Competence Management Systems
Implications for operative resource allocation

Master of Science Thesis
in the Quality and Operations Management Programme

JOHANNES BERGLIND SÖDERQVIST
OSCAR KÖÖHLER

Competence Management Systems

Implications for operative resource allocation

JOHANNES BERGLIND SÖDERQVIST
OSCAR KÖÖHLER

Tutor, Chalmers/GU: Rikard Lindgren

Competence Management Systems
Implications for operative resource allocation

JOHANNES BERGLIND SÖDERQVIST

OSCAR KÖÖHLER

Abstract

In a world of ever increasing technological diversity and an advancing 'internet of things', business landscapes are changing. New conditions alter the way in which competence resources are regarded and how they need to be managed in order for organizations to sustain as successful actors in a knowledge economy. Information systems play an increasingly important role in this new setting, including competence management systems for handling information concerning competence resources. In order to explore these new conditions for competence management this study takes a closer look at how the service delivery organization of Company X handles competence resources and considers how it can improve its operative competence management system. A pragmatic and customer-oriented approach to competence management systems is taken, guided by a thorough study on the subject by Lindgren *et al.* (2004).

A historical outlook on how competence management systems at Company X have developed over time serves as a basis for deducing how a corresponding idea of the role of competence and competence resources has developed over time in different parts of the organization. Also, a case study is carried out covering the demand and supply side of competence resources within Energy & Utilities, a business area that illustratively can represent developments of the business landscape and Company X's approach to navigate it.

Through the study the authors find that information regarding contextual experience can serve as carrier for rich competence descriptions that facilitate for requestors of, and the holders of, competence in the matching of demand and supply. It is also suggested that such information plausibly could be semi-automatically generated through the recurrent specification of new project roles.

Acknowledgements

Table of Contents

Table of Figures

Table of Tables

Nomenclature

Architecture	Division of interviews concerning system support and external limitations
CCM	Career and Competence Model
CM	Competence Management
CMF	Competence Management Framework
CMS	Competence Management System
Demand	Division of interviews concerning demand of competence resources
DISCO	The Dictionary of Skills and Competences, EU-standard
E&U	Energy and Utilities, a subsection within Industry and Society
TOOL 1	System, Employee and Manager Self Service
FA	Functional Area, a logical grouping of competences driven by business needs and development
FA SD	Functional Area Service Delivery, the part of Company X's organization that is responsible for delivering services to customer
HR	Human Resources, HR is a Functional Area
TOOL 2	System, Human Resource Management System
I&S	Industry and Society, a business line operating within functional area service delivery
IS	Information System
TOOL 4	System, Integrated Talent Management system
TOOL 5	Upcoming system for handling competence information within Service Delivery
TOOL 3	System, Current resource allocation tool
O*NET	Occupational Information Network, USA-standard
Supply	Division of interviews concerning supply of competence resources

1 Introduction

This chapter will introduce the reader to the setting in which this study has been carried out. First a brief background followed by the purpose and research questions that will guide the entire study. Lastly, delimitations and an outline of the report structure will be presented.

1.1 Background

Increasingly networked societies, an ongoing globalization and an ever growing diversity of commercialized technology make the flexibility that allows a company to exploit new business opportunities highly valuable. Company X as a company is going through a transition moving from a product centric company towards a solution centric state where products have gone into a more supportive role and services and solutions are becoming the main business. Other essential parts of the transition are the move towards software and cloud solutions as well as entering other, new market segments than traditional telecom industry. Nowadays much of the services at Company X are carried out online without physically moving employees and other resources.

The changing market and business landscapes significantly change the requirements on the organization from a competence perspective as well as ways of working. One might argue that this change in requirements pronounces an ongoing general transition in perspective on workforce from job-oriented to knowledge-oriented. Even though manners of organizing industrial activities have evolved significantly since the predominant Taylorism during the industrialization (Comstock & Winroth, 1999) the corresponding perception of work and employees have, according to Lindgren *et al.* (2003), to some degree persisted into the 21st century. They further call for a change of this perception and a corresponding change in the way competence is being managed in large organizations. Two decades ago Lawler (1994) argued that given the changing business environment for many organizations there is a need to stop thinking about competence around a relatively fixed job description and to start focusing on individuals and their competencies. Competency modeling became the answer to this need for change and in more recent years Stevens (2013) reviewed the scholarly work on the subject. He found that it is important that a competency model is tailored to its *context* and *purpose* and that such a model by no means is a 'quick fix'.

Competence management is generally intended to be facilitated through a competence management system (CMS), essentially an information system (IS) for handling competence information. The recently founded term sociomateriality (Orlikowski & Scott, 2008) is relevant with respect to IS since it involves both machines and human participants (Alter, 2008). Like competence models, technology needs to be considered in its social and organizational context (Orlikowski, 1992). Intending to address the need for extended knowledge about the relation between social setting and technology, Wanda J. Orlikowski and Susan Scott advocate the term sociomateriality as central for IS and organizational research (Orlikowski, 2007; Orlikowski & Scott, 2008; Orlikowski, 2010).

Company X is traditionally considered a technology oriented organization (Hustad & Munkvold, 2005) and is amidst the changes that make Stevens (2013) call for tailored models

for handling competence. To put careful considerations into the design and development of systems to manage competence for Company X in their ongoing transition is therefore highly relevant for the organization and an interesting case to study from a CMS perspective. Partly inspired by the work of Wanda J. Orlikowski, Lindgren *et al.* (2004) developed a set of design principles for handling a life-cycle perspective on competence in a CMS which serves as a guiding theoretical framework for the present study.

1.2 Purpose

The business landscape and strategic choices of Company X have made the organization face operative challenges in terms of handling competence resources in the context of allocation. This puts pressure on the current CMS design at Company X in general and for the service delivery organization in particular. When new sub-systems for the CMS are underway to be implemented it is consequently of high interest to explore how the CMS can be improved to support efficient operative competence resource management. Addressing this issue the present study is driven by the purpose:

> *To improve the future CMS-design in a global service delivery organization with respect to operative competence resource allocation.*

It is possible to approach this purpose in a variety of ways seeing as how a CMS is conversant both with people, machines, information and the surrounding world. None of these constituents could reasonably be completely left out if reliable conclusions are to be drawn, but the complexity of the matter calls for prioritizations and a set of clear, guiding research questions to pursue said purpose.

1.3 Problem Analysis and Research Questions

Improvement can intuitively be interpreted as moving towards the best possible setting of variables or characteristics. For this end, there is a need to know the possible variables and characteristics, as well as having a clear idea about what is to be considered 'good' in the context. In the case of a CMS there is a need to understand the actors in it, both machines and humans, as well as understanding the matter that the information in it concerns, namely competence and how it is perceived in the system. A good understanding of all of these factors could reasonably be derived from a thorough background knowledge about how the CMS has developed over time and where it is currently heading.

> RQ0:
>
> *What are the historical foundations on which current CMS is built?*

Having a clear idea of the constituents of the CMS it becomes the primary concern to know what is to be considered 'good', namely getting an idea of that which the improvement is to aim at. Seeing as how CMS is a system for processing and producing information the desired outcome would be the most important thing to specify.

RQ1:

What information about competence is necessary for successful allocation of competence resources to projects?

In order for the system to be improved, that is, to use information resources purposively and efficiently it is of fundamental interest to know where, if at all, the necessary information currently is produced and extractable.

RQ2:

From where can the competence information that is necessary for competence resource allocation be extracted?

Knowing where the necessary information can be extracted from it becomes important to consider the practical implications for how it can be put in work in the most efficient way within the frames of the CMS.

RQ3:

How can competence information that is necessary for competence resource allocation be effectively used to operatively allocate competence resources?

1.4 Delimitations

Being distinct and clear the above research questions can still be answered in a variety of different ways and with different scopes. The present study is focused on the consequences of the changing conditions for Company X. It is therefore of primary interest to study areas within Company X that clearly represents the responses from the organization to these new conditions. To focus on service delivery is narrowing the scope. However, said organization currently encompasses about 80 000 professionals and is consequently a somewhat extensive object for a study framed within a master-thesis. To narrow the scope of empirical investigations further, a business area closely involved in service delivery has been chosen, industry and society (I&S) in general and its sub-area energy and utilities (E&U) in particular. E&U is suitable since it is an area in which Company X recently successfully entered, still being an area representing the new challenges for its service delivery business. Also, significant for this choice is the fact that professionals within E&U commonly are internally or externally recruited from amongst a population of senior professionals. This way information and experience from other areas can implicitly benefit the transferability of the findings of the present study.

Another limitation concerns the level of technical detail in focus for the study as only technical feasibility on a higher level is concerned. Going into further detail would have required a stricter limitation of the conceptual scope of the study. As for the technical parts of the CMS, only the official information technology systems are closely examined in the study. Even though local solutions and unofficial tools are considered for exemplifying purposes the decision not to cover them is a significant limitation given the extensive plethora of useful support tools that exist in the organization. However, additionally covering such systems and

tools would have been difficult, not only because of the sheer number of systems but also because this number can be considered unknown why the extent of coverage would be hard to specify reliably.

1.5 Thesis Outline

Theoretical framework: This chapter presents the theoretical framework that covers relevant academic literature to complement the empirical data and support an analysis with respect to the study purpose and the corresponding research questions.

Research Methodology: This chapter explains the overall study process and the underlying research philosophy are considered as well as the logic behind the study design. It also includes relates of the data collection, literature review and analysis process.

Case description: This chapter is the only addition made to the suggested report structure of the otherwise adhered Chalmers Writing Guide (Chalmers, 2011). This chapter describes the setting for the case study at Company X. This is to introduce the reader to the specific context as well as to terminology used at Company X. This chapter is placed as number four, after research methodology and before results.

Results: In this chapter the results from data collection connected to the case study and historical investigations are presented.

Analysis: In this chapter results and theoretical framework are synthesized with respect to the research questions.

Concluding discussion: The research questions are answered in this chapter, motivated by the reasoning in the analysis. This chapter also includes managerial implications, sustainability, and future research.

