from the best practice opens up for a creative discussion and brings lots of input from the craftsmen. As mentioned earlier, it is a lot easier to maintain a constructive discussion around an existing material rather than starting out blank. The interviewees mention that the best practice provides a great foundation for the work method to eventually run efficient and without disturbances.

As stated earlier, the only reason why a best practice is not used in a project is if it is not applicable due to project conditions. There were no indications a best practice is not used because of geographical distances between the end-user and the process owner. Furthermore, it was found that, since best practices are developed by some of the most experienced and well-performing individuals within the organization, there exists no disbelief among the interviewees that the existing best practice actually is a great way of conducting the activity.

Among the interviewees utilizing best practices in their everyday operations in civil projects, there were predominately positive features mentioned. The most re-occurring answers featured the notions of a shorter time grasping the extent of a specific activity but also the reduced need for re-inventing the wheel every time a new activity is approaching. It also became evident that the adoption of best practices, particularly because of the video, has facilitated the communication between site supervisors and craftsmen of what and how is intended to be constructed.

Other positive aspects of best practices mentioned were the feeling of security, particularly in terms of capacity, when an already proven and reliable method is utilized. One interviewee argued that there is a great potential for reducing the costs of mistakes by using experiences of others. Also, there is no need for elaborating with different setups of labor and machinery; consequently producing with low capacity. Instead site personnel get a clear view of what machines to use and how many craftsmen are necessary. Although all interviewees were convinced about the advantages of the best practice initiative, there were not yet any measured effects of the performance since adopting the initiative. However, research is being conducted on how to properly measure the productivity increases, which derives from using best practices.

As there are few extrinsic incentives for contributing, to the initiative, e.g. yearly awards and announcements in newsletters, all interviewees express personal reasons for why contributing to the initiative. While most interviewees express how they appreciate sharing knowledge as it benefits the company, some also stress the importance of sharing mistakes. Other arguments for contributing are the fact that the best practice meetings is a welcoming element in the daily work of production personnel but also since the participants extend their own personal network.

4.1.8 Success factors

In the early days of the best practice initiative, the key to spread the idea throughout the organization was to create a need – a sense of urgency – among top managers. By achieving support from this level of the organization, spokesmen with authority to proceed with the initiative were ensured, on a national basis, throughout the organization. In particular, commitment and support from top management was perceived as the main success factor for diffusing best practices. As one interviewee states:

When top management is emphasizing the importance of the best practice initiative, it is much easier to take time from the production in order to meet the best practice team.

In addition, another interviewee highlights the importance of top managers clearly pointing towards the fact that dedicating time to the best practice initiative is not anything that is additional to your regular responsibilities, instead it is included in your job assignment and thus expected from you. Moreover, some top managers stress the best practice initiative as a mean towards improving operations in the long run; thus prioritized over the daily operations.

To illustrate the importance of top management commitment, the attendance at best practice meetings is very much a reflection of the level of commitment at that particular district as it is often members from the same district that are not present. Consequently, the knowledge base for evaluating best practices suffers and the volume of published best practices is not expanded in a desired speed.

Another crucial factor for the success of the best practice initiative is the involvement of key production personnel. Within Skanska Sweden AB, it is stated that improvement work shall be conducted by those who share the ambition of improving operations and those who are role models within the organization. For this initiative, these individuals were identified and selected for developing the first ten best practices. At present, it is also individuals with these characteristics who are involved in the initiative; “driving spirits” as some interviewees recognize them. In particular, one interviewee argues that the success of the initiative is predominately a matter of buy-in among production personnel as this commitment is the most crucial.

Furthermore, understanding and seeing the need of the best practice initiative among the users is perceived as a fundamental prerequisite for diffusion. Again, the dominant facilitator is top management commitment, as these individuals must communicate the reasoning and potential behind the initiative.

Finally, the full-time job of the project coordinator is another perceived reason for the success of the best practice initiative. As construction site operations are time consuming in themselves, the production personnel would be overloaded with responsibilities if adding the tasks of editing movies, administrating the meetings of the best practice teams and uploading both new and improved best practices at the intranet. If forcing these tasks upon site managers and supervisors, either the production or the best practice initiative would be suffering, therefore the role of the project coordinator is a prerequisite for the best practice initiative. In addition, some interviewees explain how they interpret the importance of the best practice initiative as there is a full-time job assigned.

4.1.9 Challenges and future areas of improvement

The best practice initiative has been partially spread throughout the organization. However, the interviewees argue there are still challenges left in order to reach the full potential of the initiative. One of the toughest challenges, which still remain, is to convince all employees about the potential of the initiative to ensure broad usage and commitment to the initiative. Some interviewees claim that this lack of participation can be derived from a resistance to share their knowledge as they interpret it as a competitive advantage. Another reason mentioned is the fact that the initiative is pervaded by documentation and it is unlikely that this approach suits all employees. One solution to this problem is to move parts of the responsibility from the production support department to the regions. By introducing local spokesmen that production personnel know, e.g. role models, it is more likely that the initiative is spread to a greater extent. Although the ambition is to get all employees “onboard”, the question remains whether this is possible or not. One of the interviewees stated “frankly spoken, if you are not willing to adopt the best practice initiative to your work, it is not sure Skanska is the right company for you”.

If seeking to expand the volume of best practices or improving the existing ones, time must be disengaged from the production as most interviewees stress their already high workload. According to some interviewees, also this problem could be solved by introducing a part-time local best practice coordinator at a regional level as a complement to the production support department. This regional function could support site managers and supervisors with best practice documentation. Preferentially, this individual should have a production background as this, to a certain extent, would assure that the relevant parts of each best practice is documented. In addition, this function could also have the responsibility of performance measurement in order to evaluate to what extent the production gains from best practices.

One possible approach for reducing the costs of the best practice initiative, which the Civil Division is introducing, is to replace the meetings of the best practice groups by virtual meetings. This would not only reduce the hard costs of travelling and accommodations, but also the hidden costs in terms of lost production. Also, this would probably increase the meeting attendance because of its high accessibility. Consequently, enhanced meeting attendance would result in better discussions concerning new and improved best practices thus allowing an improved best practice evaluation.

Another issue some interviewees perceive as negative is the fact that both the process of developing new best practices as well as improving existing ones is quite bureaucratic as it must undergo several validation activities at different parts of the organization.

As capacity is what determines whether a particular practice is best or not, several interviewees argue for the possibility of expanding the usage of best practices to the cost estimation department. Although this would be beneficial, the fact that capacity is to a great extent affected by the specific conditions of each project hinders such expanded scope of usage. Consequently, each capacity must be adaptable to specific conditions of each project if expanding its usage to the cost estimation department. There is ongoing research studying the potential in adding corrective factors of the given capacities in the best practices.

4.2 Case study Building Division Western Region

The Building Division of the western region has also taken a course of action to spread knowledge within their organization, but with a slightly different approach than the Civil Division. The basis of the initiative is an idea center where all employees are able to share their knowledge and experience without any restriction on the content, quality or amount of knowledge to be distributed. The idea center is available online and provides the ability to upload information in the form of text, images, documents and video for any type of knowledge which the contributor feels is essential to share with its' colleagues. Hence, the material to be shared does not necessarily have to contain knowledge regarding a specific construction production activity; it can enclose any type of activity appearing at a construction site.

4.2.1 The purpose of the initiative

The Building Division of the western region had, and still has, a strong urge to develop a way to share knowledge. A great part of the activities performed in the widespread projects were performed in a good manner; however, individuals in different projects were not aware of the different procedures conducted elsewhere. A question arose regarding how this knowledge could be spread outside the imaginary walls enclosing the construction projects.

The main purpose of the idea center was however not focused on identifying and producing best practices; it was rather to achieve a sharing mentality among the employees and encourage their willingness to share good practices. To achieve employees who are willing to share their knowledge, putting less focus on quality or quantity of the knowledge is still the main purpose. One interviewee claimed that the knowledge that craftsmen possess is of the highest importance; these individuals have the detailed know-how and invaluable experience of actually performing the construction work. Therefore, their contribution to the material published at the idea center is important. Another interviewee stated that the purpose of the idea center was to highlight the everyday problems which construction site personnel face;

considering this, it was one of the reasons why the idea center covered not only production methods but also various other activities.

4.2.2 The early stages of the initiative

The notion behind the idea center was derived from a development group consisting of craftsmen where discussions revolved around various topics of potential areas of improvements within the organization. One of the topics was to preserve the knowledge existing among the craftsmen. One interviewee stated that the craftsmen felt unsatisfied that their knowledge was not spread and that reinvention of the wheel was constantly carried out. The group collaborated with the management team and successfully achieved their support and commitment to begin development of a knowledge sharing initiative. However, in the beginning it was not clear how knowledge was to be shared. The first attempt made was to provide site personnel with video cameras and encourage them to document whatever innovative methods and problem solutions were conducted in their projects. Unfortunately, this attempt quickly stalled; there was no defined IT structure that could support the distribution of information, thus resulting in an open database specific for the purpose.

4.2.3 The idea center – foundation for knowledge distribution

Today, the idea center (see Figure 7) is divided into a widespread of knowledge areas where construction activities is merely one part. The different sections cover areas from planning tools and site facilities planning to leadership and work environment. For the construction production activities, these are categorized by using the same construction segments found in the construction budget and time schedule thus providing an easy way of navigating good practices based on type, e.g. roof, wall and foundation. For additional usability, the interface is equipped with a search engine. The high usability is mentioned by the interviewees to be important and some compare it to “the YouTube of construction”.

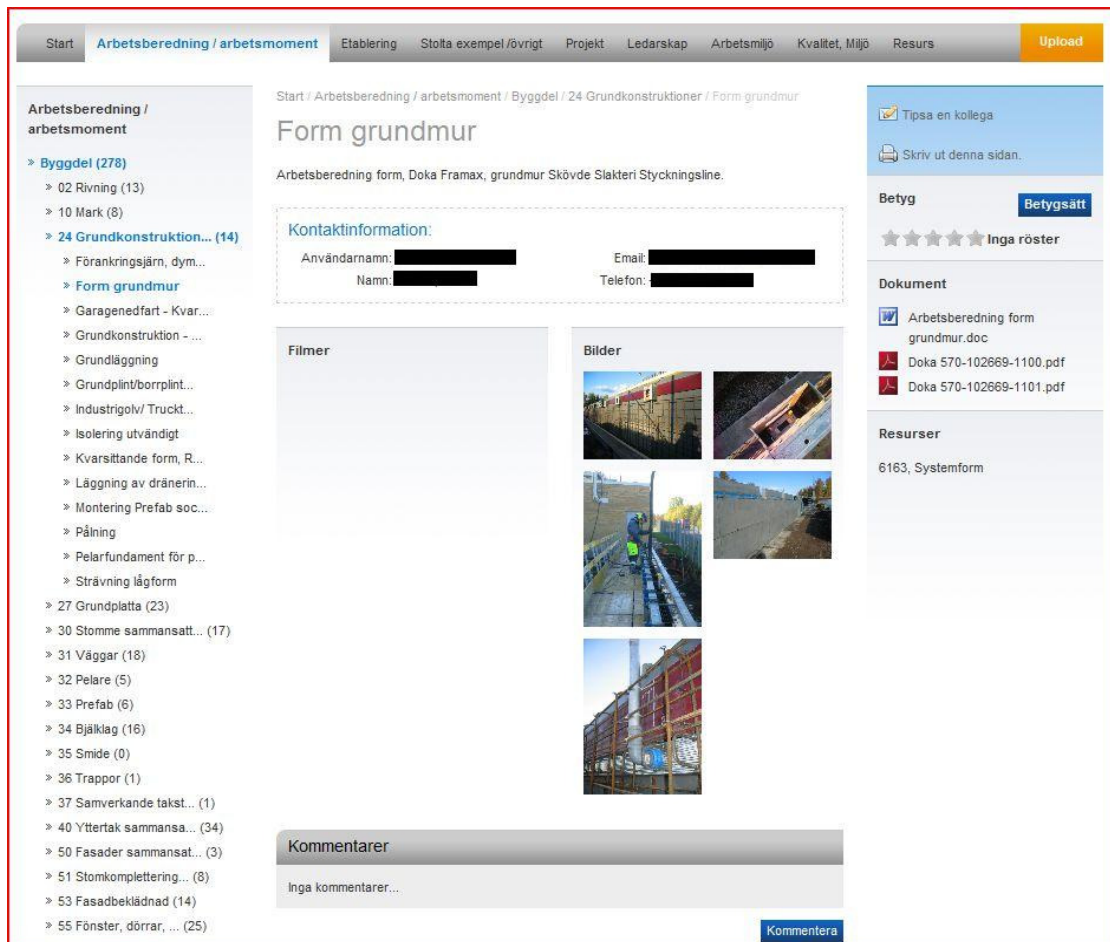


Figure 7 An example of shared knowledge from the idea center.

The idea center is based on a two-way communication design. The first part incorporates the database itself where each specific entry is capable of providing the viewer with photos, video, text, documents and contact information to the contributor. The second part of the design incorporates not only the possibility to share one's own knowledge but also the ability to give comments and grade the existing good practices. This provides the ability to publicly provide feedback on the practices such as suggestions on improvements and if the practice has turned out to be useful. Comments derived during the interviews pointed the feedback feature to act as a motivator as it shows that others have actually used the practice. As each practice also holds contact information it is easy to get in touch with the contributor if questions arise on details regarding the practice. Some interviewees mention this to be a good way of receiving in-depth knowledge. Interviewees claim that the published practices provide the introduction to an issue whereas voice or email communication with the contributor highlights the tacit knowledge, which is not possible to express via the online interface. One interviewee mentions that he has received several telephone calls on his published practices and feels satisfied given the opportunity to help others.

As for the practices published there are no minimum requirements, which must be met in order for them to be published. However, some interviewees emphasize that "free" contribution was an active decision taken in the beginning of the initiative and that the intention was to reach a high number of willing contributors. There is no type of

external review of the practices, even though some have been removed since forbidden construction methods were shown. One interviewee mentions the varying quality as a drawback of the idea center and wish for entries to reach more coherence and greater level of detail. Another interviewee finds that most practices lack sufficient quality and that this is one reason why the idea center is not used to such a great extent. In contrast, one interviewee claims that if one is simply aware of the lack of quality assurance, some pieces of useful knowledge can be derived from the published practices. Whatever is considered useful knowledge is however up for the viewer to decide. He furthermore describes that for one specific construction activity there might exist several good practices and it is difficult to evaluate which one brings about the best result.

4.2.4 Application at the construction sites

The shared material is predominately used as input to the work method statements. To each of these activity planning meeting, where site management and craftsmen are participating, diverse material for the production activity in mind are used as input. In most cases there are no complete solutions; instead material from different contributions is used as input the work method statement. Generally this triggers discussion among the meeting participants thus facilitating the planning of that particular activity. It is generally easier to choose a suitable method if there are several alternatives to evaluate. As one site manager stated “this gives us the possibility to avoid the methods we always have used thus providing us with new viewpoints”.

The other perspective of applying the idea center is contributing with own ideas and experiences. As this requires computer access, the actual “uploading” of material is only performed by site management. However the uploaded material in itself does not necessarily originate from management as also craftsmen, whom on a weekly basis, have the opportunity to present ideas or other possible contributions.