2 Theoretical Framework

The theoretical framework for the present study is intended to consider the central building blocks for CMS and will briefly address the sociological foundations, more information on this can be found in Appendix C. The overall logic of the literature study is depicted in Figure 1.
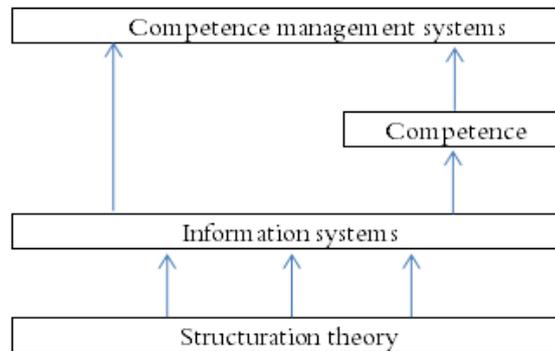
Figure 1 – Theoretical framework structure

2.1 Information systems

Information systems (IS) constitute an important part of the area in focus for the present study, namely CMS. In a study covering and comparing a range of different definitions of IS, Alter (2008, p.451) suggest that IS should be defined as:

> *"a system in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce informational products and/or services for internal or external customers"*

This definition makes it clear that an information system consists, not only of technology but also of human participants involved in processes and activities possibly together with machines. In such a context, given that the system is dependent on both humans and machines it become imperative that humans and machines interact in a constructive way, *i.e.* that the system is adopted and used.

2.1.1 Use of Information Systems

In 1986 Fred Davis introduces the technology acceptance model (TAM) that implies that actual technology use is heavily dependent on the perceived usefulness of a technology, and the perceived ease of use of said technology (Davis Jr, 1986). The model has since been widely employed in studies concerning user adoption of information technology and concerning how to attain a critical mass of users and Lee *et al.* (2003) suggests that it is the most influential and commonly used theory in information systems. Over the years since 1986 it has been extended and developed but Benbasat and Barki (2007) suggests that information systems researchers need to revisit the theory of planned behavior (see Ajzen (1991)) and closer consider factors such as IT design, attitudes, norms and behaviors when trying to give advice that are useful for practitioners. Underlining the relevance of this advice, Boudreau and Robey (2005) find that integrated technology, as would be the case in an information system, that constrain human agency can be resisted and reinvented in use. Kallinikos (2011) goes further and suggests that

5

the design of technology by no means dictate its use and states that only local practice can do that. Moreover, he suggests that this local negotiability of technology has gone so far that it commonly has acquired the character of a tacit, unquestioned belief.

2.1.2 Social actors rather than users

One might justly ask, as Lamb and Kling (2003) do, whether users of information systems are not better conceptualized as social actors. They also suggest that that is the case. The IS definition by Alter (2008) allows for this conceptualization of users as social actors since it allows for IS to consist solely of humans.

Early on, Orlikowski (1992) suggested that the perception of technology as an objective external force with deterministic impacts needed to be altered. Instead she suggested a model where technology is regarded in an interactive system together with human agents and institutional properties (A modified version of which is depicted in Figure 2). In a later study Orlikowski and Barley (2001) suggest that research concerning information technology has much to gain from adopting approaches commonly employed in organizational research such as institutional analysis. Based on an extensive literature study, Mignerat and Rivard (2009) find the institutional perspective very constructive and suggests a longitudinal approach for the study of the development of information technology in organizations as a means to attain richer knowledge. Connecting back to the previous section, longitudinal studies might also support Kallinikos (2011) when he suggests that the local adoption of technology is contingent on practices that emerge from long term learning processes. For more orientation about the connection between sociology and competence management systems, see Appendix C.
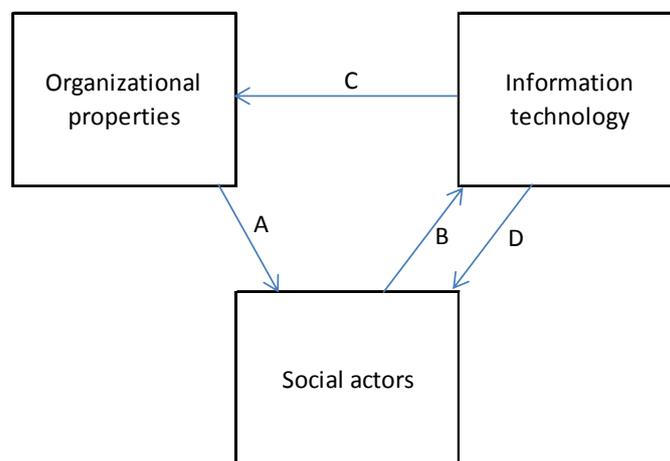
Figure 2 – A model of the integrative role of technology inspired by Orlikowski (1992) and Lamb and Kling (2003).
(A) can be interpreted both as the organizational properties' conditions imposed on social agency in the organization and also as the requirements put on designers (humans, i.e. social actors) to develop information technology for the organization.
(B) can be interpreted as the designers' creation of information technology for the organization.
(C) can be interpreted as the implications on the organizational properties by the information technology.
(D) can be interpreted as the affordance and limitations that existing information technology imply for social actors in the organization.

2.2 Competence

In order to design CMS, one has to understand the information that should be handled by the system, namely competence information. This section will consider definitions of competence and also how competence is described in order to be handled by a CMS.

2.2.1 Definition of competence

van Klink and Boon (2003) describe competence as a useful link between education and job requirements, a concept that Le Deist and Winterton (2005) finds useful yet fuzzy. Norris (1991) describes the difficulties in finding a universal definition of competence

> *"as tacit understandings of the word have been overtaken by the need to define precisely and operationalize concepts, the practical has become shrouded in theoretical confusion and the apparently simple has become profoundly complicated"* (p.332).

This observation is shared by several scholars (Shippmann *et al.*, 2000; Mulder, 2001; Stevens, 2013). Mulder (2001) lists a large number of different definitions with the conclusion that one universal definition is unrealistic. He further suggests that a definition should be case specific and to be determined from time to time. Stevens (2013) concludes that the basis for a definition are agreed upon, but cites Shippmann *et al.* (2000, p.706) when concluding

> *"the word "competencies" today is a term that has no meaning apart from the particular definition with whom one is speaking"*

In a Harvard Business Review article Prahalad and Hamel (1990) point out that competencies, as opposed to physical assets, grow when they are applied and shared. In the same article they coin the concept of core competence and visualize it as the roots of the organization that supply core products which in turn form the basis for branches, *i.e.* the business areas. Building on their thoughts Agha *et al.* (2012) argue that competition essentially has moved from concerning product or service leadership to instead concern competence leadership. They consider core competence to be the knowledge set that distinguishes a firm and provides a competitive advantage over others. They further suggest that it can be interpreted as three dimensional with dimensions *Shared vision*; *Cooperation*; and *Empowerment*. They also find that all three dimensions have an explanatory value for organizational performance and competitive advantage therein confirming findings from earlier studies (Javidan, 1998; Bogner *et al.*, 1999; Calantone *et al.*, 2002).

In accordance to Mulder (2001), Company X has defined competence as

> *"Competence is an individual capacity. It consists of a combination of* skills, knowledge *and* behavioral competencies. *It enables a person to perform in a relevant and meaningful way for a given purpose in a given role or situation.*
>
> – Skills *represent the ability "to do" something specific, described in terms of tasks. Closely related tasks are clustered into responsibilities. Skills require certain knowledge*

- Knowledge *represents cognition or theoretical comprehension of a subject*

- Behavioral competencies *represent inner characteristics or dispositions to behave in certain ways in different situations. They are driven by stable characteristics inherent to the individual"* (Company X, 2015b, p.6)

2.2.2 Perspectives on competence

Lawler and Ledford (1992) describe the drawbacks in defining organizational and individual skills by analyzing jobs where the identified skills are used to define job roles which in turn set the agenda for the entire HR management such as learning and payment. The focus on job roles places the focus on jobs rather than individuals with the result of trying to form individuals to fit the job roles (Ibid.). Since the job roles are based on historical data, *i.e.* how the job has been done in the past, it gives very little room to adapt for future challenges (Pavur Jr, 2010).

Lawler and Ledford (1992) instead suggest using a system that is based on the skills obtained by the individual, thus putting the individual in focus of the HR management. However, the compiled skills need to reflect what the company does, or its core competences as described by Prahalad and Hamel (1990). By shifting focus from a job-based view to a skill-based view and allowing the skills of the individual to be the basis for hiring, learning and payment the organization are more likely to gain a competitive advantage (Lawler & Ledford, 1992). This is due to the focus of skills rather than old job roles. Learning activities can be designed for future needs rather than to enhance skills based on historical data (Ibid).

2.2.3 Competence in knowledge-intensive firms

Globalization, information and communication technologies and innovation makes organizational performance heavily correlated with employees' competences and the way in which they are used (Abel, 2008). An increasingly dynamic knowledge-based industry has evoked inquiries as to how competence can be described in a detailed yet dynamic way in order to make it manageable. In a study concerning competence in knowledge-based organizations Lindgren *et al.* (2003) recognize that employees frequently are conceptualized as 'machines' with little needs or wants. In contrast, they conclude that employees in knowledge-intensive firms need to be regarded as individuals with needs and wants and they encourage the involvement of employee interests in the active management of competence including personal interests of employees regardless of job-descriptions and formal group-belonging. Such involvement reasonably require communication skills and abilities to quickly grasp new contexts, skills that are ranked among the most important 21st century workforce competencies by Burrus *et al.* (2013). Given the new setting with emphasis on knowledge and competence new and more integrative competences become important. This also calls for new ways in which competencies can be described in order to be communicated within and between organizations (Markowitsch & Plaimauer, 2009).

2.2.4 Competence typologies

Lindgren *et al.* (2004) develop a model through an extensive action study that incorporates a typology of competence and considers the concept contextually, as it develops in an

organization. They build their typology of competence on the conclusion that a life-cycle perspective on competence requires a past, a present and also a future of the competence at hand. Correspondingly they refer to the past of competence as *Competence-in-stock*, the present of competence as *Competence-in-use*, and the future of competence as *Competence-in-the-making*. Together these types of competence constitute their proposed typology.

Lindgren *et al.* (2004) suggest this typology by arguing that in order to act competently, individuals rely on their stock of competence (Competence-in-stock). However, competence change over time (Rozewski *et al.*, 2013) and as soon as they act they re-create and develop said stock and transform it (Competence-in-use). Referring to work by Lawler and Ledford (1992), Lindgren *et al.* (2004) conclude that the individual's desire and interests plays an important role in her career path. Moreover, it is clear that the opportunities for an individual to act competently and so recreate and develop her competences, to a large extent are deliberately given by her employer. Accordingly, they suggest that even though competence is developed through its mere employment, its development is in the longer perspective also guided by the individual's interests as well as the needs of the organization in which she works (Competence-in-the-making).