If a work method statement results in a method that currently does not exist at the idea center, this material should be uploaded. However there is one problem that pervades the question of contributing as, in particular, older and more experienced employees perceive much of their knowledge and experiences as obvious. On the contrary, it is very unlikely that this knowledge is obvious to a younger co-worker. As one site manager explained, he did not believe the things he had done for a long time were exclusive enough to upload. However, after some other site managers had visited his site they encouraged him to do so as they felt that others could gain from these practices. Consequently, as argued by several interviewees, if the knowledge of experienced employees could be diffused to co-workers on a structured and regular basis, great gains could be achieved.

4.2.5 Incentives for involvement

For this knowledge initiative, the interviewees highlight both extrinsic and intrinsic rewards. As an extrinsic reward, there are financial motives for site managers to

upload material to the idea center. The question whether this is sustainable in the long run is emphasized by one interviewee. During our study we observed a negative effect of this incentive when we found irrelevant material providing no useful input for the intended user. Yet during our interviews we were shown far more elaborated work method statements that were not published at the idea center.

As an intrinsic incentive, interviewees express a feeling of well-being by sharing their experiences with others. As one interviewee argued; “in order to receive useful information from the idea center, I must also contribute with information”. In addition, the importance of sharing knowledge is also highlighted within the regional development groups and gatherings.

4.2.6 Success factors

Interviewees state that the support from top managers in combination with a demand from site personnel have been considered mutually important success factors. As the tool for sharing experiences was initially demanded from site personnel, this is not something that has been forced upon employees. Also, the fact that top management has been involved within the regional development groups is perceived as crucial among interviewees. The fact that the initiative has not been forgotten, like previous similar initiatives, clearly indicates that it is used in the daily operations. If the idea center would not have been used by the site personnel, it is likely that the initiative would have halted or even faded away.

Interviewees also highlight the importance of reaching out to craftsmen and not only to site management. The fact that site management and craftsmen are employed under different agreements initially made the craftsmen involvement rather complicated. However, the fact that financial accounts for development group participation were adopted enabled the involvement of craftsmen. These financial accounts enabled involvement of craftsmen from minor construction projects without burdening the project economy.

Other perceived success factors are the fact that the initiative has not been seen as a time bound project but more of a continuous process. Also the simple interface of the idea center is mentioned as another success factor. The simplicity has meant that no education has been necessary but also that sharing information and using knowledge has not taken much time from the on-site production.

4.2.7 Future development

For future development of the idea center, interviewees point towards some areas of improvement. First, as the nature of published material varies to a great extent, interviewees argue that increased homogeneity would be beneficial. Today certain material is very detailed containing text, movie and documents while other material is less elaborated.

Second, there is also a possibility of turning existing material into best practices. Although this is an extensive task, material stored under the same construction segment could constitute as a foundation for a future best practice development. However, one interviewee states that most of the contributions do not reach a level that makes them suitable for turning them into best practices.

Whether best practices will be implemented or not, the manager responsible believes that the idea center will most likely remain in order to promote internal knowledge transfer and that good practices will constitute a supplement to the best practices.

5 Discussion

The following chapter contains a discussion, which revolves around the findings derived from the case studies where our own reflections and the theoretical framework act as a basis for a constructive discussion. Deriving from our case studies, and partly from literature, we believe that we have found the major stages which constitute the features of a best practice approach. Hence, we argue that best practice diffusion contains the following five stages, which will be further discussed in this chapter:

- **Identification** – an activity in need of a best practice is identified.
- **Creation of best practices** – the best practice for a specific activity is created.
- **Distribution** – the best practice is distributed and made available.
- **Application** – the on-site construction personnel apply the best practice.
- **Continuous improvements** – the practice is improved by incorporating new experiences and knowledge.

These steps range from the early selection of activities in need of a best practice to maintenance in terms of continuous improvements. We argue this is an adequate framework as it covers all aspects of best practice diffusion. Furthermore, the purpose of this master thesis is to develop a suitable best practice approach for the Building Division within Skanska Sweden. In our proposed best practice approach, found in *Chapter 6*, we will apply the framework presented above and give thorough descriptions for each of the features. As argued before, there is little to be found in academic literature regarding these five features, which is why we consider our developed framework as a contribution to the field of best practice management. Our findings, discussion and recommended approach all provide real life examples and arguments to how a functioning best practice approach could be operated within a construction-context; something which is clearly lacking in contemporary best practice literature.

In various sections of the *Discussion* chapter we have found it necessary to introduce a new terminology to enable comparison and discussion between the two cases. In these two cases, the practices shared within the organizations has different characteristics as one case deals with best practices and the other deals with good ideas and good practices. Hence, we will use the term *shared practice* as a common label for good ideas, best practice and good practices.

To improve easiness for the reader, the Civil Division of Skanska Sweden will be referred to as Civil Division whereas the Building Division Western Region is referred to as Building Division.

5.1 Identification and creation

The first two phases in a best practice approach is referred to as identification and creation where the aim is to find for which of the activities conducted on site, a best practice should be created. Furthermore, the aim is to identify which method that is considered to be the best way of conducting the activity as well as developing that

chosen method into a best practice. It should be noted that in the case of the Civil Division, one does not immediately point out a specific method as the best practice but rather choose one good practice as a basis and develop this further into a best practice taking experiences and other work methods into account.

For what activities should a best practice be created?

In literature we found little concerning the process of identifying activities suitable for best practice development. However, we have come to realize that the choice of these activities is context-dependent. As for the Civil Division, the work undertaken contains relatively few and repetitive activities conducted in most infrastructure projects. These activities are often highly dependent on capacity and there are great volumes of material, machinery and man-hours involved. Therefore, choosing the largest and most common activities in infrastructure is one way of identifying suitable activities; an approach taken in the early phases of the best practice initiative of the Civil Division. As for the Building Construction sector we argue that this could also be a suitable approach; many activities performed when constructing a house are of similar character in most projects. However, there exist variances to a greater extent between the activities conducted for the same construction segment in building construction than in civil construction. We have observed a notion of best practice creation for building construction to be something very difficult because of all these variances. However, we argue that these variances must not act as a hinder when creating a best practice; instead, focus must be set on the similarities which exist between various work methods for a construction segment.

Currently, the Civil Division identifies suitable activities by categorizing activities based on their monetary contribution to production budgets in various already conducted projects. Interestingly, the activities identified almost follow the notion of the Pareto principle; a “rule” showing that 20 % of something are often responsible for 80 % of the results (Reh, 2005). In the case of the Civil Division we found 20-25% of the activities to account for 75% of the money, i.e. close to the relation described by the Pareto principle.

Whereas the Civil Division has a structured methodology of identifying activities, no such methodology exists in the Building Division. Instead, good ideas and practices are shared on a random basis without any vertical or horizontal demand. We argue that there should exist reasons or demands for the knowledge that is to be shared. If not, there is a risk of sharing good ideas or creating best practices for activities which end-users feel are unnecessary. Also there is a risk that the incentive to utilize diffused knowledge decreases or is non-existent if the knowledge is not desired in the first place. Covering all activities on a construction site with best practices is thus not a sustainable approach, but instead it is important to focus on certain activities and emphasize *why* these activities are in need of a best practice.

As previously discussed the identification of activities is context-dependent; one general rule is not applicable for all industries, sectors or organizational divisions. Furthermore, the decision factors for choosing what work method should become best practice can neither be generalized and is depending on what the purpose of the best practice initiative is. In the case of the Civil Division, where increase in productivity

is the purpose, capacity has been chosen as the primary decision factor and cost effectiveness as the second. Theoretically, that approach would provide an easy way of evaluating practices; if work method X is quicker and cheaper than work method Y, it should be best practice. However, since the interviewees state that there are few accurate measurements performed for the evaluation of capacity and cost, the selection of work methods is, in practice, more of a subjective character than an objective one. It is followed-up by capacity and cost figures as well as individual estimation which provide the basis for the selection procedure. The interpretation of “best” is thus not scientifically proven but rather a mix of estimations and hard data originating from the best practice teams. Nevertheless, we do not consider this mix a disadvantage of the approach; the best practice team members are all experienced and capable of determining the appropriateness and correctness of different work methods even when they do not have access to hard data for comparison.

Support for the approach chosen by the Civil Division can be indirectly found in literature; the two best practice definitions by American Productivity and Quality Center (1999) and O’Dell and Grayson (1998) emphasize the best practices to be practices that produce “superior results”, “outstanding results” and are “judged as exemplary, good, or successfully demonstrated”. These statements show that a best practice does not have to be the *best* one; thus a team of experienced and knowledgeable individuals is enough for determining what to consider a best practice. Furthermore, the utopia is that the process of continuous improvement takes the best practices closer and closer to becoming the *best*. By using the definitions mentioned above, it also becomes clear to us that the Building Division initiative is not that of a best practice initiative. The information available on the idea centre is not proven to bring superior results.

Best practice creation and team composition

The best practice teams of the Civil Division are merely constituted of production personnel. This fact conflicts with the argument by O’Dell and Grayson (1998) that teams should be multidivisional whereas the interviewees argue that production personnel are sufficient. We do not fully agree with the interviewees; there is a risk that there exists product quality shortcomings related to the work method that production personnel are not capable of seeing, perhaps due to lack of experience, education or knowledge. Hence, we argue that involving more professional functions into the best practice teams would extend the best practices to become even more correct. However, one must tread carefully and not let the creation process become an inert process where several instances must authorize and review each best practice. It has been pointed out to us that a relatively low bureaucratic process where the teams themselves take decisions is essential. We have acknowledged the best practice teams to be fully empowered when it comes to developing best practices and we argue empowerment to act as a facilitator for the members to feel committed. Nesan (2004) states that empowerment, i.e. full authority when taking decisions, is a prerequisite for an organization to develop a learning spirit. We believe that empowered teams have been established at the Civil Division; the teams make decisions and take responsibility for the best practices produced. The Building Division can also be argued to have embraced an empowered organization when it comes to knowledge sharing. Here, the employee empowerment is perhaps even larger than at the Civil

Division since all employees have full authority to contribute with whatever knowledge they want and use the existing knowledge however they want. Clearly, a low bureaucracy with no requirement of external best practice reviews or constant managerial permission seeking is one factor which fuels increased commitment to the two initiatives. If comparing these two approaches of how shared practices are created and shared, it is easy to relate the Civil Division to the literature of best practice teams (O'Dell and Grayson, 1998). On the other hand, the relation between the Building Division and communities of practice (Wenger, 2004) is not equally clear. Nevertheless, the structure of the Building Division share several features with the concept of communities of practice. First, the online idea center, which is used for sharing practices, functions a forum for employees sharing a passion for the same field; on-site construction production. Secondly, the idea center poses an opportunity to share experiences with other individuals in the organization who face similar issues thus providing them useful information. Third, the high level of openness and organic structure is very much aligned with communities of practice as individuals within the building division individually decide upon what practices to share and how to use shared practices.

Creation of a best practice is, in the case of the Civil Division, a time consuming as well as a costly process. One aspect we found in regards to this process is that the long duration between best practice team meetings prolongs the time between a decision of best practice creation to the actual publishing. The rather extensive process, in which material for a best practice proposal is created and the proposal is transferred between different instances for review is also time consuming. There is also a cost factor deriving from the best practice diffusion; meetings, the coordinator wage, lost production time and travels are costs, which are necessary but nevertheless large. Early in the diffusion process, it is decided which work method is to be considered as a draft version of the forthcoming best practice; a draft which is enhanced via reviews. This approach is not aligned with what we found in literature; Jarrar and Zairi (2000) among others describe the process of searching for practices and thoroughly evaluating them against each other in order to determine which of them is considered best practice. The Civil Division saves time by not searching among the many work methods for a single construction activity that exist. However, this approach imposes a risk of overlooking other alternatives and maybe even better work methods than the one chosen. Despite this fact, we argue that the review procedures of each best practice incorporate the benefits of other work methods via the experience and knowledge of the best practice team members. The burden of thorough evaluation among several work methods for each best practice is not necessary in our opinion, especially not in the beginning of an initiative where it is important to get started and produce results quickly.

Resources needed to facilitate the best practice efforts

A standing issue emphasized by most of the interviewees is the lack of time to devote the knowledge sharing initiatives. In none of the cases was extra time allocated to those involved in the best practice initiative. This was especially clear in the case of the Civil Division; some interviewees claim they have to rearrange their everyday production work to make best practice efforts fit in their already tight schedules. The same goes for the Building Division; no extra resources were allocated in order for

employees to be able to share good ideas and information. This approach is contradictory with the statement that KM-related efforts should not be added as “another responsibility without increasing resources“(Robinson et al., 2005). McKenzie et al. (2001) also argue for the importance of resources devoted to the initiative; sufficient resources must be in place for employees to feel committed to the KM initiative. Nevertheless, it should be noted that resources *have* been allocated the studied initiatives; the initiative coordinator, the well-developed idea centre and monetary resources for best practice creation are all proof that many resources have been assigned to the initiatives. Still, the interviewees wish to see further resources assigned; especially for the time consuming process of creating and editing videos for the best practices. This task is mainly carried out by production personnel but the interviewees argue that the production support department could assign even more resources, i.e. staff, to help with this task. As of today, the project coordinator works on a national basis, which is not a sustainable solution due to great geographical distances. Instead, the interviewees argue that several support functions could be added on a more local basis. We believe that it is not the task of production personnel to do all the best practice creation work; they should instead provide their knowledge and experience whereas another person performs the documentary work.

As for the knowledge contributors, i.e. site personnel, no extra time is given to compensate for their work time “lost” due to meetings, travelling and creation of best practice material. We believe this poses a hinder for full commitment; whenever efforts related to best practice threatens to affect everyday operations in a negative manner, it is more likely that the construction production is prioritized over best practice efforts. On the contrary, Bishop et al. (2008) discuss that neither should KM-related efforts seize too much of the employees’ time since that poses a risk of everyday tasks to become down-prioritized which is not wished for. Thus, there is a conflict of interest where employees are expected to both manage their regular work while at the same time devote time to best practice efforts. We argue that it is important to find a sustainable balance between the two. Sirkin et al. (2005) claim that a maximum of 10% of an employee’s working time available should be assigned a KM initiative, a number which we consider to seem appropriate. If best practice efforts all in all require one or two days per month, i.e. 5-10 %, we believe this to be a sustainable amount of time required. Interestingly, the job descriptions for site managers and site supervisors contain no element of knowledge sharing or continuous improvement of existing knowledge. We argue that a formal statement in these descriptions could help to create a greater knowledge sharing awareness and mentality as well as increased easiness of devoting time to the initiative. However, for employees to do so, tools and procedures must be well elaborated as well as there must be sufficient resources allocated.

Shortcomings of the initiatives

As demonstrated throughout the two case studies, the Civil Division has taken on another approach than the Building Division and has developed a more sophisticated model than the Building Division. It involves a relatively small amount of individuals who decide upon and create best practices for a large mass of end-users whereas in the case of the Building Division it is rather the opposite; all end-users share and use the published information. This enables a higher degree of autonomy where the

dependency on special organizational functions is low and where the work of sharing knowledge is close to self-sustaining. It is of course too early as well as incorrect to argue that the Building Division has an autonomous approach but it incorporates more features of an autonomous system than the Civil Division. The question remains whether autonomy is desired and if the performance, in terms of qualitative practices produced, from such an approach is comparable to the structured approach of the Civil Division.