Building on the work by Lindgren *et al.* (2004), Soderquist *et al.* (2010) suggest a typology for competence, partitioning the concept into eight different categories. Through their comprehensive typology Soderquist *et al.* (2010) propose to facilitate a transition of human resource management into a more dynamic, contemporary setting. It is thoroughly based on previous scholarly work as they merge previous descriptions of competence when deriving their typology and they try it out by successfully re-describing the competence of employees in two different organizations.

However, while constructively move focus of descriptions from job positions to individual employees they do not explicitly address the issue of how to use the typology to streamline competence management in large organizations, which is why this study adopts the typology designed by Lindgren *et al.* (2004). Both Lindgren *et al.* (2004) and Soderquist *et al.* (2010) do however advocate a change in perspective towards a competency-based rather than a task-based outlook on how to manage competence in organizations.

In contrast to describing competence from an academic standpoint, a more practical way of describing competence is of great interest; in fact, there are several national and multinational taxonomies for describing and grouping competence. DISCO (The dictionary of skills and competences) is the standard used within EU and is based on a number of national skill compilations (Markowitsch & Plaimauer, 2009). The first version was developed between 2004 and 2008, while the second and current version (DISCO II) was developed between 2010 and 2012 (GmbH, 2012). Similarly, in the United States, there is a system called O⋆NET (Occupational Information Network) which has its roots as far back as the Great Depression (Peterson *et al.*, 2001; Markowitsch & Plaimauer, 2009). Both of these systems categorize individual competences in three categories as seen in Table 1, definitions obtained from (USDOL; GmbH, 2012).

DISCO Category	DISCO Definition	O*NET Definition	O*NET Category
Personal Competences	personal attributes, attitudes and capacities; e.g. motivation, leadership, initiative, flexibility, adaptability, physical strength, good eyesight, etc	enduring characteristics that may influence both work performance and the capacity to acquire knowledge and skills required for effective work performance	*Worker Characteristics*
Core Competences	generic skills, key skills, and transferable skills needed for success in the labour market; e.g. communication, problem-solving, team-working, basic IT skills, etc. Basic skills like literacy, numeracy, and oral communication	descriptors referring to work-related attributes acquired and/or developed through experience and education	*Worker Requirements*
Occupational Skills	specialized knowledge pertaining to a particular occupation or occupational group. Some occupational skills like IT-skills are transferable across occupations	requirements related to previous work activities and explicitly linked to certain types of work activities	*Experience Requirements*

Table 1 – Categorization of individual competences in DISCO and O*NET

2.3 Design of Competence Management Systems

Competence management is concerned with four main tasks, namely *1) Representation*, the documentation of staff competencies in general and core competencies in particular; *2) Reflection*, that is capturing, measuring and evaluating competencies; *3) Sharing*, making competencies available where and when they are needed and *4) Development*, making sure competencies are sharpened and complemented preparing for future needs. (Dorn *et al.*, 2008 As described by; North *et al.*, 2012) These tasks all require the management of information and IS have consequently been developed for this purpose, *i.e.* CMS.

Based on the threefold typology presented by Lindgren *et al.* (2004) the same authors derive four principles to make the most out of competence-in-stock, competence-in-use and competence-in-the-making when designing CMS. The four principles are derived based on applied CMS in general and not specifically for any particular subset of the components encompassed in competence management. The present study therefore includes a careful analysis of the applicability of the different principles in the specific case at hand. The principles are therefore merely stipulated below and will be further analyzed in chapter 6 with respect to the case of the present study.

One of the principles primarily concerns how to exploit information concerning competence in present time, competence-in-use:

The principle of real-time capture with feedback loop (RTC)

Competence-in-use needs to be tracked in real-time in order for available data to be accurate. When trying this principle out, the importance of a feedback loop to the source, the employee, to confirm or edit disclosed information, turned out to be vital. Otherwise employees turned anxious as to what information that was derived implicitly from their actions and what it would be used for.

In order to exploit competence-in-the-making, interests of employees and on different levels in the organization are found to be vital, thus the second principle.

The principle of multi-perspective interest integration (II)

Lindgren *et al.* (2003) advice that knowledge based organizations should turn their attention towards the interests of the employees in order to aptly keep up with competence development taking place among their workforce. Specifically, they suggest that slack-time should be allocated for employees to work with things of their own choice and interest, pursuing interests not necessarily limited to their work role and to encourage employees to collaborate regardless of formal organizational boundaries. In their later publication (Lindgren *et al.*, 2004) they underline that what professionals are interested in should be included in their competence descriptions as an indication of the kind of competence that they are motivated to develop. However, the two mentioned principles, that concerning real-time capture and that concerning interest integration, give rise to interesting interactions with a third principle:

The principle of user-controlled transparency (T)

Transparency of competence data is found to be central to allow competence sharing. This principle primarily serves to make competence-in-stock available in the whole organization. However, when this principle is applied to competence-in-use and competence-in-the-making, employees got anxious that workload would increase as their employees better understood the actual capabilities of their staff, and concerning competence-in-the-making, employees got worried about their privacy as private interests were exposed. Concerns stemming from these issues resulted in adding 'user-controlled' to the wording of the principle. That is, employees should be in control over the information that they disclose.

The last principle concerns the ability of CMS to regard any unit of analysis, be it individual employees, teams or larger units.

The principle of flexible reporting (FR)

This is particularly important in order to enable strategic competence development through influencing competence-in-the-making.

2.3.1 Legal and cultural factors

The design of a CMS is not only dependent on what the organization wants, but also to a number of external factors, namely legislations and cultural differences. For a multinational company like Company X several national and international legislations concerning information security and privacy need to be addressed, limiting the amount of personal information that will be visible for other employees (Commission, 2016).

Culture is also an external factor that needs to be taken into consideration for a multinational company. Miconnet and Alänge (1999) studied Company X Radio Systems in three different locations around the world and found great differences in how tools, even though they are the same worldwide, are not used the same way due to cultural differences that stem from national culture rather than company culture. Their work was guided by the work of Schein (1992) who divide culture into four parts that can be described as layers of an onion; *basic underlying assumptions*; *norms/beliefs/values*; *behaviors*; and *artifacts*. The first two are considered by

Miconnet and Alänge (1999) to be determined in individuals by the national culture and will not change that easily, something that the last two might. This implies that a company can share the same artifacts (e.g. tools) around the world, but the use of them will differ because of different underlying values and beliefs.

3 Research Methodology

This chapter outlines and describes the way in which this study was conducted, including literature study; data collection; and data analysis. It also covers the ethical considerations and trustworthiness of the study.

3.1 Research Philosophy and Approach

Given the purpose of this study, it sets out to validate previous studies as well as to gain insight into a practical issue at Company X. The practical issue manifests a situation where previous studies (Lindgren *et al.*, 2004) supplies predictions based on the usage of certain principles. Therefore, this study inherently requires both a deductive and an inductive take on the subject of study. Deduction is to derive a conclusion from a known state of affairs whereas induction is to draw a conclusion from multiple observations (Wallén, 1996; Hansson, 2011). An initial hypothesis of how to employ the principles given by Lindgren *et al.* (2004) at Company X will be *deduced* from the framework given in the mentioned study combined with the state of affairs at Company X. This hypothesis is refined through conclusions about the situation at Company X gained from *inductive* reasoning. This approach fits well into what Dubois and Gadde (2002) refer to as systematic combining. According to them systematic combining is based on an abductive logic. Hansson (2011) explains abduction as the derivation of a fact from something else that makes the fact appear natural via general background knowledge.

Our research philosophy might best be described as pragmatism. It can be described as a philosophical view arguing that positivism and an interpretivist's perspective can be held simultaneously focusing on the research question as the most important research determinant (Saunders *et al.*, 2009). Concerning pragmatism as a research approach, Morgan (2007) compare it to the conventional qualitative and quantitative approaches respectively. In so doing, he essentially agrees with Allwood (2012) who problematize the very distinction between qualitative and quantitative approaches. Allwood (2012) suggests a more pragmatic approach encouraging the consideration of pros and cons of different research methods depending on the research problem at hand. Morgan (2007) argues that where qualitative and quantitative approaches would employ induction and deduction respectively, the pragmatic approach suggests abduction. Where the conventional approaches fall into either subjectivity or a strive towards objectivity a pragmatic approach settles for intersubjectivity and, as for the desired kind of inference, a pragmatic approach would according to him strive for transferability where a conventional approach would focus on a specific context in the case of a qualitative approach, or on attaining generalizability in the case of a quantitative approach.

3.2 Research Design and Process

Transferability is considered as one of four criterions for evaluating qualitative studies in general and business research in particular by Bryman and Bell (2011), the other three being credibility, dependability and confirmability. In their work they refer to a study done by Guba and Lincoln (1994) as the source of these criteria. When Morgan (2007) argues for transferability as a convenient inference method in a pragmatic approach he also refers to how transferability is regarded by Guba and Lincoln in an earlier study (Lincoln & Guba, 1985)

where they operationalize transferability as the extent to which learning from one context can be applied in another. Shenton (2004) elaborate on the work of Guba and Lincoln (1985; 1994) and suggest measures that researchers can take in order to ensure high quality in line with transferability and the other three criteria. In accordance with these measures several provisions for trustworthiness are deliberately included in the study. These provisions are, in accordance with their varying nature, employed in different parts of the study and are therefore dispersed in the corresponding parts of the report. However, for the sake of clarity they are summarized in Table 1.

Criterion	Measure
Credibility	• Adoption of appropriate, well recognized research methods • Development of early familiarity with culture of participating organizations • Triangulation via use of different methods and different types of informants • Iterative questioning in data collection dialogues • Debriefing sessions between researcher and superiors[1] • Peer scrutiny of project[1] • Examination of previous research to frame findings
Transferability	• Provision of background data to establish context of study and detailed description of phenomenon in question to allow comparisons to be made
Dependability	• Employment of "overlapping methods" • In-depth methodological description to allow study to be repeated
Confirmability	• Triangulation to reduce effect of investigator bias • Admission of researcher's beliefs and assumptions • Recognition of shortcomings in study's methods and their potential effects • In-depth methodological description to allow integrity of research results to be scrutinized

Table 2 – Provisions for trustworthiness of the study. Inspired by Shenton (2004)

This study is in practice centered on a case that is chosen so that it will provide understanding of the circumstances in which its hypotheses make suggestions. The present study can accordingly be called a case study with what Bryman and Bell (2011) refer to as a critical case. The same authors also suggest that case study research frequently entail a longitudinal element. Such is also the case in the present study where archival information is consulted and retrospective interviews are held to investigate how the relevant CMS has changed over time.

3.2.1 Literature Review

The idea of a literature review is to put research in the context of such work that have already been undertaken through drawing out key points in the literature body where the present study aims to contribute (Saunders *et al.*, 2009). In a work specifically elaborating on the subject of literature review, Hart (1998) state that a good literature review should use ideas in the body of literature to frame and justify the chosen approach and methods to the topic and therein show that the study at hand effectively contribute to something new. In this sense a good literature review can also be a provision for credibility of the study (Shenton, 2004).

---

[1] The very nature of a Masters' thesis at Chalmers University of Technology implicates both regular meetings with the supervisor as well as peer scrutiny by opponents to the thesis.

Cronin *et al.* (2008) suggest that bibliographies in particularly related journals can be manually searched, being a slow but often rewarding way of framing relevant literature. In the present study *Management of Information Systems Quarterly* can be considered central for the subject. Accordingly, we conducted a thorough, manual search of bibliographies in said journal 2011–2015 in order to understand the state of the current academic front line. A systematic approach to literature review is gaining popularity in business research (Bryman & Bell, 2011) not least because it allows for confirmability of findings, in line with the prescriptions of Shenton (2004). The present study also takes on this approach in addition to the mentioned bibliography search and employ Google Scholar using keywords such as *"Competence management", "Competence management systems", "Core competence", "Talent management", "Structuration theory",* and *"Competence allocation".* We did not get a hit that was not available through the databases at the library of Chalmers University of Technology. The only exception was that no access was attained to material from the databases of Gartner. The snowball effect was utilized in the sense that relevant literature was scrutinized in search of references, which in turn could be used to further build up the reference library.

3.2.2 Data Collection

As mentioned above the present study can be considered a single case study with a longitudinal element. Both the case study and the longitudinal elements in terms of investigations of the historical development of CMS-architecture are heavily using interviewing for data collection. This is complemented by archival studies of records of competence request management and internal documentation. The extensive use of interviews as a means for data collection is well aligned with the over-all research strategy. Kvale (1994) conclude that the main criticism towards interviewing as a scientific method is stuck in dichotomies arguing in a similar fashion as Allwood (2012). Allwood (2012) problematize the conventional focus on qualitative versus quantitative resource instead of weighing pros and cons for each specific method in each specific research context. Similarly, to both Morgan (2007) and Allwood (2012), Kvale (1994) take on a pragmatic stance, focusing on the obvious possibility to attain knowledge and understanding through interviewing as the central defense of the method.

3.2.2.1 Records

This part of the data collection concerns a record of competence resource requests including comment fields that cover the matching of competence resources during two years (2014-2015) in a significant part of the service organization of Company X. The primary purpose of the study of these records is to support the confirmability, in accordance with the advice of Shenton (2004), of the overall study through triangulating findings from the interviews of the case study.

3.2.2.2 Interviews

Within the first month of the project, a screening is made through open interviews in order to get an initial understanding of the development of CMS at Company X Service Delivery. The interviews were kept open in order for we to get as much understanding as possible of the interviewees' perception and situation (Bryman & Bell, 2011). Through search on the internal intranet and through snowball sampling, knowledgeable of each component was identified and

interviewed. However, since the users' interaction with the CMS is of interest, and therefore also the users' perception and opinions play a role, the interviews were kept semi-structured and not structured. This was in order to allow for the interviewees to be free to add elaborations outside of the template, and for the interviewer to be able to ask ad-hoc follow-up questions (Saunders *et al.*, 2009).

As for the case study, semi-structured interviews and semi-structured group interviews are held. Being a case study and seeing as how the population representative for the population is fairly small, the snowball sampling method was deemed prudent. Had the population been larger the sampling might have needed to be randomized in order to ensure representability in the sample (Bryman & Bell, 2011). The structure is necessary to ensure that the hypothesis is actually tried out and the flexibility of keeping interviews semi-structured is important as the interviewees are in need of thorough contextual understanding to make sense of findings.

A total of 47 interviews were conducted divided between; 22 architecture; 12 demand; 7 supply; and 6 advising interviews, with a total of 47 respondents. All interviews were documented using field notes to allow for saving time and assuring accuracy of transcription (Saunders *et al.*, 2009) and the interview templates can be found in Appendix A and B.

3.3 Data Analysis

All field notes were transcribed in connection to each interview in order capture all findings. If there were any confusion the interviews were followed up by either an email, phone call or physical meeting for clarification. The results presented in this report is in accordance with our research philosophy and field notes have been reduced with respect to our research questions, extracting the most relevant statements and points of views. The data were analyzed in tandem with its collection, similar to the principles of Grounded Theory as explained by Strauss and Corbin (1998). This led us to formulate theories, which in turn could be analyzed in comparison with additional data collection. This process of systematic combining allowed for the qualitative study to evolve over time, sharpening the research questions along the process (Dubois & Gadde, 2002; Mills *et al.*, 2006).

To validate findings, respondent validation was used where the researchers' analysis of the responses was validated with the respondents. This allowed for conclusions to be verified which in turn strengthen the trustworthiness of the study (Miles & Huberman, 1994; Bryman & Bell, 2011). Regular meetings with the supervisor at Company X additionally validated our findings and conclusions.

3.4 Ethical Considerations

Ethical considerations are naturally part of the study building on the findings by Lindgren *et al.* (2004). In their revision of the principles for CMS design they find that employee integrity is vital for a well-functioning system. However, carrying out the study deliberate consent and transparency was ensured concerning what information that was sought for, why and how it would be used. This also served to prevent any occurrence of deception. When engaging people in the study we were cautious not to invade their privacy. We were also careful not to harm participants in any way, including aspects such as status and social relations.

4 Case Description

This section aims to set the context for this study in terms of specific information about Company X and CMS at Company X from a historical perspective as well as the chosen field of interviews.

Company X is divided in a number of ways and to describe all of them would require considerable space, which is why this section only describes the relevant divisions for this study.

Company X consists of 20 functional areas that encompass all aspects of the company. This study is mainly concerned with Functional Area Service Delivery (FA SD), which is one out of the 20 functional areas. It is however very large as it employs about 2/3 of the total Company X Employees.

4.1 The changing requirements on competence management

To support effective competence resource allocation there are two major areas to consider. The first area concerns the estimation of resource demand and the second area concern the maintenance of supply. Analogously one can describe these two areas as a demand- and a supply side of competence resources respectively. For the purpose of this study it is the operative level of the demand- and supply side together with the corresponding matching process that is of interest. More precisely it concerns the enablement of the communication between demand and supply that is necessary for the matching between them.

At Company X there have been several initiatives and investments to facilitate this process. The actual investments and the initiatives that lead up to them seem to describe a dialectic process between two different perspectives on what competence is as well as how, and fundamentally why it should be managed. These perspectives are not spelled out directly but might be implicitly derived from choices and priorities of different stakeholders.

First, the overall organizational perspective on competence as a sub-set of human resource data; this perspective is advocated by the HR-department and has a broad focus that encompasses recruitment, career management, competence management and others. The HR-function is concerned, not only with FA SD but with the whole organization. Focus, concerning competence, is therefore on needs that are general for the whole organization such as long-term strategic planning for education and recruitment as well as on individual career planning.

Second, from the perspective of the growing global service delivery, the needs are more specifically focused on a resource perspective rather than that of the individual employee.

> "The number of staff, including partners, that delivers services for [Company X] in 2013 in more than 1200 projects around the globe is close to 75 000 people. These people with their own set of unique experience and competence should be

matched with on-going and upcoming projects with specific competence needs" – Urquhart *et al.* (2013, p.4)

This clear difference in focus and viewpoint regarding competence management between HR and FA SD is quite natural when taking into account the different missions of the two divisions, and exist in almost all companies. HR is looking at competence management from a strategic perspective, meaning that their focus is to secure that competence needs, both present and future, are met and not necessarily on how the tactical and operational allocation is being done. The tactical and operational aspect is however of utmost importance to FA SD who is responsible for allocation of resources for current and future projects, meaning finding the right resource with the right competence for the task at hand.

The allocation process is supported by several IT-systems described in Table 3. The systems are designed to work together to support both registration of competence and allocation of competence resources. The use of the systems will be presented in chapter 5.1.1 and further analyzed in chapter 6.

System name	Description
TOOL 2	Main database for HR related data.
TOOL 1	Portals for accessing and editing data in TOOL 2
TOOL 4	Handles individual career planning and learning elements
TOOL 3	Allocation tool for finding employees suitable for project positions based on data in TOOL 2

Table 3 – IT-architectural elements for competence management

4.1.1 Information Security and Competence Management

Managing competence implies handling information about individuals and particularly in the case of operative management information might be more detailed and therefore more sensitive for publication. Regardless of sensitivity, data concerning individuals has to be handled according to Company X Privacy Policy Framework. Several requirements are put on any tool or process employed in the organization that utilizes information about individuals in its usage (see Table 4, data collected from (Company X, 2014)). The policy is based on national and international standards to form a baseline of what is required by Company X, but all new applications need to be thoroughly examined with all applicable legislations. This forms the baseline of what should always be covered, however, more detailed requirements and limitations hold depending on the national context of the tool or process (Architecture18).

Category	Description
Notice	to individuals to identify the purposes for which Personal Information is collected, used, retained and disclosed.
Choice and consent	available to individuals with respect to the collection, use, retention and disclosure of Personal Information.
Collection	of Personal Information for the purposes identified in the Notice.
Use, retention and disposal	of Personal Information as identified in the Notice and for which the individual has provided Consent.
Review of Personal Information	for individuals to access their information and ensure it is correct and accurate.
Disclosure to third parties	of Personal Information for purposes identified in the Notice and for which the individual has provided Consent.
Transferring data to other countries	in a legal, secure and auditable manner.
Security for privacy	of Personal Information to help protect against unauthorized access and use.
Quality	of Personal Information to ensure that reasonable steps are taken to ensure Personal Information is correct and accurate.
Accountability and Privacy by Design	to ensure compliance with the privacy framework.

Table 4 – Categorization and description of information privacy measures at Company X

4.2 Competence and role description

4.2.1 Position tagging

As an administrative tool for handling salaries and other HR-related issues, all positions within Company X are described with a number of labels and together form the tagging of a position. The current position tagging system was implemented as a part of the Career and Competence Model (CCM) introduction in 2012. CCM consist of four main components; Job roles, Job Stages, the Competence Model and the Career Framework, where the Competence Model along with job roles and job stages are closely linked to the present study. Job roles and job stages are described in this section together with three additional position tags used by Service Delivery. A short description of the competence model will be described in section 4.2.2.