One issue identified derives from the approach of “free” idea contribution existing at the Building Division; little assurance that the published work method is an efficient or even a correct one. This issue lands a greater responsibility on the end-user as these individuals must themselves determine how suitable the contribution published at the idea center are. However, the fact that everyone can contribute provides a large volume of published ideas, which in turn generates several insights to a specific issue as well as shared experience regarding site activities that perhaps would not be covered if a best practice approach existed. Such activities concern e.g. site establishment, leadership and safety issues. In the case of the Civil Division, using a best practice is more “safe” than using information from the Building Division’s idea centre and one does not have to worry as much about bad performance, efficiency, final quality or correctness of the practices.

The opinions have varied throughout the study on what is the suitable amount of information to be incorporated in a practice available in a knowledge repository. Some interviewees merely desire basic information to get hold of what the practice implies and then contact the information distributor whereas others desire more thorough information so that little individual adjustments have to be made to the practice. Some of the interviewees of the latter opinion claim that if each practice contains detailed information, it can prove useful for both experienced and inexperienced personnel; one determines how much of the information is considered useful and neglects the rest. Liker (2004) argues that standards must contain sufficient amount of useful information but still provide space for the individual to personalize and adjust the standard (or best practice). In our opinion, concerning the amount of information, a best practice should rather contain more information than less. On one hand, this poses a risk that experienced personnel feel an abundance of unnecessary and too explicit information. On the other hand, it has the strong advantage that new or semi-experienced personnel are given a great aid when performing an activity for the first time. Furthermore, extensive information could be of use also for experienced personnel; some interviewees claim that even if you have conducted a specific work method before, the best practices can provide some insights or new approaches that have not been considered before.

5.2 Best practice format and distribution

In both cases, IT has posed an integral part of the initiatives, which have heavily contributed to their gains. Both IT structures have been considered to be user-friendly and easily available as well as able to provide sufficient information on the best practices or good ideas. Jarrar and Zairi (2000) argue an established IT-infrastructure to facilitate a KM initiative and O’Dell and Grayson (1998) and Loforte Ribeiro

(2009) claim IT to be a supporting tool as well as a part of the solution in a knowledge sharing corporation. Furthermore, O'Dell and Grayson (1998) argue that IT itself does not provide any wonders, it is rather a facilitator. This is something that is visible in the two case studies. In none of these cases a knowledge repository was just created and left adrift; instead, there were efforts from the management side that encouraged people to share their knowledge. IT merely provided the help for them to share. Several interviewees have pointed towards a high usability as one of the factors for a well-functioning IT infrastructure. We can only agree; by a clear cataloguing and an easy user interface everyone, including the older professionals, is able to find the right information quickly.

Whereas a knowledge repository, i.e. database, spread explicit knowledge Davenport and Prusak (1998) as well as O'Dell and Grayson (1998) discuss the concept of *knowledge maps* or *pointers* which act as facilitators to help spread tacit knowledge. Both of the knowledge repositories found in the respective cases provided the ability for the knowledge seeker to easily retrieve contact information to the person responsible for the knowledge published, i.e. process owner or contributor. Many interviewees stated this possibility of personal contacts as a great way of getting more insight into a subject. We believe construction to be a rather "hands-on industry" with many individuals who possess rather analogue characteristics, e.g. they prefer face-to-face conversation to a digital one. This observation in combination with the fact that tacit knowledge is primarily transferable face-to-face results in that we believe a knowledge pointer to be an important part of an IT structure. We believe such a knowledge map not only guides people to knowledge and information sources; it can also act as a motivator as the map provides acknowledgement of one's skills and expertise. Furthermore, Davenport and Prusak (1998) mention these knowledge maps to, at least partially, exist in the heads of some employees. Thus, it is obvious that this is a bad place to store information; people shift jobs and information gets lost.

It is worth noting that all interviewees were satisfied how the distribution systems functioned in the two cases, thus IT is not the constraint in the process of diffusing the initiatives. We believe that this proves what some scholars argue; IT only supports a KM initiative and does act as a driving factor. Nevertheless, IT has to fulfil its' purpose of spreading information correctly otherwise it will become a constraint to diffusion. In the Civil Division case it was the end-users who decided what content the best practices should contain and we argue this is proof of an empowering spirit and that needs deriving from the end-users must be taken into consideration when designing the system.

The format and content of practices in the two cases are able to incorporate basically the same features; some introduction to the practice, a work method statement, photos and a video. It should be noted that for most entries at the Building Division, all of these features are not included; however there exists the possibility to do so. The interviewees have stated that these features are sufficient to cover the various aspects of the practices. We agree that for the well elaborated practices containing all of the above features; it is easy to grasp even activities which are very complex. There is no literature available to guide which type of content is the most appropriate in various situations, thus the proper best practice layout and content is a product of needs as well as trial and error.

As both of the investigated cases relied partly on the movie format for communicating practices, most of the interviewees claimed that this format clearly presented how practices were conducted. However we argue that unless adequate resources are allocated, a strong reliance on the movie as the vehicle for knowledge diffusion could act as a barrier for both developing new and improving existing practices. As interviewees from both cases claimed that time was a scarce commodity at the construction sites, we feel recording videos that also need to be edited require time that does not exist for on-site personnel. However, the Civil Division had allocated a project coordinator that supported the production personnel with this task. Assigning such a resource is a costly solution that also places a strong reliance on this specific individual. Consequently, we believe that the question of best practice format needs to be sufficiently addressed, e.g. what does it require from users/contributors, before one can state that this is the proper solution.

5.3 Application

In both of the investigated cases we found that the shared practices or knowledge were used as input to the activity planning meetings. The most obvious similarity was that in both cases, the shared practices were never applied without any adaption. It is merely project-specific adjustments that are made to the best practice, i.e. adaption according to the differences there exist in different projects. It should be noted that the work method and inherent procedures should not be changed. Instead, only the features where the best practices differ too much from the project-specific prerequisites and conditions should be adapted. As interviewees highlighted the uniqueness of each construction project, we believe that it is not reasonable to claim that a best practice should be mandatory to apply without any adaption as this is not possible due to the varying nature of what is being produced. This is also emphasized by Josephsson and Saukkoriipi (2009) who claim that the products themselves need to be standardized in a greater extent if seeking to standardize the process.

Even though we found similarities of how the shared practices were used at construction sites, we found a profound dissimilarity in terms of to what extent the input was used. While the Civil Division had an ambition to apply the prescribed best practice as much as possible and hence only made the necessary project specific adjustments, the Building Division used the shared material only as additional input to their work method statements. The implication of this, as we interpret it, is that the Building Division still has to develop their own methods which means that they, to a great extent, “re-invent the wheel” each time a construction production activity is planned. On the other hand, the many practices available for a single production activity can facilitate innovation as different inputs can lead to new innovative work methods. The fact that there is not one recommended work method for each activity this implies, there exist no coherency in terms of how activities are carried out. In conclusion, the Civil Division has clear guidelines of how to use best practices while the Building Division uses it in a less structured manner.

The dissimilarities of how shared practices are used in the examined cases are most likely a direct consequence of the purpose of each KM-initiative. As the overall goal of the Civil Division was to raise the productivity by applying best practices

throughout the organization, it is obvious that these practices shall be applied to the extent that is possible as these practices have the highest capacity. On the other hand, the Building Division initiated their idea center to create a sharing mentality among the employees and encourage their willingness to share good practices. The main conclusion to be drawn from this is that the overall purpose of initiatives like these governs in what way the shared practices are used.

How can production personnel contribute?

All KM-initiatives are solely dependent on one primary ingredient; the willingness and ability of employees to share their knowledge with the rest of the organization. Within a construction context where focus is on finding best practices, particularly involving production personnel would be the main focus as these are the ones possessing that particular knowledge. In both the cases we examined, interviewees were committed to sharing their experiences with others. However, their ability to do so differed. At the Building Division, basically all employees had the ability to upload their own contributions to the idea center without involving other co-workers or functions within the organization. If they possessed information that could be useful for other individuals within the organization, only a low level of computer skills could stop them. On the contrary, at the Civil Division, a way more bureaucratic process needed to be initiated before knowledge from one individual could be accessible to others. Although this approach included knowledge validation, we believe that such a bureaucratic process can be seen as an obstacle for knowledge sharing. Particularly as interviewees from both cases highlighted their already high workloads, we believe that if looking for involving as many employees as possible, not only the committed driving spirits, the routines for knowledge sharing must be as simple as possible.

Rewards for best practice dedication

In our theoretical framework we emphasize the importance of employee rewards for engaging in a best practice initiative. Whether rewards are extrinsic or intrinsic, the fact that any rewards are introduced will increase the likelihood of best practice success (Bishop et al., 2008). In our cases, the Building division had set out extrinsic rewards in terms of financial bonuses for site managers which encouraged them to contribute to the idea center. Simard and Rice (2007) emphasized monetary rewards as negative as these could place the money itself as the main driver instead of contributing to the organizational knowledge. In addition, Hackman and Wageman (1995) stressed the difficulty of finding a balance between extrinsic rewards and the quality of the contribution. As we interpreted some contributions to the idea center of the Building Division as less sophisticated, this could be a consequence of introducing monetary rewards but not deciding upon reward levels based on the quality of the contribution. Apparently, contribution volume has been prioritized ahead of contribution quality. This example clearly demonstrates the difficulties of incorporating extrinsic rewards in a best practice perspective.

In order to achieve wide commitment to a best practice initiative, O'Dell and Grayson (1998) highlight intrinsic rewards as key to success as intrinsic rewards are self-rewarding. In both our case studies, we found examples of intrinsic rewards as

interviewees explained how best practices and shared knowledge facilitated the daily operations. Above all, best practices and shared knowledge constituted adequate input to the work method statements which were carried out in the construction projects. Interviewees mentioned a reduced need for re-inventing the wheel as one positive aspect, also discussed by Reddy and McCarthy (2006). Also security in terms of capacity was mentioned as reliable and proven methods are used. Another positive aspect was the fact that high capacity can be achieved almost immediately instead of elaborating with different setups of labour and machinery. This reasoning is similar to that of Santos et al. (2002) who claimed that standardizing processes would reduce process variability in terms of time and costs.

5.4 Continuous improvements

Within the examined literature, O'Dell and Grayson (1998) discuss the ambiguous meaning of "best" as the best practice is constantly a moving target. Hence, we interpret the notion of continuous improvement as a cornerstone of a best practice initiative. However, the question of continuous improvements differs widely between the two investigated cases. As the Civil Division has prescribed routines that explain how improvement ideas should be handled from construction site emergence until being available to the rest of the organization, no such guidelines exist at the Building Division.

In the Civil case, the notion of continuous improvement was mentioned among both the construction site personnel as well as development managers. The reasoning that pervaded the improvement work was very much aligned with the reasoning of Liker (2004) who claimed that any practice must be standardized before any improvements can be performed. On the other hand, at the Building Division no improvement initiatives were taken. Instead new ideas, similar to already existing contributions at the idea center, were not used to update existing practices but were instead uploaded as completely new contributions. To illustrate this, the idea center contained 23 possible practices for casting a concrete foundation and 34 possible practices for constructing an outer roof. Although these practices presented somewhat different practices for the same construction production activity yet within different environments, we believe that the vast amount makes it rather time consuming for users to select which practice to use. This way of working was also mentioned by Liker (2004) however not as a suitable approach for improvements as such contributions will most likely result in further variations that will only be occasionally used and probably ignored.

Although the Building Division has no prescribed routines for conducting continuous improvements of the shared practices, the practice classification at the idea center is rather similar to the two first knowledge levels of Chevron, presented by O'Dell and Grayson (1998). As some of the contributions were fairly fragmented ideas of how to improve certain processes thus representing the "good idea" label, other complete proposals of how to conduct particular construction production activities constituted the "good practice" level. Due to this similarity to the knowledge labelling of Chevron, there is a clear potential of developing these knowledge contributions to the third label – "local best practices". However this is a difficult task due to the

abundance of existing material. Also the question of who will perform this upgrading remains.

At the Civil Division proposals for improving best practices can derive from two possible sources, either any employee within the organization or at any of the best practice team meetings. However, so far, none of the applied improvements have originated from anyone outside of the best practice teams. As the main thought behind best practices was not to document the very “best” practice but instead continuously improve the documented practice, it is distressing that proposals do not originate from the broad mass of end users. There are two possible reasons for this, either that the improvement process is too bureaucratic or that best practices is merely of interest for the members of the best practice teams. One possible approach for facilitating the improvement process would be to utilize an online comment function at the intranet where each employee could give feedback to the process owner without any need for involving anyone else.

5.5 Success factors and possible barriers

From our two case studies we have identified both success factors and barriers for each particular KM-initiative. In this section these will be discussed and compared to the presented literature under four subheadings; managerial issues, empowerment, organizational structure and IT. As the Civil case was presented in greater detail, the main emphasis in this section will revolve around this case.

Managerial issues

Literature about KM and management issues mainly concerns the importance of achieving commitment among top-managers. As this is not self-evident, McKenzie et al. (2001) accentuated the need of nurturing top-management with success stories giving real life proof or examples of how KM can improve business results. In the Civil Division, during the early phases, the intention of the project coordinator was to create a need for the best practice initiative among the civil top-management. By providing a real life example where a certain best practice was half as costly and only required one third of the time compared to a normal practice, top-managers realized the potential of spreading best practices throughout the division. Another question highlighted in literature was the importance of early producing convincing results (O’Dell and Grayson, 1998). By letting district managers decide upon the first ten construction production activities to develop best practices for, thus choosing activities of high volumes, which enabled financial payoff, this approach was rather aligned to literature recommendations.

Not only was top-management commitment important to catalyze the Civil Division’s best practice initiative, but production personnel also perceived it as critical during the operation phase. Although conducting operational development is not included within the job assignments of site management, the Civil Division has created a culture where dedicating time to best practices is not perceived as an additional task but rather expected from site management. If top-management commitment was not

achieved, this culture among site management would not have been possible. It was of high interest to see highly occupied site professionals to find commitment and time to engage in best practice efforts while their day-to-day operations does not really provide any gaps for anything other than construction production activities.

Another found success factor, which has not been mentioned in literature, was the importance of taking small steps in the early phases. One noticeable example was the fact that the Civil best practice format has been extended since the first best practices. Instead of imposing unnecessary documentation upon site personnel, the best practice format has been governed by site personnel demand. As both interviewees from site management and production support department believe that too much documentation could have exterminated the initiative, we interpret this carefulness as a success factor.

In addition to top-management commitment, literature also stresses the significance of achieving acceptance and commitment among employees. For the examined case studies, this matter constitutes a profound difference between the cases. As the Civil best practice initiative is primary a top-down approach, however accepted and embraced at all levels of the organization, the KM-initiative of the Building Division is more of a down-up approach as the initial need originated from craftsmen. In the Civil case, the strategy was to involve role models of the organization that were also willing to engage in improvement work to use these as opinion leaders within the civil projects. In the Building case, no such strategy was pronounced. All in all, we understood it as the number of committed employees was larger in the Building Division although these did not share the same high level of commitment as the members of the civil best practice teams. Naturally, this leads us to the remaining main challenge of the two initiatives; how to create involvement and commitment among the employees that have not yet embraced the initiatives? Secondly, is it necessary, or even important, to reach out to every single employee? To discuss this, Figure 2 (Rogers, 1962), explains the relation between innovation diffusion and adoption, which provides some interesting numbers. As 14 % of the employees resist until the very end and 2 % never capitulate, it is logical to argue that it will cost more than it generates to convince these individuals. If also considering the Pareto principle (Reh, 2005), which in this case would mean that only 20 % of the employees represent 80 % of the knowledge contributions, it is even less necessary to involve everyone within the organization. In addition, if considering a time perspective, commitment will be achieved from right to left in Figure 2. However, the fact remains that 34 % of the employees need some persuasion to be convinced, how can this be achieved? If looking back at the work of Nielsen and Michailova (2007) introducing KM-positions, training and rewards will most likely enhance the possibilities. Although these will require financing, this is most likely necessary as it is unwise to believe that KM-success can be achieved without any investments.

Empowerment

As discussed earlier the Civil Division had a strategy to involve those that shared an ambition to develop operations but they were also considered as role models within the organization. By locating and involving these individuals, placing them in groups with other driving spirits creative communities were established. By also giving them

the freedom to take decisions within their own field – best practice creation and continuous improvements – thus abandoning bureaucracy, very little could obstruct the creation of new best practices. This approach is very much aligned with the empowerment definition of Conger and Kanungo (1988).

On the other hand, the KM-initiative of the Building division could be considered to be even more empowered as site personnel has even greater possibilities to decide upon what knowledge they want to share with others within the organization.

Organizational structure

When appraising the organizational setup of a KM initiative, Nielsen and Michailova (2007) argue that clearly defined KM positions increase the likelihood of KM success. In the examined cases, only the Civil Division had incorporated such functions. While the best practice teams of the Civil Division had clear objectives and strategies for creating and improving best practices, the development groups within the Building Division had no clear guidelines for discussing and developing the idea center. Nevertheless, these groups also had other issues on their agenda.

In terms of organizational structure and KM-positions as discussed by Nielsen and Michailova (2007), another important difference between the Civil and the Building Division is the existence of a supporting project coordinator. As the high workload of site management can be interpreted as a possible barrier to knowledge transfer, the full-time job of the project coordinator is one of the greatest success factors we have found. This statement is widely agreed among interviewees as it was emphasized among site management, best practice team members and representatives from the production support department.

On the discussion about who is participating within the complementary groups within each initiative, the Building Division has opposed to the Civil Division accomplished to involve not only site management but also craftsmen. As craftsmen possess deep, particularly tacit knowledge, this is an important source to involve in development operations. Also, as it is the craftsmen that actually perform the construction production activities it is unwise, but also unfair, not to include them in such discussions.

Information technology (IT)

Similar for both cases is the fact that knowledge and best practices are distributed with the help of IT. As effective IT-solutions are critical for successful KM-initiatives and not only mentioned by scholars (Jarrar and Zairi, 2000; Loforte Ribeiro, 2009) but also by interviewees, it is likely that this is the most efficient tool distributing knowledge within an organization. Although both initiatives utilized IT as the mean for distribution, the two IT-interfaces differed quite a lot. While the intranet where the Civil Division distributed their best practices did not enable any two-way communication, the idea center of the Building Division not only enabled two-way communication in terms of a comment function but also a function which enabled employees to tell other co-workers about a particular knowledge contribution. All in

all, we believe that these functions made the idea center more dynamic than the intranet of the Civil Division. Also, if addressing the question of how to involve the broad mass of employees, the overall simplicity and functions of the idea center clearly facilitates wide application. In addition, positive comments and tips will also function as soft extrinsic rewards. Besides these positive aspects, another benefit of the idea center is that the time from when a new practice is created until it is available to the rest of the organization, is substantially shorter than the same process in the Civil Division.

6 Our proposal to Skanska Sweden

The following section will cover our proposition concerning how an approach for best practice diffusion should be designed and initiated at the entire Building Division of Skanska Sweden. Our conclusive proposition is based on:

- Findings derived from the two case studies.
- Key aspects found in best practice literature.
- Observations in the organization of Skanska Sweden.

The proposition aims at providing a specific explanation for *how* such an approach should be designed, supported by arguments *why*. Our intention is to provide such a comprehensive description of the features included in the best practice approach that it is applicable and understandable for the individuals responsible for initiation of the approach.

Implication of the terminology best practice

We stand somewhat critical to the definition of best practices which Skanska Sweden has today; “currently, the best known way of conducting a specific construction production activity”. We argue that there is a risk of such a definition to become overwhelming and that the practices created must be the very best work method that exists within all of Skanska Sweden. Instead, we believe that the definition should lean more towards that of a **Good practice**: “A method or process that has been implemented and proved to improve organizational results. Validated by data gathered at the location and constitutes a candidate for companywide implementation.” (O’Dell and Grayson, 1998, p.13). This means that the practice is not necessarily the best known but rather a well functioning. Hence it can be beneficial for other projects which conduct work methods with lower performance. We would also like to add to the definition that the aim of a good practice is that by future continuous improvements, it shall *strive* towards becoming the best known. There is even a risk that a good practice will never be able to incorporate the best work methods; then so be it; it is still a very good one. Concluding this argument is our proposed best practice definition for Skanska Sweden:

A good practice, which through continuous improvement, strives towards becoming the best known practice.

Depending on how Skanska will relate to the concept of best practice, the implication of best practice will have a strong influence thus governing how the best practice approach will be designed and conducted. Adopting the best practice definition we state above will direct the best practice approach in such a way it will include little bureaucracy in the development of best practices. Furthermore, it will be efficient when it comes to creating a volume of best practices quickly and it will also provide great room for continuous improvements from people within the Building Division. On the other hand, if adopting the current definition of Skanska; “the currently known best way of conducting a specific construction production activity”, this would

impose a more costly and time consuming approach due to the need of extensive benchmarking between work methods in order to find the *best* practice.

However, it is not only the implication of best practice that will govern the design of the approach; also the purpose of the approach is highly influential. This fact became very clear during our case studies; the Civil Division focused upon finding the *best* work methods in order to increase operational capacity whereas the purpose of the online idea center at the Building Division was to encourage knowledge sharing among its employees. These different purposes resulted in two different approaches when it comes to sharing practices; one structured and somewhat bureaucratic approach whereas the other one is open and organic with no bureaucracy.

Consequently, the meaning of best practice and its' purpose are two fundamental questions which must be raised when deciding upon how a best practice approach should be designed and conducted.

Four main success factors for best practice diffusion

We have concluded that there exist three possible approaches which we believe are all capable of diffusing best practices within the Building Division of Skanska Sweden; a national, a regional and a national/regional mix. All of the three approaches contain different characteristics as well as advantages and disadvantages. It should be noted that none of them are without difficulties; nevertheless, we believe the approach we have selected is the most suitable one, which brings most benefits with least difficulties. As a basis for deciding upon which approach is the most suitable, we argue that there are four attributes which are more important than others and should thus be given extra attention. These attributes are presented in the list below along with a discussion concerning to what extent three approaches are capable of fulfilling the following attributes:

- **Well-rooted on a local level:** It is of high importance that most employees within the organization are committed to the initiative. If maintaining a strictly national approach with best practice teams who meet on a national level only, it is difficult to reach all individuals and promote the initiative. On the other hand, if adopting a regional approach, with respected and known individuals engaging in best practice-related efforts in close organizational and geographical distance to the end-users, it is more likely that the remaining employees will also adopt the initiative. However, a national regional mix would pose the same likelihood of local commitment as a strictly regional.
- **Large catchment area:** If seeking to improve overall organizational performance by enhancing the performance of less efficient units, it is a prerequisite that well functioning practices are identified, documented and applied throughout the organization. In general, a large catchment area would pose an increased likelihood of locating well functioning practices. For this reason, a regional approach would not be sufficient as a national initiative clearly would be more effective in this matter. However, a national regional mix would also provide a large catchment area.
- **High efficiency, i.e. input-output:** On-site construction contains a number of construction production activities, carried out by Skanska personnel, which constitute a large part of the production budget. It is of great importance that a

majority of these activities will be covered with best practices. Predominantly, this is what will make best practices relevant for on-site personnel. Consequently, an adequate best practice approach must ensure a capacity of quickly producing such a volume. In this perspective, involving a great number of employees is necessary, hence the national regional mix is the most attractive as it allocates the task of creating best practices to all the eight building regions. Accordingly, by creating one best practice each region will receive additional seven best practices from the other regions. Nevertheless, this could also be made possible by adopting a regional approach. However, as the regional approach does not include any national coordination, this approach would pose a risk creating best practice duplicates, which is not desirable.

- **Little burden for the involved production personnel:** As realized from our case studies, on-site construction personnel are in general exposed to a high workload. Hence, these individuals will not be able to spend very much time on producing best practices as this would pose a risk of disturbing the daily operations. Again, to place as little load as possible on production personnel, it is of great importance to broaden the responsibility of creating best practices among as many individuals as possible. For this reason, the national approach would not be the favorable as it involves the smallest number of individuals. On the other hand, the strictly regional approach would be more sufficient as it involves a larger number of individuals. However, the national regional mix would ensure just as little burden per best practice produced as it involves an equal number of individuals. Also, as mentioned earlier, this approach prevents the risk of producing duplicates.

A national/regional best practice approach

In conclusion, the approach containing a national regional mix is the most attractive solution as it outperforms the other possible approaches in all the four attributes considered as most important. In such an approach, overall strategic decisions and plans are managed on a national level whereas the best practice development itself takes place at the regional levels. However, as aforementioned, also this approach brings about difficulties. Particularly difficult, is the need for increased administration, as the efforts of eight building regions must be coordinated. Nevertheless, we believe that by mixing a regional and national perspective, one is able to incorporate the different advantages as well as removing some of the main disadvantages and difficulties incorporated in each approach. We argue this is the approach, which is the most adequate for the Building Division of Skanska Sweden. The approach will be presented in greater detail in following sections.

Purpose of the best practice initiative

We argue that the purpose of diffusing best practices is clear: by capturing and diffusing knowledge from around the company, great gains in productivity can be achieved. Due to its size Skanska Sweden contains inherent advantages in terms of capturing knowledge. A great catchment area and the fact that many construction

projects can apply the best practices pose great potential for productivity improvement. One part of the business plan for Skanska Sweden is to increase productivity by developing and applying best practices; an industrialization of the construction projects. The intention to diffuse best practices exist for each of the eight Building regions but the strategies for achieving this vary; there is no unified approach neither on a national nor a regional level. We argue that since there are intentions within each region, but no common strategy, a national/regional mixed approach is suitable. Such an approach would ensure that all regions work according to a common approach but also that the establishment on a regional level is likely to increase commitment to the initiative on a local level. Furthermore, our proposed approach provides a high input-output efficiency of 1:8 where the regions produce one best practice and receive seven best practices from the other regions, thus dividing and decreasing work load for the different regions.

6.1 The underlying organizational structure

A structured approach requires an organizational setup and different functions which make best practice development possible. This section will explain what we believe should be the purpose of the best practice initiative as well as describe how the organizational setup should be designed.

Organizational functions and responsibilities

To achieve a national/regional mixed approach, we argue that three different organizational functions should be incorporated. Figure 8 shows the organizational structure of the initiative whereas the list below it briefly describes the functions and their interrelations.

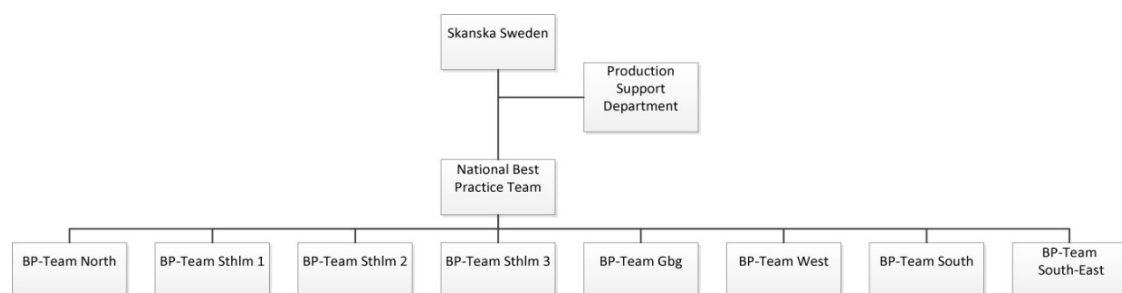


Figure 8 Schematic organizational overview.

- 1) **The production support department:** there exist eight different geographical Building regions, each with their own organizations. We believe that four best practice coordinators from the production support department should each be responsible for one or several regions; one coordinator for the south and south-east region, one responsible for Gothenburg and the western region, one coordinator for the northern region and one coordinating the three regions in Stockholm. Furthermore, one of these individuals should also bear an overall

national function to coordinate the different regions and gain a comprehensive picture of the entire best practice approach. The main responsibilities of these coordinators should be to manage best practice team meetings, publish and edit best practices on the intranet, support the process owners and develop and conduct training in best practices. We believe that one of these four coordinators will have a full-time job related to the approach whereas the other three will only spend part time on the best practice approach. Furthermore, we believe that having several coordinators instead of one brings opportunities for the regions who can more easily contact a person who is close on both an organizational as well geographical distance.

- 2) **One national best practice team:** from each of the eight regions, one person should be nominated for participation in the national best practice team. This individual should be one with profound knowledge of its regional organization and what projects that are currently undertaken; preferably an experienced site manager, a project manager or a district manager. The main responsibilities of the national team are to make decisions on a strategic level such as; which best practices should be created, review the national status of the approach and taking necessary actions for the future. Each of these regional representatives should during each meeting take responsibility for one or several construction activities for which a best practice should be developed at their respective region. These individuals have an important task of representing the region and its needs as well as informing the regional best practice team of the national progress.
- 3) **Eight regional best practice teams:** apart from the national best practice team, there is also one best practice team located at each of the eight regions. These teams are constituted of six to eight individuals of the following professions: craftsmen, site supervisors, site managers and project managers. Each region has, derived from the national meeting, been assigned with the responsibility to develop one or several best practices. The regional best practice team members are in turn assigned the task of creating one specific best practice; thus, becoming process owner of a particular best practice.

National and regional meetings

Two important features in the proposed approach are the team meetings and the ongoing creation and improvement of best practices. The best practice meetings on the national basis should be conducted quarterly whereas the regional meetings are held semi-quarterly. When the best practice initiative has been running successfully for a while there is an alternative of conducting IT-based meetings instead of face-face which reduces not only the time spent but also the cost of travel and/or accommodations for the national best practice members. Between the meetings the best practice development, which is partly based on the input given from the team meetings, takes place.

As mentioned before, the purpose of the national team meetings is mainly to identify for which activities best practices should be developed, hence assuring that no double best practices are developed simultaneously, but also to assign the responsibility of development to the different regions via the regional representative. We strongly emphasize the importance of keeping structured meeting agendas for the meetings

where discussions should revolve around the few main standing issues described below:

- **Current status.** Main questions concern the status of earlier allocated best practice creation responsibilities as well as progress of best practices in development. If any issues concerning the creation process have been identified, an action plan to deal with those issues should be decided upon.
- **Identification.** For what construction activities do we need best practices? (The identification process is described more in Section 6.2).
- **Assign best practice creation.** The regional representatives who consider their region to be suitable for creation of a specific best practice take responsibility to create these, if possible, until the next meeting. Whether or not to take on a best practice creation might depend on local knowledge within a specific construction segment or if there is a suitable construction project where a specific work method is about to take place in the near future.

After the national meeting, best practice meetings should be conducted on each of the eight regions. The aim of these meetings is to review and discuss the best practices created at the region, assign best practices to different process owners, spread information what happens on a national basis as well as concluding whatever best practices that are needed within the region. Stated below are suitable meeting topics:

- **Current national status:** what is the status of the other regions concerning their development work? How far have they come and what activities are currently and are about to be covered by best practices.
- **Assigning best practices:** member(s) of the team are assigned the task of creating the best practice(s) which were assigned the region during the national meeting.
- **Best practices created or in development:** each individual responsible for a best practice discusses his or hers best practice draft and receives feedback and suggestions for improvement from the other members.
- **Desired best practices:** if there has arisen any need for a best practice, the national representative brings those suggestions to the next national meeting.