Before the introduction of CCM the old Competence Management Framework (CMF) described roles in terms of Functional roles (comparable with the current Job Role). For example, solution architects are supposed to design solutions for customers, but someone specialized in network roll-out might have issues designing solutions for maintenance of smart metering networks even though the roles required are both solution architects. This called for the introduction of Functional skills, which were Service Delivery's' way of adding skills to individuals (comparable to the current Portfolio competencies) to allow for resource allocation.

4.2.1.1 Job role (JR)

Job roles define the characteristics of different roles that are needed in the organization. There are 220 different job roles currently defined at Company X. Each job role is associated with a

number of general competences called Job role competencies (see section 4.2.2.1). They are then complemented by a selection of Company X wide competences such as "English skills" and also six different behavioral competencies (see section 4.2.2.2.2).

4.2.1.2 Job Stage (JS)

Job stage can be regarded as the seniority of a specific job role. It is specified on a scale from one to nine where nine is the highest level. When considered for a position at job stage nine (FA SD levels 5-9 depending on job role), the subject is examined through an extensive procedure involving competence management whereas the lower stages are examined through self-assessment and a review from the employees' respective line manager. All competencies except for behavioral competences (see section 4.2.2.2.2) are assessed on a scale; T–A–B–C–D, where D is expert and T is novice. Each job stage requires a certain competence level and the competence assessment review assess the individual competence in comparison to the job stage the employee are working on.

4.2.1.3 Functional Area (FA)

Company X has defined 20 different functional areas that can be thought of as the ways in which the organization generates value. Job roles are sorted into a functional area such as Service Delivery, Administration or Technology & Research.

4.2.1.4 Competence Domain (CD)

Specifies the kind of technology, product or process family within which the job role is connected.

4.2.1.5 Industry Vertical (IV)

Industry vertical is a rather new category intimately connected to the growing service business area within Company X. It is intended to specify within which industry segment a job role is assigned; an example is "Telecom Operations".

4.2.1.6 Service Area (SA)

Is connected to the business line in which the job role is engaged. It can be seen as the manner in which the competence domain is applied through the employee's work.

Not all tags are used for all employees; FA SD has greater need of granularity for allocation purposes than Company X in general. Other FA:s might use more than the three depicted in Table 5, but since that is out of scope for this study, only the general perspective is given here.

	Job role	Job stage	Functional area	Competence domain	Service area	Industry vertical
Company X standard						
FA SD						

Table 5 – Description of how the different position tagging is used at Company X, shaded boxes indicate used tags

4.2.2 Competence descriptions

The Competence Model divides competence into four categories; Job role competencies; Company X-wide competencies; Portfolio Competencies; and Local competencies. This study is concerned with the first three types, which are described below.

4.2.2.1 Job role competencies

There is a set of job role competencies for each job role. These are assessed in the process of determining job stage. Job role competencies are considered key competencies needed for a particular role such as "Scopes, defines and designs solutions" for Solution Architect.

4.2.2.2 Company X-wide competencies

The Company X-wide competencies are in turn divided into two parts; Knowledge and Skills; and Behavioral Competencies.

4.2.2.2.1 Knowledge and Skills

Knowledge & Skills are not specific to a distinct Job role; it is a more general competence that can be applied to a number of Job roles and responsibilities. Some are relevant for most or all job roles (example: English Skills or Company X Knowledge) while some are relevant for a few job roles (for example ITIL Knowledge).

4.2.2.2.2 Behavioral Competencies

Behavioral Competencies can be defined as *"sets of behaviors driving job performance, linked to characteristics inherent to the individual"* (Company X, 2015a, p.9). Company X has a catalogue consisting of 20 different behavioral competences clustered in three groups; think, lead, and do. The six most relevant to each job role are assigned to it. The others are still important to each role, but the six chosen are deemed more relevant to the specific job role why these are the ones that are assessed. Assessment are carried out on job stages seven through nine on selected job roles, nine out of FA SDs 74 job roles are applicable for this assessment.

4.2.2.3 Portfolio competencies

These are competences that an employee can have and span across all competence areas that hypothetically could be relevant for the functional area Service Delivery. In the system TOOL 5, the portfolio competences are sorted into the four categories Products/Solutions/Services, Service Element, Technology, and Processes, Frameworks and Tools. As compared to job role competences, portfolio competencies are not hard coded to a specific job role but rather describe competencies possessed by the individual.

Table 6 describes how the different competencies are used within Company X in general with respect to functional area FA SD.

	Job role competenc	Knowledge and skills	Behavioral competenc	Portfolio competenc
Company X standard				
FA SD				

Table 6 – Description of how different types of competencies are used at Company X, shaded boxes indicate used competences

4.3 Energy & Utilities

The overall challenges for Company X in the transformation into a more pronounced service provider are characterized by a rapidly changing business landscape and correspondingly swift development of the competence required to be a successful actor in it. The present study is addressing these challenges and therefore a case was picked that to some extent can represent them. The case should be situated within a relatively new field since new fields and previously unknown business opportunities are likely to emerge more frequently in the future. Also, the case should be within an area where Company X have decided to become a significant actor since that implies an interest to manage the necessary competencies in order to sustain as a successful actor within the area. Industry and Society has these characteristics but is in itself very diverse as a business area. Many different industries are represented within it and for the purpose of the present study it is important that the case would concern an area where Company X as an organization has decided to develop over time. Based on this Energy and Utilities was picked for the case study.

Conventionally, competence resources at Company X are requested by a project manager and the identification of the requested resources are mediated by line managers. In the case of I&S the contextual understanding is sometimes lacking within the organization and experienced professionals within different industries need to be recruited externally. This is the case also for E&U where large projects so far have concerned integration projects related to smart metering for energy utilities providers. In the largest project yet in Sweden, Company X have engaged in integrating several different third party service providers' smart metering network solutions in order to future wise manage these as one larger network for the energy utilities provider. This has required a lot of understanding of the specific solutions that third party service providers have employed, as well as extensive experience of systems integration for enterprise applications. These experiences and understanding is relatively new as competence requirements within Company X and the search for it has consequently been intense. Correspondingly the demand side of competence resources within E&U is represented by project managers, line managers, as well as professionals with an overall perspective on the projects such as program managers. Also, the supply side includes senior professionals that were recruited internally as well as externally from the E&U industry.

5 Results

This chapter aims to describe the strategic view of competence management, in terms of systems and intentions from a historical perspective as well as the operative use of said systems. The first sub-chapter focuses on the historical development of CMS from the introduction of TOOL 2 in 2002 up until present time. It is then followed by a section that describes the actual use of the systems and the desired system design as described by both supply and demand of competence information. Lastly, the planned system design for upcoming CMS is described.

5.1 CMS at Company X 2002-2015

The results presented here stem both from archive studies and interviews and they describe the historical development of the current system architecture for handling CM. TOOL 2 was introduced in 2002, as well as the portals for interacting with it (TOOL 1). TOOL 2 still constitutes a central part of CMS at Company X and the year of its introduction is therefore considered a good starting point. Moreover, it is clear that there is a partitioning chronologically before and after the system TOOL 4 was implemented in around 2012. The time period before that, 2002-2011 is referred to as generation 1 and the time after, 2012-2015 is referred to as generation 2. The partitioning emerges primarily from the manifestation of the different CM focuses between HR and FA SD through the implementation of TOOL 4 (Strategically and job-oriented for HR versus operatively need-driven and skill-oriented from FA SD). In the first subsection, focus is on the intentions behind the centrally governed systems, administrated by the HR department, and not on their actual use. The central perspective has generally been strategically focused and governed on the basis of a relatively long-term perspective. The second subsection contrasts to this through focusing on the operative CM perspective on the centrally governed systems and the responses to them in terms of adaptations and locally developed system support in different parts of the service delivery organization.

5.1.1 Official centrally governed systems

The findings in this section are based on archive studies performed through the Company X intranet with validation through interviews.

HR was responsible for registration of competencies and also owner of the systems used during generation 1. The data was mainly used for long term planning of staffing needs but also to manage salaries and individual career development. In 2002, means for managing individual competence development were introduced in terms of portals where employees and managers could interact with TOOL 2. These portals are referred to as employee and managers' self-service portals (TOOL 1) and constitute an add-on module on TOOL 2. TOOL 1 were primarily developed to support the description of individual employees' competence development. All HR-data such as salary, job role and job stage are stored in TOOL 2. TOOL 1 are used, for instance, to access data and in some cases also to edit the information, assessments and updates of job role competences. TOOL 1 as self-serving portals also indicate a direction where HR moves towards delegating the operative HR-matters for operative units.

At FA SD, the ongoing general transition in perspective on workforce from job-oriented to knowledge-oriented raised needs in various parts of the organization of Company X for a more integrated system support for the management of competence development and learning. Parallel to this, HR realized the need for a better system for handling competence profiles and competence development, both in terms of individual career management and from organizational long term recruitment needs. The system chosen by HR is called Integrated Talent Management (TOOL 4) and was supposed to be a replacement for the aging TOOL 1 portals and implemented at the start of generation 2. The system is intended to handle employees' competence profiles and to manage annual goals and learning, all to serve as a basis for the annual performance reviews.

During the preparations for the new system, representatives from the organization were involved in compiling all requirements that the new system should handle. However, as the operative responsibility for competence resources is delegated to the different business areas (such as FA SD), many operative requirements were excluded when specifying the requirements for what was to become TOOL 4, such as registration of competence suitable for allocation (Architecture13 & Architecture14). However, with TOOL 4, HR introduced Job role competences as a way for TOOL 4 to handle more detailed competence information than before. Identified gaps from competence assessment reviews are addressed by designing goals and assigning learning activities, all handled by TOOL 4. When the employee has participated in a learning event, the information is automatically updated to the individual competence profile.

5.1.2 Operative Responses and Adaptations
The findings presented in this section are primarily based on interviews and further supported by internal documentation from the Company X intranet.

Even though competence planning and allocation were in need of suitable IT-support across the whole organization around the turn of the millennium (Hustad & Munkvold, 2005) FA SD gained strategic importance and so did its specific needs for IT-supported competence management. Particularly, this need concerned ways to effectively match available competence resources with market demand (Urquhart *et al.*, 2013).