We argue that the regional meetings should be conducted in relation to each of the national meetings. In addition, regional meetings are to be conducted half-way between the national meetings; these would then act as best practice creation meetings where the only topic of the agenda is to review and improve the best practices belonging to other process owners in the team.

Careful selection of the team members must be done in each region. The regional manager in collaboration with the district managers and project managers are the ones who should identify and choose suitable participants. Findings from our case studies as well as arguments from literature point at the importance of these individuals to act as opinion leaders for the rest of the organization. Their technical knowledge in construction is of course important but their personal attributes should be considered equally important. Their will to engage in organizational improvement work, contribute with their knowledge and understanding the potential of managing knowledge are all important attributes. Perhaps most important is the selection of the national representative. This individual must, apart from above mentioned

characteristics, have profound knowledge about the regional organization and what special knowledge it possesses.

All best practice team members must understand the potential in diffusing best practices, as it will benefit both the organization and its employees, but also that it is a costly and time consuming process which must be allocated time apart from the everyday work. Furthermore, these individuals will act as opinion leaders in their respective region and play an important part when it comes to spreading word of best practices and achieve understanding and commitment to the initiative in the lower levels of the organization which are not as involved in the best practice approach. As the members are all professionals working at, or in relation to, construction sites they will act as initiative promoters for their colleagues.

Even though the teams conduct much of the work embedded in the approach, there is a need of a coordinating function on the regional as well as the national level that manages the different teams and monitors the overall work conducted at the different regions. Both literature and interviewees in our case studies argue for the importance of allocating sufficient resources to a best practice initiative in order to support the initiative. We argue four individuals from the production support department should be involved in the best practice approach; individuals responsible for coordinating one or several regions as well as one grasping the national perspective. We believe it is impossible to place a coordination responsibility on one of the regular team members; these are production personnel who are already busy performing construction-related activities. Their task is to share their knowledge and create best practices, not administrating and coordinating work between regions. We believe that the work of a coordinator would contain different parts throughout the year. In relation to the meetings the work is focused on planning the meetings and coordinating the team whereas other tasks emerge during the period of creation and improvement. Here, their task is mainly to publish best practices, remain updated on the regional progresses and train employees in the field of best practices. We have estimated that for the three coordinators with regional responsibility only, their work-load will require a part time job whereas the coordinator with the national responsibility concludes a full-time job. All in all, 2.5 coordinating employees are estimated in order to simplify the cost calculation which is presented in section 6.8.

6.2 Identification

When creating best practices it is crucial to have a strategy on how construction production activities suitable for best practice development should be identified. There is a vast amount of activities performed in all Building projects of which there is no need to develop a best practice. Some activities are performed seldom while other activities are project-specific thus hard to find common denominators that could act as basis for a best practice between projects. We noted an interesting fact in the Civil Division case where production budgets from many projects were accumulated; 20-25% of the activities accounted for 75% of the budget sum. We believe that this notion, close to that of the Pareto principle, could as well be found in Building projects. If so, it is a suitable target to cover this 20-25% of activities with best practices, thus not covering the rest of the activities.

When it comes to identification we have developed four different approaches that can pose suitable for activity identification. These different ways of identification should mainly be used by the national best practice team in their task of finding activities appropriate for best practice development; the four approaches are presented in the list below:

- 1. Identification by needs:** This selection criterion aims at creating best practices for whatever activities production personnel express a need for; e.g. activities that are difficult, are of high volume, are costly or time-consuming. One way to gather needs is by letting each regional department produce a list of 10-15 activities for which they desire best practices; desires which are brought along to the national meeting. Deriving from this meeting a “desired best practice list” can be produced showing the main activities, which production personnel from various parts of the company consider to be crucial in some way. One great benefit with this selection criterion is the team members’ feeling of empowerment as it is their demand, which will be covered by best practices.
- 2. Identification using accumulated production budgets:** The next possible way of identification is by using an accumulated production budget covering completed projects. Such a database contains all activities conducted in previous building projects and it is easy to sort the largest activities based on either man hours or their total cost contribution to the production budget. Out of these activities 20-25% of the activities which account for 70-80% of the man hours or total costs should be identified as suitable for best practice development.
- 3. Identification by warranty costs:** All buildings produced where the client and contractor allege some of the Swedish standard construction contracts implies a five year warranty period. This is a period where large costs often arise, deriving from quality defects. Part of these defects are due to incorrectly executed work methods, which is why an accumulated list of the construction segments causing the largest warranty costs can provide a good basis for best practice identification. Skanska Sweden AB has a strategy of heavily reducing the warranty costs over the coming years which is why this identification approach could be suitable.
- 4. Identification by activities for standardized technical solutions:** For major construction segments, e.g. walls and floor structures, the department of Technology and Design has developed standardized technical solutions. These include detailed specifications on the technical features of each segment; however, they lack work methods and descriptions for the actual execution of the activity. Hence, best practices could be developed for each of these standardized technical solutions.

From these four selection criteria, we believe that *identification by needs* and *identification using accumulated production budgets* are the most suitable, particularly for the first years of the initiative. As acceptance among on-site construction personnel is of high priority to accomplish company-wide adoption, applying identification by needs will increase the likelihood of employee buy-in. Due to the empowering characteristics of this selection criterion, we strongly argue for this criterion to continuously pervade the best practice approach. Next, as the overall objective of introducing a best practice approach is to increase the productivity of the Building Division, it is natural to argue that the construction production activities

which constitute a majority of an accumulated construction production budget should be covered by best practices. Hence, we argue that *identification using accumulated production budgets* should be utilized until these activities are covered by best practices. Nevertheless, *identification by warranty costs* and *identification by activities for standardized technical solutions* are also suitable criteria. However, we do not interpret them as equally important as the first two selection criteria, at least not during the beginning of the initiative.

6.3 Creation of best practices

Once the activities have been identified and the responsibilities of creating different best practice have been delegated to the different regional departments, work can begin in the regional best practice teams. Based on findings from the civil case we have developed a process which should be carried out continuously throughout the year.

We argue that it is not necessary to thoroughly evaluate a large amount of work methods for a specific activity in order to find a best practice. Instead, we argue that the best practice teams should be fully empowered to decide upon which practice is the most appropriate. Of course, the best practice should be cost-effective and provide good performance in terms of short time duration and achieving predetermined operational requirements. However, it does not have to outperform a number of “hard data criteria”, such as capacity figures. Such criteria are difficult to determine as well as it is difficult to secure their reliability since measuring performance is a difficult field. In addition, a difficult question to answer is who should conduct such performance measurements as there does not exist any such resources within Skanska Sweden today.

We believe it is important that the best practices are not transferred on a route of reviews through different functions for evaluation and approval, but can directly be published at the intranet. However, there should be a review made by the Work Environmental Department and the Department for Technology and Design to check for shortages concerning their special areas.

The eight-step process is described in text and in Figure 9 on the following pages:

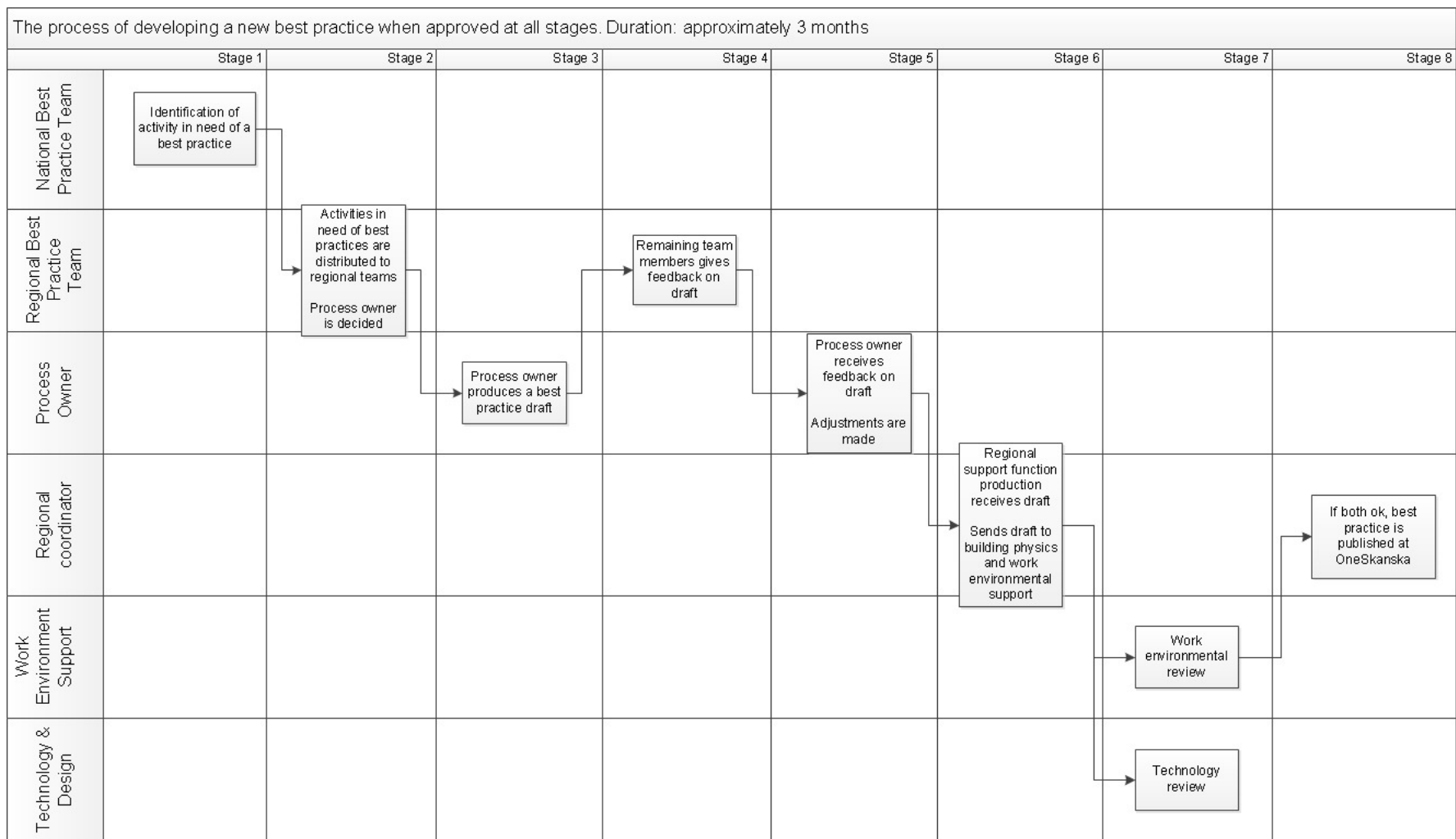


Figure 9 The process of developing a new best practice when approved at all stages.

- Stage 1** Identification of activities is made according to the description in section 6.2.
- Stage 2** The responsibilities to create best practices are delegated to the different regional departments where members of the regional best practice teams become process owners of a specific best practice i.e. responsible for that best practice.
- Stage 3** The process owner produces a draft version of the best practice by documenting the work method. However, there is also a possibility for the process owner to delegate the documentation task to other individuals in the organization. This might be necessary as it is not certain that the process owner himself or herself conducts the specific work method at his or her construction site at the given time.
- Stage 4** When the best practice draft has been created there are two possible ways for the process owner to receive feedback; either by mail correspondence with the other regional team members or by a review session conducted in between the larger regional and national meetings. It is up to the group to decide if they feel a meeting is necessary or not. The craftsmen who are members of the group should be assigned access to individual mail accounts in order to ensure that they are as involved and receive the same information as the rest of the members.
- Stage 5** When feedback on the best practice draft reaches the process owner, via mail or a meeting, this feedback should be incorporated into the draft, thus becoming more complete and striving towards best.
- Stage 6** The draft is transferred to the regional coordinator who in turn forwards the draft to the Work Environmental Department and the Department of Technology and Design. Although this stage initially seems unnecessary, it is included in order to minimize the possible communication paths for as well process owners and the Work Environmental- and Design and Technology department.
- Stage 7** The two departments review the draft(s) to check for shortages concerning work environment or building physics-related issues; moisture safety and air tightness.
- Stage 8** If approved without comments by the two departments, the final version of the best practice is, via the regional coordinator, published at the intranet. However, if it is not approved, it is once again transferred back to the process owner for correctional adjustments.

We believe this to be a hands-on way of working which poses the possibility of quickly producing a volume of best practices, while still incorporating the knowledge and experience of all the members of a regional best practice team. The knowledge possessed by these experienced individuals is sufficient for finding what work method among many that is most appropriate. Later, when a best practice has been created and it undergoes enhancement in the process of continuous improvement, the other regional teams' knowledge and experience will further improve the practice. We believe it is more important to get familiar with the best practice approach and quickly produce a volume of practices, rather than focusing on each practice created to be the absolute best in its field.

We argue that the teams should focus on incorporating a relatively large amount of information into each best practice, rather than keeping it very brief. This way the best

practice will prove useful to experienced production personnel who can sort out the information they feel relevant but also prove useful for inexperienced personnel or for those who perform a work method for the first time.

6.4 Best practice distribution

To make best practices available to all Skanska employees, best practices will be distributed through the intranet, OneSkanska. Figure 10 below presents a schematic proposal of content and how best practices should be presented.

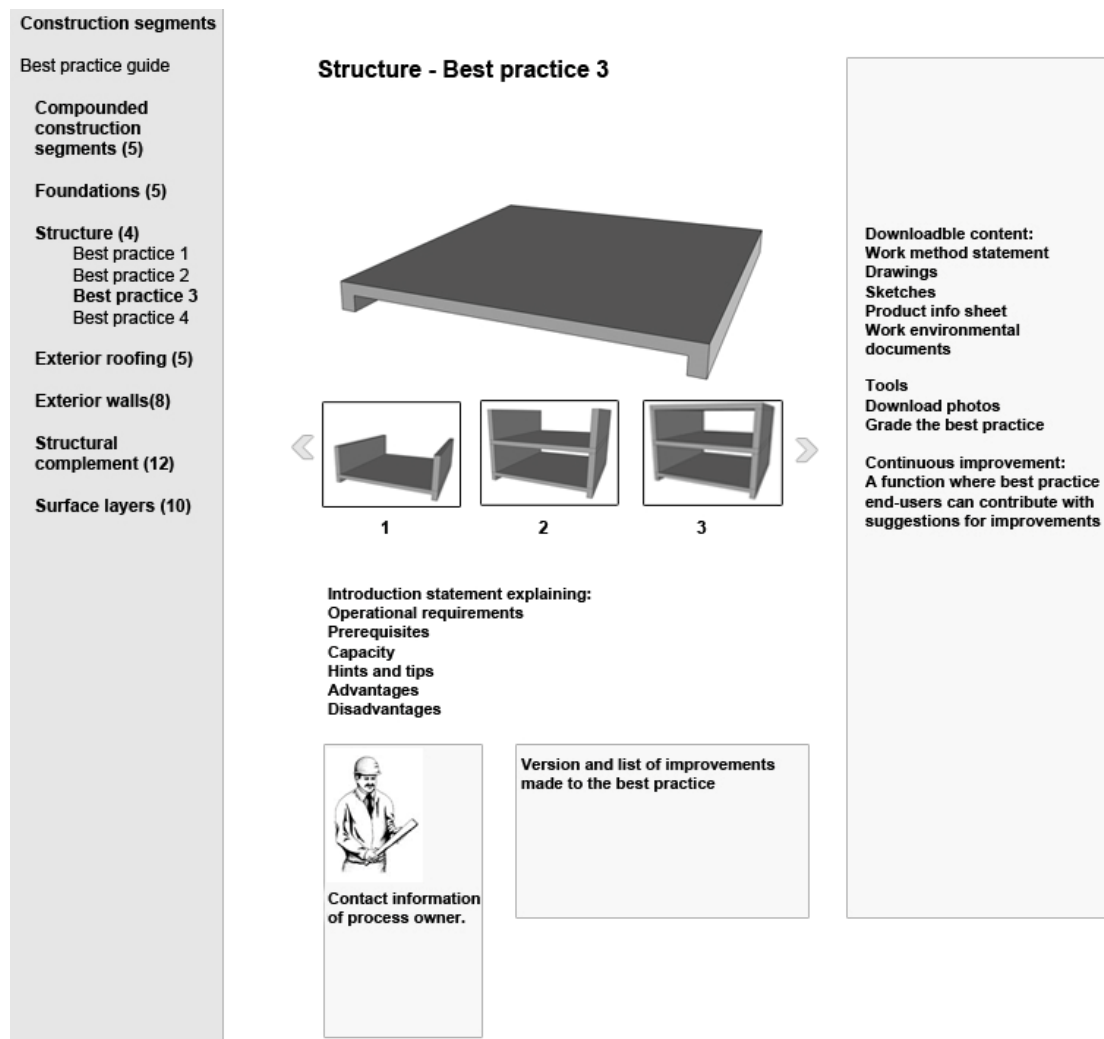


Figure 10 Proposal of best practice content and layout.