Company X has traditionally had a decentralized technology-minded organizational structure (Baladi, 1999) where the development of local system support solutions emerges in response to local needs (Hustad & Munkvold, 2005) and correspondingly the service organization developed a straight-forward matching tool. It was named TOOL 3 and was implemented around 2002 (Architecture7). Being implemented rather simultaneously to TOOL 1 it used information about individual competence profiles registered in TOOL 1 to identify corresponding line-managers that might have available resources that met competence needs according to a request for resources. The line-manager then responded to the request and if she could not supply the requested resources the issue was handed over to global competence resource managers to be managed through their network and knowledge of the organization (Advisor2 & Advisor1; Architecture7). However, TOOL 3 was inherently limited in accuracy

by the information that TOOL 1 could supply and FA SD responded by initiating particular extensions of tagging in TOOL 1 for the employees concerned by their business (Advisor2 & Advisor1; Architecture2). Noteworthy is also that the usage of TOOL 3 does not seem to have been adopted by a critical mass in the organization (Demand5; Demand7; Demand8; Demand9) something that is further elaborated on in section 5.2.1.

When TOOL 4 was about to be implemented the service delivery organization had hopes for better support for operative competence management (Demand5). When the anticipated system support with TOOL 4 was not realized, FA SD decided to continue to use TOOL 1 and start preparations for a completely new system to handle competence registration (Advisor2 & Advisor1). This system was later named TOOL 5, and during generation 2, wide-ranging discussions were conducted as to how the over-all resource allocation process should be constructed within FA SD, not least concerning competence resources (Architecture2; Architecture2; Architecture9). Opinions were aired and committees organized not only to specify the overall process but also to agree on requirements on the necessary IT-support (Architecture2). Meanwhile setting requirements and developing the new allocation system, TOOL 3 kept on being the official tool although complemented by other portals, IT-systems and bottom-up initiatives during this second generation (Architecture2; Architecture2; Architecture9).

In parallel to efforts in refining the tagging of individual competence positions and profiles the official allocation support was still, in 2012, lacking in fit with practical needs to exploit potential of internal competence resource supply globally. TOOL 3 continued as the official allocation tool without being adopted by a critical mass of users, and a number of local solution provided support according to local needs without enabling a proper overview beyond the social network of the local context.

5.1.3 Summary of 5.1

Chapter 5.1 can be summarized by Figure 3 where (A) can be considered requirements setting for the design of information technology in accordance with the ideas inherent in CMF and CCM (TOOL 2, TOOL 1, TOOL 3, TOOL 4). (B) in turn implies the design of said technology which in turn supports the organizational properties institutionalized through CMF and CCM (C). Social actors in the organization have then turned out to use the systems in slightly different ways than their design was intended for (*e.g.* TOOL 1 turned out to be extensively used in relation to TOOL 3 for allocation purposes, a utilization not taken into consideration for the design requirements (A) of TOOL 4). The capabilities of the system gave an infrastructure for social actors to utilize (D) but they determined the use of the technology according to local needs and not in accordance with the intended design.
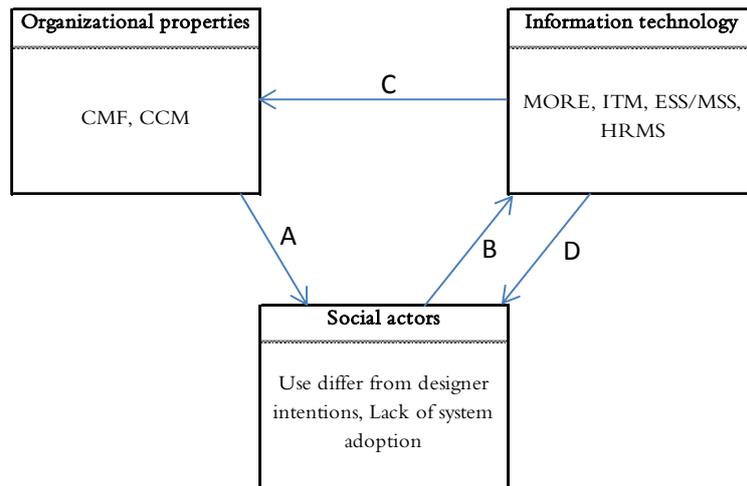
Figure 3 – Formal CMS during generation 1 & 2, seen as an integrative system of information technology, social actors and organizational properties (Inspired by Orlikowski (1992) and Lamb and Kling (2003)).

5.2 Operative perspective on CM, the case study

The findings presented in this section are primarily based on interviews with both demand and supply of competence resources with additional validation through archive studies.

In this section, results are presented regarding user opinions on the systems available. In the second sub-section results are presented concerning user opinions on the applicability of the information currently available as well as the information desired concerning competence resources. In both subsections the demand- as well as the supply side of competence resources are covered.

5.2.1 Regarding system support

Among representatives for the demand side of competence resources there seem to be a consistent perception of there being two parallel kinds of competence management. One that concern formal functional belonging, career path and salary and another one that is about placing competence resources at the right place at the right time (Supply3). In terms of official systems support the former kind is centrally governed and associated with TOOL 4 and the latter is managed by FA SD and associated with the matching tool TOOL 3 which is currently supported through TOOL 1.

TOOL 4 offers support for individual career planning and is an essential tool for line managers when performing yearly performance reviews with its employees. The system handles learning and development, individual goals and aspirations as well as assessment of job role competences. The assessment is the basis for activities for the upcoming year, where the gap between actual competence level and desired level are addressed by the learning and development module that identifies suitable courses for the employee. Since the desired level is stated by the different job stages which in turn are the basis for salary, TOOL 4 facilitates the individual career planning. However, the authors got the notion that TOOL 4 is perceived largely as an administrative tool related to formal career advancement rather than a competence

development support. One senior solution architect stressed that in practice, people only update data in TOOL 4 when formalities require them to (Supply3). Also, TOOL 4 does not offer support for allocating the right resource to the right place at the right time, mainly because of its lack of support for handling portfolio competences (Advisor2 & Advisor1; Architecture2).

Regarding the more resource oriented competence management type the right time and place for competence resources are also dependent on goal function. For instance, line managers have a responsibility to keep their staff employed in projects and project managers have an implicit responsibility to get the optimal resources in terms of competence/cost. Not being the focus of the present study these partly conflicting agendas are nevertheless important to keep in mind. Project managers and line managers do have a central theme for this study in common; they both represent demand for easily accessible up-to-date information concerning competence resources. The official tool for handling this is TOOL 3 supported with data from TOOL 2 via TOOL 1. However, the tool seems only to work well for rather standardized projects and in the area of the present case study they are quite rare (Demand8).

A line manager estimated that such projects accounts for about 10% of all projects and that TOOL 3 consequently is of little or no help in the other 90% of the projects (Demand8). Several of the interviewees from demand stress that they have never used TOOL 3 for finding competence resources, only to retroactively register allocations in order to abide by formal processes. The actual allocation is managed through social networks. (Demand5; Demand7; Demand8; Demand9) One manager said that the perspective on competence at Company X is too focused on technical competencies (Demand4). A program manager had a similar opinion and said he had tried to use TOOL 3 but since he only could specify technically oriented skills *"we got people we just couldn't work with"* and he therefore relied on his own social network to find the right people from then on (Demand12). A project manager succinctly gave three arguments for why he would not use TOOL 3: *"1. It is difficult to use. 2. It is difficult to find the roles or competence descriptions that you need. 3. It takes a long time to get an answer and the answer is rarely a good one"* (Demand9).

5.2.2 Regarding desired information

From the demand side of competence resources, in the area of E&U personality characteristics as well as industry specific experience seem to be highly valued. A senior operations manager working in I&S argued that the organization has *"a technical view on people and that doesn't work in this world of system integration"* (Demand4). A line manager stresses that I&S is a bit special in this case; even though personality related characteristics are of importance also in more established fields in order for a project team to work well, within I&S projects are less standardized and it is therefore more up to the individual's *"self-leadership"* as she put it, and creativity to solve problems that come up; there are rarely standardized solutions to be found (Demand8). An experienced solution architect also stated that within such projects it is highly important that team members are highly flexible and good at handling changes (Supply4). All representative of the demand side stress the need for industry specific experience within projects, even though it is said not to be necessary for every project member. However,

reasonably there is no sharp divide between roles that do, and such that do not require contextual experience. A representative from the supply side that went into his first I&S project without, at the outset, having the contextual understanding that the role required stressed that *"it is a matter of attitude to go into a project without previous contextual experience"* (Supply1).

Few representatives mention information concerning technical skills as the decisive information they need to make a decision. A line manager explains this through stating that the level of technical expertise required is generally there, it is not the issue but that personality related characteristics is the bottle neck in finding the right resources (Demand7). A project manager nuanced the picture stating that "*it can be really hard to find very domain specific expertise but you generally don't need quantity there, the issue is often finding technical generalists with the right soft skills*" (Demand9). A program manager within E&U emphasized the importance of information about personality related characteristics and experience, as well as more domain specific process and technical skills (Demand3), indicating the need for understanding the full picture. On the supply side within E&U an experienced professional stressed the fundamental importance of contextual experience and personality characteristics in new kinds of projects (Supply2) (such as is generally the case within E&U and I&S). A line manager stated that lack of technical expertise rarely is the issue within Company X as opposed to contextual experience in new areas such as I&S. Therefore, she considered information about contextual experience to be of more importance than information concerning technical competencies (Demand7). A solution architect with experience from working in I&S did the same prioritization and concluded that people on E&U-projects generally are very senior professionals in the organization (Supply8).

Several of the demand representatives emphasized the importance of information about peoples' experiences in order to be able to determine the fit for a given project role. A project manager explained that the ideal competence management system would be efficient in screening for relevant candidates but that he wanted a few different candidates to evaluate qualitatively on the basis of their previous experiences (Demand5). The same project manager also stressed the importance of such information being unbiased, *i.e.* that experiences should be described neutrally and preferably not be entirely deducted by their holder. The importance of up-to-date information about competencies was generally emphasized among the interviewees and two of them, a line manager and a project manager explicitly mentioned real time capture of experiences as a feature of an ideal competence resource allocation system (Demand5; Demand8). A senior engineer working as a global coordinator of competence resources also greatly valued rich CVs as a source of good material for deciding whether a candidate is a good fit or not (Demand10).

Regarding the supply side, most of the representatives have been at Company X for a long time and have experience from more established business areas within the organization prior to their work in E&U. They generally stress that I&S and E&U require more in terms of personal characteristics such as curiosity and aptness for challenges and change. Recurrent among the interviewees on the supply side is stressing the importance of work processes and appropriate

methodologies for system integration projects. Two senior solution architects claim that process knowledge, how Company X works, is what is generally required and that domain specific experts can be consulted when needed (Supply5 & Supply6). They especially stressed the importance of engaging domain specific technical expertise in the earliest phases of a project. Similar to the demand side they also emphasize the importance of having some project members with relevant industry specific experience. One senior E&U expert recruited from the industry estimated that it is sufficient if 15-20% of the members in a project have industry specific experience while the rest are required to have more general experience of IT and systems integration (Supply7).