By utilizing the already existing and deeply rooted OneSkanska as the channel for distribution, no additional distribution channel is required thus facilitating application and availability for all employees. In order to easily find the intended best practice, the best practices will be catalogued under the same construction segments that are used in the production budgets; BSAB. The BSAB system is a commonly used structure for information in the construction sector. The system consists of codes and associated title that denotes different types of building components or production output. By using the same categorization of construction segments, coherency is

achieved throughout the organization hence minimizing confusion. To clearly guide the user, the number of available best practices is presented under each construction segment. In addition, there is also a best practice guide which explains how the best practice should be used in the construction projects. This guide functions as a “reader manual” thus explaining how the inherent documentation should be used.

Best practice content

One of the three cornerstones of the best practice is the online photo slide-show explaining the work procedure of that particular activity. To make the photo slide-show even more descriptive, photos must be selected carefully thus presenting the vital parts of the work procedure. In addition, a descriptive text is embedded in the photos, highlighting key issues throughout the work process. Each photo represents one step of the work procedure which is also described in the work method statement. Furthermore, photos could also be used to display difficult technical solutions and details. Although a movie may constitute a better base for communicating the scope of the work procedure we argue that, if selected carefully, photos could be just as good. Yet, if production personnel strongly argue for movie format instead of photos, such arguments must be considered. As employee buy-in is what determines success of best practice adoption, employee demand must always be carefully considered. However, if comparing the photo format with video, there are several advantages:

- First, presenting a best practice in photos implies that basically everyone within the organization has the skills to compile a best practice. Hence no additional training is required.
- Secondly, as time is a scarce commodity for production personnel, photos require less editing hence less time is necessary. Also future improvements will be easier to conduct as it only requires new photos.
- Third, if necessary, photos can beneficially be printed and then brought out on the construction site. This opportunity is not available for videos.

The second cornerstone of the best practice contains an introductory text presenting a capacity, e.g. m² per hour, if that is possible to determine. Also prerequisites that need to be fulfilled in order to conduct the practice are explained. If the ambition is to utilize the practice to a great extent, it is important that these prerequisites are considered already when planning the preceding activities. If there are any hints or tricks that deserve special attention these are also brought to light here. Finally, pros and cons related to the practice are briefly discussed. Other aspects considered as particularly important, such as operational requirements, should also be presented here.

The third cornerstone of the best practice is the work method statement. This document, which is already deeply rooted in the Skanska operational manual, explains each step of the activity in greater detail as well as prerequisites, risks and countermeasures. In addition it also states what resources are required in terms of labor, machinery and materials. If presenting a best practice for a floor structure, the work procedure shall span from initial activities to assembly and final concrete pouring, hence covering all the activities which constitute the work method. As the work method statement is already widely used within the construction projects, no

additional documentation, apart from photographing, is imposed upon the production personnel. Due to their already limited amount of time, this fact is of great importance to achieve participation and commitment to the initiative. If the best practice could gain from any additional documentation, e.g. drawings or sketches, such could also be included.

To determine whether the practice is perceived as successful among others within the organization, there is also a possibility to grade the practice. For the process owner, this grading will potentially figure as a possible source of recognition in terms of an extrinsic reward.

To facilitate continuous improvements there is an online guide for sending improvement proposals to the process owner. As this manual governs the level of documentation, this minimizes the risk of low quality improvement proposals. The format guidelines also facilitate the work of the process owner when he/she shall revise the proposal. If best practice improvements are conducted, revisions and a short description of what has been changed in each revision are presented under the revision heading.

Finally, the process owner of the best practice is presented. This is not included only as a contact for improvements, but also to provide a possibility for exchange of tacit knowledge. If a best practice user does not understand or requires more information, there is a possibility for the user to contact the process owner.

6.5 Application

When applied in the construction projects, the scope of how best practices will be used will vary quite a lot. As the nature of different projects differs, this implies that it will be difficult to use best practices without any adaption. However, using the best practices without any adaption is not intended. It will never be mandatory to directly copy a best practice. Nevertheless, in some situations adoption without adaption may be beneficial. If a best practice user is not aware of any better practices and if the best practice is aligned with project conditions, it should be applied directly without adaption

As it will not be mandatory to use the best practice, the question remains how best practices should be used. Again, as the work method statement is deeply rooted as a planning tool, the best practice should be used as an input to construction production activity planning meetings where the work method statement is compiled. By using the best practice as such input; this implies that there immediately exists a method to discuss around. As the best practice is a method that has proven superior results within other parts of the organization, adapting the practice to the conditions of the project would in most cases be beneficial. Consequently there is reduced need for re-inventing the wheel when a well functioning method, validated by both the Work Environmental- and the Technology and Design Department, can be applied. By spreading and adopting these practices throughout the organization, there is a great potential for improving organizational performance, both in terms of productivity and quality. From an organizational perspective, the capturing of best practices mean that

future organizational performance will be less affected by employee turnover as knowledge, to a certain extent, will be tied to the company instead of its individuals.

To increase the likelihood of best practice adoption among the construction projects, best practices should be included as a standing point in the initiation card; a checklist that is mandatory to go through before on-site construction production starts. As the scope of the project is analyzed before production starts, this provides an opportunity to identify the activities of the project and then determine whether there exist best practices for these. By doing so, the project team should state an ambition level concerning to what extent best practices will be used.

To further highlight the notion of best practices, issues related to best practices should be continuously emphasized throughout the organization. As there already exist an intranet, regional magazines and newsletters within the company; we believe that new best practices or successful results derived from using best practices should be presented through such channels. For example, a short notice presenting one project that has used the best practice of someone else and consequently improved their performance would provide recognition to both process owner and user but also provide a success story to the rest of the organization. By giving recognition to those engaging in best practices, this could figure as an extrinsic reward. In addition, best practices should also be emphasized within the development groups as well as at management meetings and regional days. Hence, top management continuously nurtures employees with the benefits and importance of engaging in best practices.

Besides from the business units where construction projects are undertaken, adopting best practices also poses a future potential for the Technology and Design department. By consulting best practices, employees at this department are provided with information concerning how their technical solutions are produced at the construction site. In addition, if best practice capacities get quality assured in the future, there is also a possibility for the Cost Estimation Department to use these capacity figures when preparing their bids.

6.6 Continuous Improvements

Most likely, it is hardly possible to overemphasize the importance of continuous improvements when initiating a best practice initiative. As the construction industry is constantly subject to change in terms of regulations, technological innovation and other new inputs, best practices need to be revised and improved in order to stay up-to-date. To accomplish improvements, there must be guidelines governing how to conduct these. In this model there are two approaches for conducting improvements; one where all employees continuously can propose suggestions for improvements and one where the regional best practice teams are allocated improvement responsibilities.

As on-site construction personnel is frequently under time pressure, with the implication that a small amount of time is available for continuous improvements, the regional coordinator should be allocated time to visit projects where best practices have been used. At these meetings, the coordinator shall follow up on best practice application in order to gather proposals for improvements. If such are identified, the

coordinator himself should have the authority to carry on with the improvement process by contacting the process owner.

How the implication of best practices affects continuous improvements

Not only is the implication of best practice vital for the design and conducting of a best practice approach, the implication is also important for the possibility of conducting continuous improvements. If adopting the current best practice definition of Skanska Sweden, which basically implies that a best practice is the currently best known way of conducting a specific construction production activity, this will obstruct spontaneous improvement proposals from co-workers as there is a greater chance that the best practice is the *best* practice. However, if adopting the best practice implication proposed by us, this would imply greater opportunities for co-workers to contribute with improvement proposals as it is easier to improve a good practice than the *best* practice. Nevertheless, continuous improvements is not something that should be conducted for the sake of conducting it, but the fact remains that continuous improvements work as a means of involving and creating commitment among those that are not members of the regional best practice teams. Thus, it is of utmost importance to provide them with the opportunity to propose improvement suggestions. In conclusion, the implication of best practices proposed by us will facilitate continuous improvements to a greater extent than the current definition.

Spontaneous improvements

As aforementioned, anyone within the organization has the possibility to send an improvement proposal to the coordinator who discuss the suggested improvement with the process owner. At OneSkanska there is an online guide for submitting such proposals which could include photo, work method statement or other documentation. Depending on the scope of the improvement, the amount of documentation is to be decided by the one sending the proposal. When the proposal is received, the coordinator and the process owner could, depending on scope of improvement, either accept or deny the improvement if it is a minor change or, if the change is profound, discuss the proposal with his regional best practice team. If the improvement is accepted, the improved best practice is sent to the regional coordinator from the Production Support department who, if the team finds it necessary, sends it to the Technology and Design and Work Environmental departments for approval. This procedure is basically the same as the one for developing new best practices.

Controlled improvements

To make the supply of best practices relevant for on-site construction personnel, there must be a certain volume of best practices available. Hence, focus throughout the first years should mainly be to achieve such a volume, but nevertheless still focus on improving the already developed best practices. When a sufficient volume is accomplished, e.g. 80 % of the production costs in the accumulated production budget or when there is no additional demand from the regions, the national coordinator should govern the regions towards controlled improvements instead of further

developing new best practices. Although there are routines for continuous improvements, these do not mean that improvements will be continuously conducted. This fact has been identified in one of our case studies where no improvement proposals have been submitted by individuals outside the best practice teams. With this in mind, we propose to introduce the concept of controlled improvements where the regional best practice teams should be allocated improvement responsibilities. Instead of delegating responsibilities of best practice creation, the regional groups should instead be assigned the responsibility of improving the existing best practices. In addition, to include national differences, one region should improve best practices created at other regions. To accomplish this, the proposed meeting structure is also able to incorporate such controlled improvements. The process is described below and presented in Figure 11:

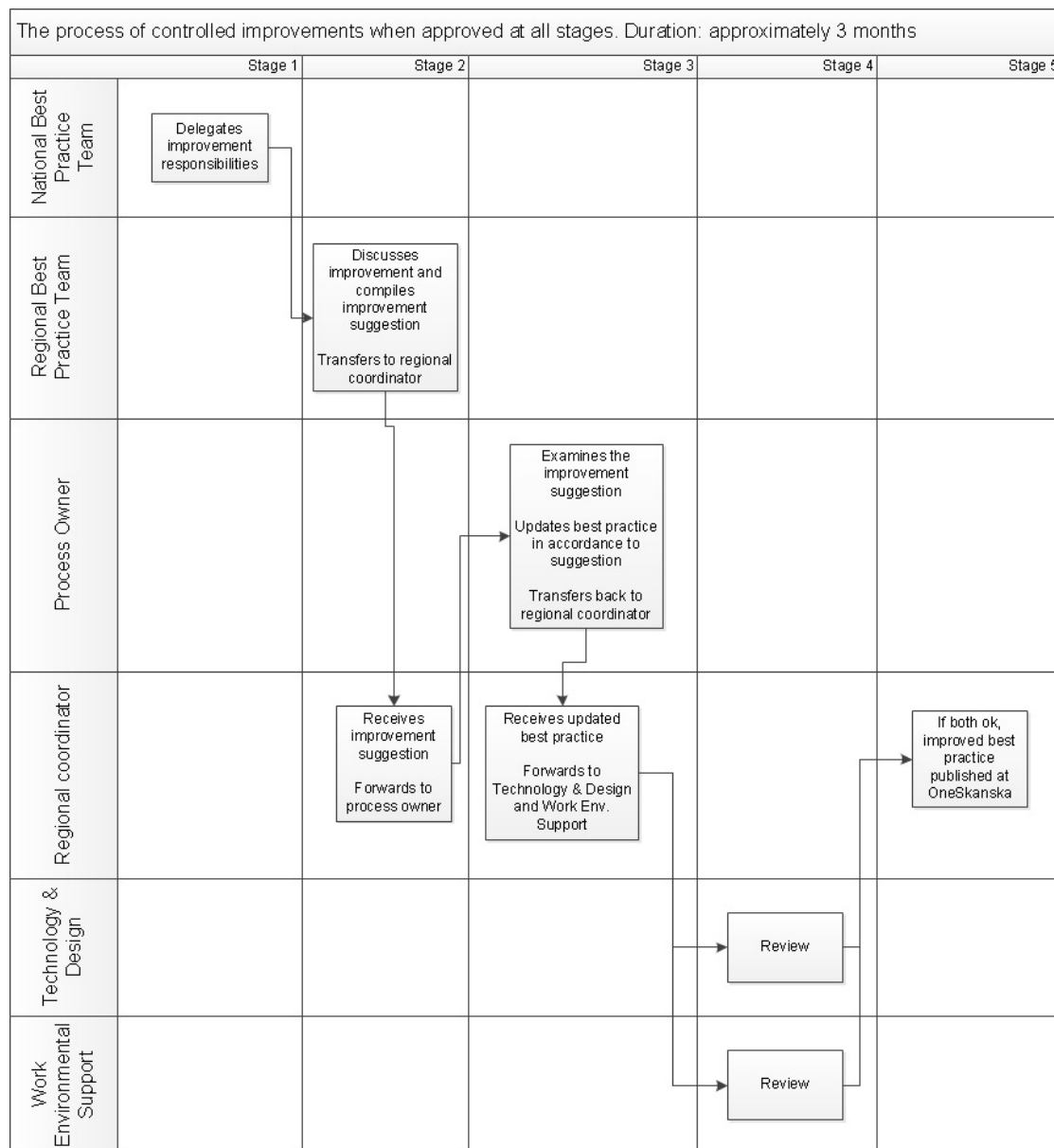


Figure 11 The process of controlled improvements.

Stage 1 At the national meetings, improvement responsibilities for a specific set of best practices are allocated to specific regions.

Stage 2 At the regional meetings, the set of best practices are reviewed and discussed. If only minor changes are suggested, these are directly documented. However, if the improvement implies a major change, e.g. an entirely new work method thus requiring new documentation, the task of doing so should be allocated to one of the team members. Despite the scope of improvement suggestion, this is transferred to the regional coordinator who in turn forwards the improvement suggestion to the process owner.

Stage 3 The process owner then, depending on the scope of improvement, either immediately updates the best practice or discusses the suggestion on the next regional meeting. When the improvement is conducted, the process owner transfers it to the regional coordinator who forwards the suggestion to the Work Environmental and Technology and Design department for approval.

Stage 4 If both ok, regional coordinator receives approved suggestions.

Stage 5 Regional coordinator publishes improved best practice at OneSkanska.

Photos facilitate improvements

In general the reliance on photo constitutes profound simplification compared to video, not only for the creation of new best practices but also when discussing continuous improvements. First, almost everyone can handle a digital camera. This is not the case when discussing video cameras and the following video editing which is required to compile several video clips into one video file. Second, the reduced need for additional handling means that compiling an improvement proposal will require little additional time from production personnel. Basically, the only document production personnel have to produce to propose a major improvement is the work method statement. However, this documentation is already something that the production personnel is expected to compile as part of their job description. Hence, little additional work is required thus increasing the likelihood of continuous improvements.

Table 3 Typical best practice-related activities conducted during the first year.

Typical best practice-related activities conducted during the first year						
Month Level	December/ January	March	April	June	August	October/ November
National level	BP-team meeting. Outcome: regions are delegated responsibilities for BP creation.		BP-team meeting. Outcome: status update and new responsibilities delegated.		BP-team meeting. Outcome: status update and new responsibilities delegated.	
Regional level	BP-team meeting. Outcome: nominate process owner who creates a BP draft.	Feedback/review session. Outcome: improvements to the BP drafts.	BP-team meeting. Outcome: nominate process owner who creates a BP draft.	Feedback/review session. Outcome: improvements to the BP drafts.	BP-team meeting. Outcome: nominate process owner who creates a BP draft.	Feedback/review session. Outcome: improvements to the BP drafts.
Total number of produced best practices throughout one year ≥ 32						

6.7 Estimated financial implication of best practice application

In order to emphasize what costs the proposed best practice approach poses a possibility of reducing, we have utilized general statistics regarding the construction process, presented by the Swedish Construction Federation (Sveriges Byggindeindustri, 2009). The statistics, which represent costs in a Swedish housing project, divide these into three categories; production-, client- and contractor costs, see Figure 12. First, the production cost constitutes the total cost for conducting a construction project; value added tax, construction client- and contract costs. In particular, construction client costs concern design, credits, insurances and the client's cost for administration. The contractor costs are explained in Figure 12.

The best practice approach offer the opportunity of reducing some of these costs; however, not all. As the best practices developed will only concern on-site construction production activities, the initiative predominantly poses a great possibility of reducing craftsmen costs. In addition, as the costs for officials, sub-contractors and common expenditure are, to a great extent, connected to costs for craftsmen also these could be reduced.

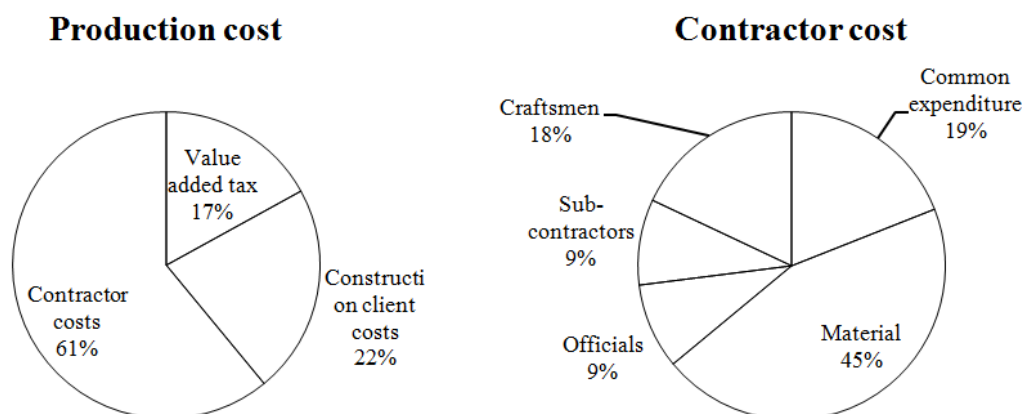


Figure 12 Production and contractor costs in a Swedish housing project (Sveriges Byggindeindustri, 2009).

What does this mean for a building region within Skanska Sweden?

To illustrate an example of what the proposed best practice initiative means to one of the eight building divisions of Skanska Sweden, an estimation of costs and potential costs savings if adopting the proposed best practice approach is presented in Appendix 1. In this estimation, the numbers of the Building Division, Gothenburg Region is applied. All in all, the estimation shows that:

- The cost operating the initiative in one year is 679 KSEK per region, i.e. 5.4 MSEK for the entire Building Division of Skanska Sweden.
- The cost for developing one best practice is 170 KSEK and implies in average a required time of 275 hours.

- The required time for the involved personnel varies between five to ten days per year.
- If the application of best practices results in an approximate increase in productivity by 1.2 %, a cost break-even level is reached.

6.8 Conclusive statements to Skanska Sweden

To conclude our proposed best approach, this section aims at providing Skanska Sweden with some arguments *why* our proposition is what we believe the most suitable as well as a brief action plan on how to initiate and operate the best practice initiative for the following five years.

First off, we have developed and compared three possible approaches; each with their specific advantages and disadvantages. Naturally, all of these provide different benefits depending on what perspective one is looking at them but we believe that our proposition is what can provide the largest potential for quickly creating a large volume of practices which can be applied company-wide. Furthermore, we believe that the broad mass of end-users are more likely to commit to the initiative as it is communicated both on a national and regional level. Also, the proposed approach provides the benefit of conducting *controlled improvements* thus ensuring that the practices created are more likely to incorporate the best practice in the future. Below is a list of the various advantages and disadvantages which we have identified for the proposed approach.

Advantages

- + The national business plan of Skanska Sweden states that best practices should be developed and applied, but without a clear strategy how to achieve this. Our proposition suggests a suitable approach on a national level that can assist in reaching that goal.
- + All regional departments have a desire to introduce best practices, but without a clear strategy and, for some regions, even lack of a strategy. Our proposition suggests a suitable approach on a regional level.
- + An organizational-wide catchment area poses a potential that knowledge from a great number of people can be shared across the country.
- + A high input-output efficiency of 1:8 where one region creates one best practice and gets access to seven best practices produced at other regional departments.
- + The best practices created directly become national; there is no need for each regional department to develop their own best practices.
- + A large volume of best practices is quickly created at a defendable cost.
- + A structured approach with clear responsibilities for each best practice team; it is clear how best practice should be identified, created, distributed, applied and continuously improved.
- + As best practice development takes place at the regional level, it is more likely that end-users who are not members of the best practice team become committed to the initiative.
- + There is a possibility to create a large supply of best practices covering all large construction production activities and their variances.

Disadvantages

- The approach requires the involvement of a large number of people; around 60 employees should be participating.
- All regional departments must engage in the initiative and they should be equally committed.
- Geographical and organizational differences between regions such as traditions, culture and geological conditions are not incorporated in the best practices initially created. However, these differences will be included when conducting controlled improvements.
- The proposition requires several individuals from the production support department who dedicate half or all of their work-time to the initiative. A large portion of the costs to develop best practices derives from the cost of these individuals. Nevertheless, they are crucial to achieve a functioning approach.

Throughout this study, the limitation has been to only focus upon diffusing best practices for construction production activities. However, it must be noted these activities constitute merely a small part of the widespread activities conducted within different parts of the company and the construction process. Hence, we see several possible areas where best practices could improve performance and simplify daily operations. As for on-site construction, several activities are conducted, which do not provide any value adding work but are nevertheless required to enable a functioning production; e.g. construction surveying and receipt of goods, could also gain from best practice development. Furthermore, outside the construction site, a vast amount of areas can be identified where best practices could improve performance; e.g. finance, cost estimation, engineering, HR and IT. We believe a similar approach as presented in this chapter could be adopted when diffusing best practices for these areas.

Focus areas for the first five years of the best practice approach

To increase the likelihood of best practice success, we have chosen to outline focus areas for the first five years. A short summary is presented in Table 4.

Year zero is primarily included to highlight the start-up preparations we interpret as important. As the heart of the initiative will be the best practice team members, it is of great importance that the regional management appoint the right personnel. This means that those who want to engage in the initiative but also are perceived as role models within the organization should be selected. However, these are not necessarily the most competent individuals within the organization. By selecting individuals possessing the aforementioned characteristics, committed groups are achieved. Furthermore, as these individuals are role models within the organization, they will act as opinion leaders. When these individuals have been identified, they will be informed about the structure and organization behind the initiative but also given the opportunity to raise their thoughts. Next, both regional and national best practice teams will conduct start meeting where objectives, strategies and meeting routines are discussed.

During the first year, the groups must also strive towards finding appropriate meeting routines. Our proposed meeting schedule and agenda ensures that additional time is allocated for the best practice initiative. However, it is unclear how our proposed meeting structure will be perceived among the production personnel which will constitute the best practice teams. As the main task of on-site personnel always will be production, the best practice initiative must acclimatize to this context.

In order to make the available best practices relevant for the production personnel, it is of great importance that an adequate volume is created. Consequently, the main focus of the first two years must be to create such a volume. As the purpose behind the initiative is to increase productivity, activities in need of best practices should be identified by an accumulated production budget presenting either the accumulated man hours or costs. However, as acceptance among production personnel will determine the success of the best practice initiative, best practices wished for by production personnel should continuously be considered. When a certain percentage of the accumulated production costs are covered by best practices, another proper identification criterion is costs deriving from quality defects. Furthermore, it should also be adequate to create best practices for the already existing standard technical solutions, e.g. outer walls and floor structures etc.

On a regular basis throughout the initiative, top management as well as best practice team members must continuously nurture the rest of the organization with information and the implication of best practices. As only a minority of the organization will be involved in the teams, this means that this minority will develop the best practices that the majority of the organization will use. By spreading the word of best practices to the rest of the employees, e.g. various development groups, but also take the opinions of these into consideration, we argue that the risk of making best practices to something that only belongs to the “exclusively-involved” is prevented.

As mentioned earlier, best practices must be improved in order to stay up to date. Although there are routines for continuous improvements, this does not guarantee that such are conducted. Therefore, controlled improvements will be introduced when a desired volume of best practices is created, preferentially around the third year as approximately 60 best practices should have been developed at this time.

Table 4 Focus areas during the first five years.

Year 0-5, what should be the focus?					
Year 0 (2011)	Year 1	Year 2	Year 3	Year 4	Year 5 (2016)
<ul style="list-style-type: none"> – Ensure that key personnel are selected for BP-teams – Inform team members about BP initiative – Conduct start meetings 	<ul style="list-style-type: none"> – Create a volume of BPs – Identify by needs and accumulated production costs – Find suitable group routines – Communicate BPs on regional level 	<ul style="list-style-type: none"> – Create a volume of BPs – Identify by needs and accumulated production costs – Communicate BPs on regional level 	<ul style="list-style-type: none"> – Create BPs – Identify by needs and accumulated production costs – Introduce controlled improvements – Communicate BPs on regional level – Introduce national “e-meetings” 	<ul style="list-style-type: none"> – Create BPs – Identify by needs and costs for quality defects – Conduct controlled improvements – Communicate BPs on regional level 	<ul style="list-style-type: none"> – Create BPs – Identify by needs and standard technical solutions – Conduct controlled improvements – Communicate BPs on regional level

7 Conclusion

To address the purpose of the initiative; developing a suitable best practice approach for the Building Division of Skanska Sweden, we stated two research questions. First, how should an approach for sharing practices be outlined and secondly; what are the success factors and barriers for diffusion of practices? However, in this conclusion, these questions will not be *directly* answered as we have already responded to these in the findings and discussion chapters. Instead this conclusion will emphasize our main findings, which we argue are of most importance when initiating and conducting a best practice approach within the Building Division of Skanska Sweden. Accordingly, this chapter will revolve around our four main conclusions.

The objective and implication of a best practice approach are fundamental cornerstones

From our two case studies we have concluded that both the objective of a best practice approach as well as the implication of a best practice are fundamental cornerstones for diffusing best practices. If not carefully assessing these aspects, we doubt that a best practice approach will deliver desired results. For instance, if the objective is to develop best practices we argue it is necessary to conduct a structured approach, i.e. clear processes, organizational functions and responsibilities. On the contrary if the purpose is to share knowledge, an open and organic approach is more suitable, since it places less emphasis on content and quality, thus facilitating knowledge sharing.

As for the Building Division of Skanska Sweden, which seeks to initiate best practices to raise productivity, it is necessary to capture well functioning practices and spread these to a great number of projects. Only by accomplishing this, productivity will gain. To increase the likelihood of such productivity improvements, it should be prioritized that the approach comprises the entire Building Division.

Next, the implication of the terminology *best practice* is central for how the best practice approach should be conducted. As the implication determines what to accomplish when developing a best practice, this poses a strong influence on how the best practice will be developed. For Skanska Sweden, we argue for the following definition of a best practice:

A good practice, which through continuous improvement, strives towards becoming the best known practice.

Although we recommend a new implication of the best practices, we still argue for the preservation of the terminology *best practice* as it is a commonly accepted term. By adopting the proposed implication, this implies that the process of creating best practices will be subject to less bureaucracy and instead enable empowerment among involved personnel. In addition, there will be a great potential of quickly creating a large volume of best practices as well as facilitating continuous improvements.

In addition, a best practice approach should not be interpreted and communicated as a temporary project but rather as a continuous process of improving organizational performance.

Our proposal for best practice diffusion – A national/regional approach

When developing an approach for best practice diffusion, specific features of the intended organization as well as the overall purpose must be carefully assessed. From our case studies, we identified four important aspects, which a best practice approach within the Building Division of Skanska Sweden must enable. We argue that the proposed approach enables all of these:

- **Strong local commitment:** Local commitment is achieved by letting regional personnel decide upon for what activities best practices are needed as well as regional teams create best practices. In addition, these team members will regionally figure as opinion leaders thus facilitating local commitment.
- **Large catchment area:** A large catchment area provides a strong possibility of improving productivity as the size of Skanska Sweden enables a large knowledge base but it also implies a great number of projects acting as receivers of best practices.
- **High efficiency, i.e. input-output:** The proposed approach entails the possibility of quickly producing a large volume of best practices, which is a prerequisite for achieving Skanska Sweden's objective of best practices; productivity improvements.
- **Little burden for the involved production personnel:** Due to the nature surrounding on-site construction, where time is a scarce commodity, creation of best practices are not allowed to imply loads of additional work. Instead, work related to best practices must, to the extent possible, be incorporated within activities that are already conducted. Therefore, the proposed approach broadens the responsibility of creating best practices to a large number of employees thus implying less time per employee and best practice created.

Five stages of a best practice approach

In literature, there is little coverage of the inherent stages of a best practice approach. Derived from our study, we have concluded a best practice approach to incorporate the following five stages which constitute the basis for best practice diffusion.

- **Identification** – An activity or process suitable for best practice development is identified via context-dependent selection criteria.
- **Creation** – Best practices for specific activities or processes are developed.
- **Distribution** – The best practices are distributed and made available to the concerned employees.
- **Application** – Personnel within the organization apply the best practices.
- **Continuous improvements** – The best practices are improved by incorporating new experiences and knowledge into the best practices.