5.2.3 Summary of 5.2

Chapter 5.2 can be summarized by Figure 4Figure 3 where (A) can be considered organizational properties' conditions setting the scene for social actors in the organization through the formal competence models based on job roles. (B) in turn indicates the response from social actors to design local solutions and tools which makes information in formal systems obsolete when they are operatively substituted by the local solutions (C). The poor fit between actual operative competence resource management needs and the officially supplied tools makes them more of administrative formalities (D) whereas the actual work is supported through local solutions and social networks.
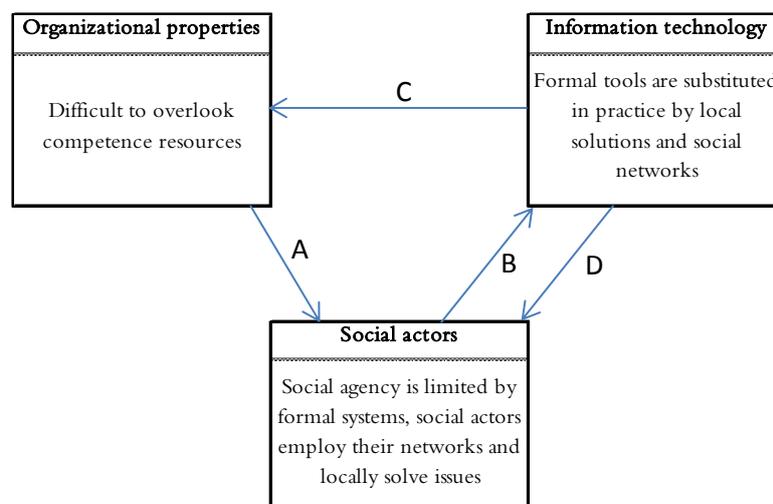
Figure 4 – Actual CMS during generation 1 & 2, seen as an integrative system of information technology, social actors and organizational properties (Inspired by Orlikowski (1992) and Lamb and Kling (2003)).

5.3 CMS at Company X 2016 →

During this period FA SD will implement the system TOOL 5 with the purpose of taking over competence profile management from TOOL 1 and enable a better depiction of available competence resources (Demand5). TOOL 5 will be implemented successively, starting with the roll-out at CSI during the spring and summer of 2016 (Ibid.). The system will be the interface through which employees and managers interact with TOOL 2 in order to describe individual competence profiles and assign new competences to them over time (Ibid.). It will

be up in parallel with TOOL 4 that will be continuing as the main HR-portal for all Company X employees (Architecture21; Demand5). Consequently, people within FA SD will interact with both these systems, from the individual's perspective largely divided so that competence management is managed in TOOL 5 and career management is managed in TOOL 4. TOOL 5 will make it possible to search on the experiences of employees (Demand5). The professional history of an employee will be stored and made searchable. However, it is unclear at the moment exactly how new competences will be formulated and also in what form experiences will be stored (Ibid.). The current project that employees are engaged in will also be visible in the system (Ibid.). TOOL 5 is further intended to communicate with the new allocation system called TOOL 6 and provide it with data (Architecture2; Demand5).

The process at FA SD during generation 2 of finding new system support for operational resource management resulted in a set of requirements for the supporting allocation IT-system (Architecture2). Early in 2016 it was dubbed TOOL 6 even though the implementation process has not yet started when this is being written. TOOL 6 will, according to requirement settings allow for more flexible search criteria and transparency (Architecture2; Architecture9). Moreover, the idea is for TOOL 6 to be interconnected with TOOL 5, loading much of its data from there (Architecture2; Demand5). It will communicate with TOOL 5 and thus benefit from any improvements made in that system compared to TOOL 1. The extensive preparation of TOOL 6 during the previous generation was partly a measure to ensure the adoption of the new tool by a critical mass of users (Architecture2; Architecture9). The lack of such a critical mass has been one of the fundamental problems with the architecture so far and is considered an enabler both in the pre-studies to TOOL 6 and in more general research concerning the operations management of the service organization as a whole (Architecture2; Urquhart *et al.*, 2013). In order to avoid the scattering of the architecture into a plethora of different tools, TOOL 6 is intended to have a broader functionality than its predecessor TOOL 3 (Architecture2; Architecture2) and there is an ambition to make it compatible with different existing systems for project management in order to minimize double work for the user, *i.e.* that a project only should need to be defined in one system (Architecture2).

Summarizing, TOOL 2 and TOOL 1 in generation 1 focused primarily on competence-in-stock. TOOL 3 did however include intentions of storing data concerning description of project roles in terms of situated experiences thereby aspiring to cover also competence-in-use to some extent. In generation 2 the introduction of TOOL 4 implies an increased focus on competence-in-the-making through the learning features and career planning elements in the system. Meanwhile FA SD starts to develop their own system support for operative CM while temporarily substituting TOOL 4 for TOOL 1 in these matters. In the coming generation 3 the HR perspective seems largely unchanged while FA SD will implement a more complete system support that to a larger extent will handle experiences, possibly including present time experiences. A summary of all systems and their connection to the typology described by Lindgren *et al.* (2004) is captured in Table 7. This is also compared to the growth of services as a percentage of total sales to indicate the increasing significance of Service Delivery.

| Generation | Competence management at Company X | | | | Services share of sales |
| | HR – Strategic responsibility and perspective | | FA SD – Operative responsibility and perspective | | |
	Systems of interest	Competence type	Systems of interest	Competence type	
1: 2002-2011	TOOL 2 TOOL 1 (R)	[black | white | white]	TOOL 3 (A)	[black | grey | white]	26 % – 37 %
2: 2012-2016	TOOL 2 TOOL 4 (R)	[black | white | grey]	TOOL 3 (A) TOOL 1 (R)	[black | grey | white]	43 % – 44 %
3: 2016 →	TOOL 2 TOOL 4 (R)	[black | white | grey]	TOOL 5 (R) TOOL 6 (A)	[black | white]	N/A

Table 7 – Historical overview of systems and their compability with copmetence types suggested by (Lindgren et al., 2004).

The graphs should be interpreted as [Competence-in-stock | Competence-in-use | Competence-in-the-making]. Example: In the graph below, the black field marked with A indicate that Competence-in-stock is managed. The grey field marked with B means there is an intention to manange Competence-in-use and lastly, the white field marked with C indicate no intention or system support for Competence-in-the-making.

[A (black) | B (grey) | C (white)]

31

6 Analysis

The results will in this section be analyzed with respect to the theoretical foundation and the research questions to set the foundation of answering the research questions in the next chapter. The first sub-section in this chapter is concerned with interpreting the historical development of CMS at Company X through perceiving the development as a dialectic process between different parts of the organization deriving how the predominant perspectives on competence in the relevant parts of the organization have developed over time. Subsequently we inquire and respond to how the systems' development has affected operations in terms of communication of competence data for allocation purposes. The second and last section will analyze the current directions for generation 3 together with the wishes and ideas of demand and supply representatives.

6.1 Two perspectives negotiating

Kallinikos (2011) suggests that the design of technology not necessarily determine the way in which it is used. Even though design obviously has a fundamental impact, he states that only local practice finally determines the way in which technology is used. At Company X, central systems and interfaces such as TOOL 2, TOOL 1 and TOOL 4 have been designed historically for distinct purposes but the ways in which they have been used is in some ways differed from the intended purposes, challenging their inherent capabilities. More importantly, throughout generations 1 and 2 the systems have manifested a dialogue between HR and FA SD as to how competence is perceived and what system support it requires in order to be effectively managed. Moreover, throughout the development of the systems, their functionalities and restrictions have set conditions for professionals working in the organization as to how the communication of competence resources can be conducted and therein shaped their behavior.

6.1.1 The technology-mediated dialogue between HR and FA SD

The division of responsibility with a strategic focus at the HR department and an operative responsibility for FA SD yield a both constructive and constraining friction in the employment of the CMS over time. At the outset of generation 1, TOOL 1 made it possible for individuals to interact with TOOL 2 and so develop and build the available data concerning competence in the organization. There were also capabilities in TOOL 3 for capturing experiences even though these were isolated to TOOL 3 and not accessible from other systems (Architecture2). However, being the source of competence data, TOOL 2 came to be a limiting factor for the information flows required in the allocation of competence resources within the growing FA SD business of Company X. Following the introduction of TOOL 3, the initiatives from FA SD to introduce new ways of tagging competences to individual profiles to allow for more detailed descriptions indicate a drive towards a more skill-based approach to competence required by the market of FA SD. The way in which TOOL 4 manifests the job role as a consistent format for the centrally governed competence management indicate that even though progressive in terms of learning and development, HR still holds a more job-oriented view on competence.

With the beginning of generation 2 the two perspectives on competence collide when hopes for TOOL 4 to solve some of the operative problems with coarse competence data are turned into disappointment for FA SD. As a consequence, FA SD then turn to the previous TOOL 2 interface, TOOL 1, extending it further and sustaining as the only user of it with regard to competence. It is clear that the technology has had an important role in manifesting the positions and roles of the two entities HR and FA SD respectively. While HR effectively assumes its responsibilities to manage long term planning and to provide support for individual competence development through TOOL 4, FA SD realizes the extent of its needs for systems support in CM through the shortcomings of the new system from an operative perspective. This realization triggers discussions as to how TOOL 3 can be replaced with a system that is better adapted to the actual conditions of FA SD. It also puts into sharp relief that a system support must be designed around its intended use and not the other way around, in accordance with Stevens (2013). Though dispersed to start with, the discussions entail close examination of the actual needs for system support, also taking into account learnings from the local, unofficial solutions to different needs for system support in the allocation processes.

The intentions behind the systems TOOL 4 and TOOL 3 are in many ways progressive. TOOL 4 has features for integrating individual competence development with courses and learning based on the individual's and the organizational interests. However, TOOL 4 does only relate to the individual on an annual basis and is otherwise not naturally connected to the work processes as these are commonly administered in local systems. It seems as though TOOL 4 is not perceived as an integral part of the working environment in practice but as a mere administrative formality. TOOL 3 provides access to potentially up-to-date information about competence resources across the organization and also stores experiences of individuals as a sort of automatically updated CV. The addition of portfolio competencies that are disconnected from the job role is a significant step towards a more skill-oriented idea of competence. Even so, they are also administered and assessed manually by employees and managers through TOOL 1 and consequently are relying on individuals' initiatives and prioritizations adding to the workload.