These five stages constitute a generic framework for best practice diffusion, where the main stages are generally applicable for any organization or industry. However, it must be noted the embedded processes of each of the five stages are context-dependent. Throughout this master thesis, we have given construction-contextual real-

life examples and proposed processes to each of the five stages; this is something which we consider as our main contribution to contemporary knowledge management literature.

Continuous improvements – introduce the concept of controlled improvements

Continuously improving existing best practices within an organization is a particularly important stage in best practice diffusion. As most industries are constantly exposed to change in terms of competition, technical innovation and new regulations; best practices must be continuously improved to remain valid and valuable. Consequently, continuous improvements ensure the best practice initiative not to fall into oblivion, thus continually proving its right to exist.

Continuous improvements are particularly important if adopting the implication of best practices we propose; the best practice is not necessarily the best known method, but rather a well-functioning one. Hence, best practices created with this implication rely to a large extent on improvements in the strive for becoming the best known method.

For the Building Division of Skanska Sweden, we strongly advice to adopt the concept which we refer to as controlled improvement. In short, this concept implies that the best practice teams are delegated the responsibility to, apart from creation, also improve the existing best practices. We have introduced this concept since our case study of the Civil Division has shown that despite existing routines, no spontaneous improvement suggestions have been posed by individuals outside the best practice teams. Conclusively, as continuous improvements constitute an important stage of best practice diffusion, allocating controlled improvements to the responsibilities of the best practice teams is a prerequisite for ensuring valid and valuable best practices.

7.1 Recommendations for further research areas

Throughout our study, we have encountered five areas, which we believe pose relevant subject for further research. We argue four of these areas to be specific to Skanska Sweden whereas one area proves useful to the field of best practice management.

Research topics for Skanska Sweden:

- **Evaluation of the best practice approach:** Skanska Sweden will, in some form, engage in best practice diffusion. Regardless the setup of the initiative, we believe a suitable topic for research is evaluation and follow-up of the best practice approach when it has rooted in the organization.
- **Effects deriving from applying best practices:** When the best practice approach has been adopted in the organization, one suitable research topic is investigating the effects of applying best practices on construction sites.

- **Strategy for implementing the best practice approach:** Initially, a best practice approach will mainly concern those who are directly involved in the initiative. A topic suitable for research is developing a strategy for how the best practices permeate the organization and reach all fractions of it.
- **Wider application of best practices:** In our research we have focused on using best practices in construction production only. However, there are other departments in Skanska Sweden where using best practices can provide great benefits; e.g. Cost Estimation Department and the Department of Technology and Design. A research topic could thus be to examine what aspects are important for best practices to be useful in these branches and how these could benefit from using best practices?

Research topics to the field of best practice management

- **Performance measurement:** Design productivity measurement tools and apply them in order to investigate the productivity improvements deriving from applying best practices.

8 References

- Adams, E. (2010). The joys and challenges of semi-structured interviewing. *Community Practitioner* , 83 (7), 18-21.
- American Productivity and Quality Center. (1999). *What is benchmarking*. Retrieved from American Productivity and Quality Center: www.apcq.com
- Bishop, J., Bouchlaghem, D., Glass, J., & Matsumoto, I. (2008). Ensuring the effectiveness of a knowledge management initiative. *Journal of Knowledge Management* , 12 (4), 16-29.
- Bygghälsögruppen. (2002). *Skärpning gubbar SOU 2002:15*. Stockholm: Regeringskansliet.
- Byggekostnadsdelegationen. (2000). *Från byggsekt till byggsektor SOU 2000:44*. Stockholm: Regeringskansliet.
- Conger, J. A., & Kanungo, R. N. (1998). The empowerment process: Interating theory and practice. *Academy of Management Review* , 13 (3), 471-482.
- Davenport, T. H., & Prusak, L. (1998). *Working knowledge - How organizations manage what they know*. Boston, Massachusetts: Harvard Business School Press.
- Epple, D., Argote, L., & Murphy, K. (1996). An empirical investigation of the microstructure of knowledge acquisition and transfer through learning by doing. *Operations Research* , 44 (1), 77-86.
- Gidado, K. (1996). Project complexity: The focal point of construction production planning. *Construction Management and Economics* , 14, 213-225.
- Granath, J., Svedlund, B., & Wiberg, M. (2009). *Scantias Produktionssystem - Inte bara för produktion*. Linköping: Linköping University – Institute of Technology.
- Hackman, R. J., & Wageman, R. (1995). Total quality management - Empirical, conceptual and practical issues. *Administrative Science Quarterly* , 40 (2), 309-342.
- Hertzberg, F. (1987). One more time - How do you motivate your employees. *Harvard Business Review* , 65 (5), 109-120.
- Holt, G. D., Love, P. E., & Nesan, J. L. (2000). Employee empowerment in construction: an implementation model for process improvement. *Team Performance Management: An International Journal* , 6 (3/4), 47-51.
- Imai, M. (1997). *Gemba Kaizen - A commonsense low-cost approach to management*. New York, NY: McGraw-Hill.
- Jarrar, Y. F., & Zairi, M. (2000). Best practice transfer for future competitiveness: A study of best practices. *Total Quality Management* , 11 (NOS 4/5&6), 734-740.

Josephsson, P.-E., & Saukkoriipi, L. (2009). *31 rekommendationer för ökad lönsamhet i byggandet - att minska slöserier!* Göteborg: Chalmers Tekniska Högskola, Centrum för management i byggsektorn avdelningen för Construction Management.

Josephsson, P.-E., & Saukkoriipi, L. (2005). *Slöseri i byggprojekt - Behov av förändrat synsätt.* Göteborg: Sveriges Byggindustrier.

Kerr, S. (1995). On the folly of reward A, while hoping for B. *Academy of Management Executive* , 9 (1), 7-14.

Liker, J. (2004). *The Toyota Way - 14 management principles from the worlds greatest manufacturer.* New York: McGraw-Hill.

Loforte Ribeiro, F. (2009). Enhancing knowledge management in construction firms. *Construction Innovation* , 9 (3), 268-284.

Love, P., & Li, H. (1998). Developing a theory of construction problem solving. *Construction Management and Economics* , 16, 721-727.

Lutz, J., & Gabriellson, E. (2002). *Byggsektorns struktur och utvecklingsbehov.* Stockholm: Byggkommissionen.

Mack, N., Woodsong, C., MacQueen, K. M., Guest, G., & Namey, E. (2005). *Qualitative Research Methods: A Data Collector's Field Guide.* North Carolina: Family Health International.

McKenzie, J., Truch, A., & van Winkelen, C. (2001). Winning commitment for knowledge management initiatives. *Journal of Change Management* , 2 (2), 115-127.

Mohamed, S. F., & Anumba, C. J. (2006). Potential for improving site management practices through knowledge management. *Construction Innovation* , 6, 232-249.

Nesan, J. L. (2004). Efficacy-information for implementing learning in construction. *The Learning Organization* , 11 (1), 45-66.

Nielsen, B. B., & Michailova, S. (2007). Knowledge management systems in multinational corporations - Typology and transitional dynamics. *Long Range Planning* , 40, 314-340.

Niklasson, C. (2011, April). Byggarmén. *Byggnadsarbetaren* , pp. 16-22.

Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-Creating Company - How Japanese Companies Create the Dynamics of Innovation.* New York, NY: Oxford University Press.

Nordström, U., & Revai, E. (2008). *Byggstyrning* (3rd edition ed.). Stockholm: Liber.

O'Dell, C., & Grayson, J. C. (1998). *If only we knew what we know: The transfer of internal knowledge and best practice.* New York: The Free Press.

- Reddy, W., & McCarthy, S. (2006). Sharing best practice. *International Journal of Health Care* , 19 (7), 594-598.
- Reh, J. F. (2005). Pareto's Principle-The 80-20 Rule. *Business Credit* , 107 (7), 76.
- Robinson, H. S., Carrillo, M. P., Anumba, C. J., & Al-Ghassani, A. M. (2005). Knowledge management practices in large construction organisations. *Engineering, Construction and Architectural Management* , 12 (5), 431-445.
- Rogers, E. M. (1962). *Diffusion of Innovations*. New York, NY: The Free Press.
- Santos, A., Formoso, C. T., & Tookey, J. (2002). Expanding the meaning of standardization within construction processes. *The TQM Magazine* , 14 (1), 25-33.
- Scarborough, H., Swan, J., & Preston, J. (1999). *Knowledge Management - A Literature Review (Issues in People Management)*. Trowbridge: Institute of Personnel and Development, The Cromwell Press.
- Simard, C., & Rice, R. E. (2007). The practice gap: Barriers to the diffusion of best practices. *Information Science and Knowledge Management* , 12, 87-123.
- Sirkin, H. L., Keenan, P., & Jackson, A. (2005). The Hard Side of Change Management. *Harvard Business Review* , 83 (10), 108-118.
- Skanska Sweden AB. (2011, May 6). *OneSkanska*. Retrieved May 24, 2011, from Presentation Skanska Sverige: Unpublished internal document
- Stone, D. L., & Eddy, E. R. (1996). A model of individual and organizational factors affecting quality-related outcomes. *Journal Of Quality Management* , 1 (1), 21-48.
- Sveriges Byggindustrier. (2009). *Fakta om byggandet 2009*. Stockholm: Sveriges Byggindustrier.
- Szulanski, G. (1996). Exploring internal stickiness - Impediments to the transfer of best practice within the firm. *Strategic Management Journal* , 27-43.
- Thompson, K. R. (1998). Confronting the paradoxes in a total quality environment. *Organizational Dynamics* , 26 (3), 62-74.
- van Beveren, J. (2002). A model of knowledge acquisition that refocuses knowledge management. *Journal of Knowledge Management* , 6 (1), 18-22.
- Wenger, E. (2004). Knowledge management as a doughnut: Shaping your knowledge strategy through communities of practice. *Ivey Business Journal* , 68 (3), 1-8.
- Wolf, P., Späth, S., & Haefliger, S. (2011). Participation in intra-firm communities of practice - A case from the automotive industry. *Journal of Knowledge Management* , 24 (1), 22-39.
- Yin, R. K. (2003). *Case study research: Design and methods*. Thousand Oaks, California: Sage Publications, Inc.

Yu, W.-d., Lin, C.-t., Yu, C.-t., Liu, S.-j., Luo, H.-c., & Chang, P.-l. (2007). Integrating Emergent Problem-Solving with Construction Knowledge Management System. *Proceedings of the CME 25 Conference* (p. 10). Reading, UK: University of Reading.

Appendix 1. Cost estimation – what could best practices generate?

This appendix is included to provide an estimation of how much it will cost to develop one best practice and what the best practice initiative could generate in terms of financial results. First, Table 5 explains the costs related to conducting best practice meetings throughout one year. As national meetings, but also regional meetings to some extent, will imply costs for travels etc. these additional costs must be included. In this estimation, these additional costs are included within the cost per hour and employee. However, for some regions, which operate on a rather small geographical area, the cost per hour may be too high.

Table 5 Costs for conducting best practice meetings for one year

Cost items	Meetings/Year	Meeting duration (h)	Number of individuals	Cost/hour, employee (SEK)	Cost/year (SEK)
National meetings	4	8	8	1000	256000
Regional meetings	8	4	64	1000	2048000
In total					2304000

The issues discussed and decided upon during the best practice meetings are not enough for the creation of best practices. Hence, the actual creation and review, performed by production personnel, takes place in between the meetings. As these activities will not require any additional costs, e.g. travels or accommodation, the cost per hour and employee is less than stated in Table 5. Also, it should be noted that the additional time for creating and reviewing best practices are amplified. Costs for activities in between meetings are presented in Table 6.

Table 6 Costs for conducting necessary activities in between best practice meetings

Cost item	Additional time/best practice (h)	Number of best practices/year	Cost/hour, employee (SEK)	Cost/year (SEK)
Creation/documentation	40	32	400	512000
Review	14	32	400	179200
Work environment and Technology review	8	32	400	102400
In total				793600

As mentioned several times in the report, one crucial aspect necessary for involving production personnel is to limit the amount of extra burden related to the best practice initiative. Hence, we argue that both local and national administration is necessary thus involving the Production Support Department. We estimate three additional employees will be required; one full time and three part time (in this estimation 50 % is used), all in all two and a half employee. These individuals will spend approximately 80 % of their time working from the office while 20 % of their time will be out in the field. Hence, two separate costs per hour are used, see Table 7.

Table 7 Costs for additional administration at the Production Support Department

Cost item	Percentage of total work time	Work hours /employee, year	Number of coordinators	Cost/hour, employee (SEK)	Cost/year (SEK)
Coordinator, regular work	80%	1800	2,5	400	1440000
Coordinator, with travels	20%	1800	2,5	1000	900000
In total					2340000

Table 8 summarizes the cost estimation in terms of total costs, related to the best practice initiative, for Skanska Sweden in one year. Numbers for total costs and hours as well as costs and hours per best practice are presented.

Table 8 Total costs for Skanska Sweden AB in one year

Cost item	Cost (SEK)	Time (h)
Meetings	2304000	2304
-national	256000	256
-regional	2048000	2048
Creation process	793600	1984
-Creation	512000	1280
-Review	179200	448
-Add. review	102400	256
Administration	2340000	4500
In total	5437600	8788
Cost and hours / best practice	169925	275

Next, it would be interesting to further examine what these numbers mean to a specific building region, see Table 9.

Table 9 Cost related to the best practice initiative on a regional level

Cost item	Cost
Total cost	5437600
Cost per region	679700

Finally, the question what the best practice initiative will generate is addressed in Table 10. In this example, the numbers of the Building Division Gothenburg Region are used. As the construction production activities affected by the proposed best practice approach only affects the activities conducted by own Skanska personnel, only the numbers of Skanska craftsmen will be touched upon. Within this region, 130 craftsmen would be affected. These work 1750 hours per year which all in all brings about 227 500 hours. The cost for employing these craftsmen is 312 SEK per hour.

Table 10 Potential cost savings deriving from the best practice initiative at the Building Division, Gothenburg Region

Item	Time (h)	Cost (SEK)
Craftsmen hours / year	227500	70980000
Assumed that BPs will cover 80 % of total craftsmen hours	182000	56784000
If increasing productivity by:	Saved time	Reduced costs
<i>1 %</i>	<i>1820</i>	<i>567840</i>
<i>1.2 % (break-even)</i>	<i>2180</i>	<i>679700</i>
<i>5 %</i>	<i>9100</i>	<i>2839000</i>
<i>10 %</i>	<i>18200</i>	<i>5678400</i>

Deriving from Table 9 and Table 10, it is concluded that an increase in productivity by 1.2 % will imply break-even. Again, it is important to remember that these calculations only concern the effects on craftsmen hours. In real life, also site management hours, common project costs and cost deriving from warranty claims could be reduced by applying best practices.

Although these numbers are extremely difficult to determine in advance, the estimation provides an indication that the proposed approach most likely will deliver a positive financial result. In Table it is estimated that 80 % of the activities conducted by Skanska craftsmen will be covered by best practice. In this example, it is important to remind that such a volume of best practices will probably not be achieved during the first three years of the initiative. Consequently, until this volume is achieved, the initiative will probably be a no-win project. Also, it assumes that the best practices will be used in all projects. Immediately, this is most likely not the case. However, after continuous improvements have been conducted, the level of best practice adoption will increase as the quality of practices increases.