6.1.2 Institutional consequences of interaction with technology

Being technology-centered and having a history of a rather flat organization the staff at Company X is in general used to taking initiatives and driving their own work. There consequently exist social networks among co-workers as a default for any lack of, or dysfunctional operative CMS. It is also clear from the interviews that this default solution often is chosen over the official tools and systems. Seeing as how current systems are relying on the individual to manually input data, this activity needs to be prioritized over other work tasks. The priority among the senior professionals subjected to the present study however, seems to be the activities that are directly connected to current projects. As a result, the competence resource data that is available in the systems tend to be inaccurate. The elements of interest integration in TOOL 4 are crippled by the fact that the job role often is a poor depiction of the individual's job in practice and her actual competence profile. The frames within which the interest integration can be employed are in these cases inaccurate and therefore not

enabling an idea of the actual future capabilities of the organization's competence resources, its competence-in-the-making.

6.2 Voice of the customer

As presented in section 5.3 the TOOL 5 and TOOL 6 are underway to be implemented during 2016. For the preparations of TOOL 6, local solutions and the opinions of employees have been taken into account when setting the requirements but the connection between TOOL 5 and TOOL 6 is still under development and is subjected to an ongoing discussion, a discussion that includes the handling of experiences. Even though a lot of work has been put in to facilitate the adoption of the tools by a critical mass some of the drawbacks of previous systems and TOOL 4 still remain in TOOL 5 and TOOL 6. The CMS relies on the initiative of individuals to feed the system with data manually. TOOL 5 is a parallel system to TOOL 4 handling similar information, forcing people within FA SD to interact with two different systems regarding competence information, TOOL 5 will be used to assess the individual competence profile and identify gaps and TOOL 4 will be used to design development goals and, when needed, assign for learning activities.

As for TOOL 6 it will need to be compatible with several different systems for project management in order to avoid double work for project managers. Also, if the roles in the project are to be accurate there is a need for flexibility in the system so that they can be updated over time. A project manager clarified this need by stating that *"in practice you adapt the roles in order to make the most out of the resources you've got"* (Demand9).

As for TOOL 5, the importance of competence information to be up-to-date is generally stressed by representatives from the demand side. One project manager also saw a semi-automated registration of data as a possibility to obtain unbiased data, as opposed to if the data is manually fed into the system. The benefit of unbiased data was emphasized both by the supply and demand side. For the supply side it was seen as a way to credit performance rather than individual marketing abilities (Supply3; Supply5 & Supply6). On the supply side there are also concerns for how the systematic storage and availability of data concerning experiences might be used and the consequences it might entail. It has to be combined with complementing information regarding the individual's interests and wishes concerning future career development. If not, chances are that people will converge in terms of what projects they get assigned to and it will be more difficult to get into a new areas and broaden competence development (Supply5 & Supply6) which might lock in potential for the organization in terms of competence-in-the-making.

6.2.1 The desired information about competence resources

The results from the first round of interviews, covering twelve representatives from the demand side of competence resource information within I&S and E&U point towards a division of competence and competence information into three different categories. These are labeled *know-how*, *behavioral characteristics*, and *contextual experience*. The operationalizations of which are given in Table 8 and that can be constructively compared to the definitions of competence types in chapters 2.2.2 and 4.2. respectively.

Competence category	Operationalization
Know-how	Know-how is a skill or an ability that might be learned.
Contextual experience	The different contexts in which an individual has worked before and the roles that have been held there.
Behavioral characteristics	Personality related characteristics and individual interests.

<div align="center">Table 8 – Operationalization of competence categories</div>

6.2.2 Reinterpreting desires of demand

A commonly spoken desire concerning information about all of the categories of information is for it to be accurate and up-to-date. Even so, competence information is generally regarded as something generated in the past, implicitly leaving the present and the future outside of the concept of competence. However, having up-to-date information about know-how, contextual experience and behavioral characteristics does with little stretch of the imagination imply a full coverage of the competence typology suggested by Lindgren *et al.* (2004). Competence-in-stock is regarded as that which has been learned over time. This rhymes with the operationalization of know-how in Table 8. The remaining two competence types suggested by Lindgren *et al.* (2004) might also be derived from the competence types in Table 8. Consider for a moment that competence-in-use is not merely the sum of competencies taken from her stock. It is the application of them in the making of a situated context, therein re-creating and transforming the competence of the individual. Moreover, competence-in-the-making is taking into account the fact that competence development is heavily dependent on an individual's aptness for learning different things and also her motivation and interests in combination with organizational interests. At time t, a list of an individual's competencies-in-stock can reasonably be considered her know-how. Given the situated context she is in and the new way in which she applies her know-how there, the difference between competence-in-use and contextual experience is vanishingly small if existing. Moreover, the interests and aptness of the individual at time t, to acquire different capabilities and take on certain challenges is what would be called behavioral characteristics and it is also justly interpreted as her competence-in-the-making.

Based on the notes taken at the interviews we interpreted the interviewees' prioritizations among the competence categories in Table 8 and the interviewees were then asked to validate the interpretations. A few corrections were made and the results are visualized in Figure 5. The majority of the interviewees prioritized contextual experience high and none gave it the lowest priority. The rationale behind this was that information about an individual's contextual experiences implicitly gives information also concerning the other two categories: behavioral characteristics and know-how.
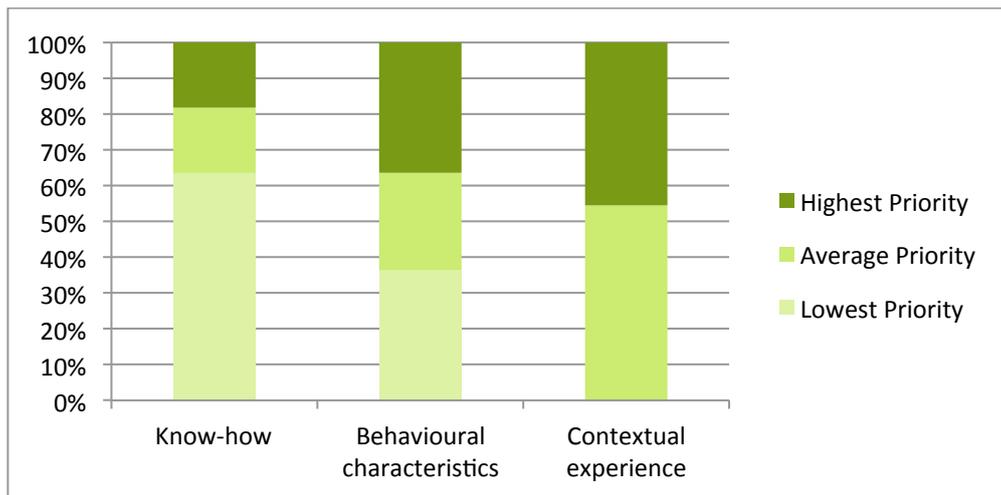
Figure 5 – Prioritization of competence information, validated demand data

6.2.2.1 The desired information in practice

Contextual experience is registered within the organization in order to specify project roles for individuals. That is, tasks are defined, what they require in terms of competencies is specified as well as where and in what setting they are to be carried out. A troublesome fact is that there is no single system currently able to gather said information in one portal. It is however a stated ambition to handle experience within TOOL 6 and TOOL 5 and this would in theory, based on the above analysis, enable the CMS to record all three competence types over time. If the handling of experiences encompasses also present tasks and includes data concerning current interests of the individual, then the system would effectively cover also what Lindgren *et al.* (2004) refer to as competence-in-the-making.

Taking the prioritizations presented in the previous subsection and considering their practical availability for CM purposes we find that contextual experience both in theory and practice seems to be a hub for competence information. The analysis behind this finding is visualized in Figure 6. There are quite firm restrictions on what data that can be stored concerning behavioral characteristics (Architecture10; Architecture18). These restrictions also vary greatly in the different geographical areas where Company X is currently doing business (Architecture18). Consequently, looking at the first row and the first square in Figure 6 the available information concerning behavioral characteristics that is manageable across the organization is poor and consequently says little about the actual person it describes. Moreover, it tells as little or less about what the person has experienced or what know-how she possesses which is depicted in the last two squares of the first row in Figure 6. Concerning the second row in the same figure, information about contextual experience might reasonably say something about the actual behavioral characteristics of a person. Also, quite obviously it says something about the actual contextual experience of a person and also forms rather good grounds for assuming a person's know-how. A senior engineer with experience both from the demand and supply side of competence also put experience as top priority. This analysis seems to have a good fit within E&U but also with other areas within Company X (Demand11). Currently working within Network Design and Optimization at Company X he emphasized the importance of having information concerning previous projects of people since it told him

how people have used their competences and what niches they might be good at (Demand11). He further stressed that experience might entail information about niches that the organization doesn't yet know the importance of but that may turn out to be a great asset. He states that

> "Upcoming niches are hard to predict [...] e.g. within 5g there will be new niches coming up that we currently don't know about [...] and therefore you need to somehow map niches continuously" (Demand11).
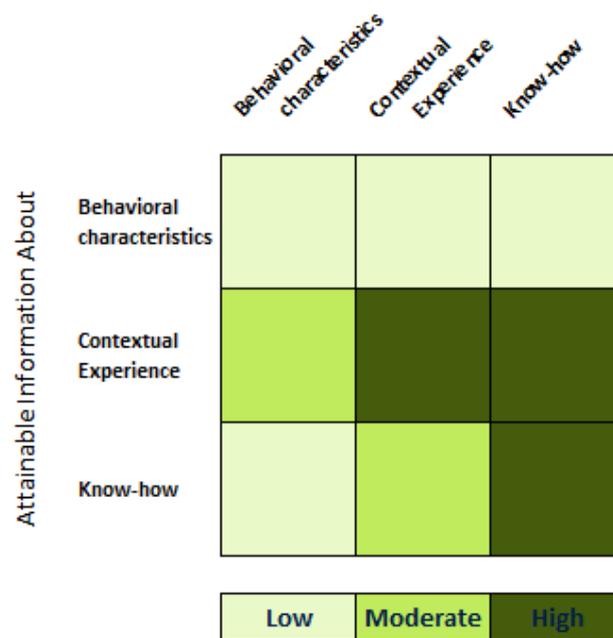

Figure 6 – Correlation of competence information and actual competence

7 Concluding Discussion

In brief, this study finds support for contextual experience as a constructive carrier of competence information. The intuitive way to do this would be through using the registration of new project roles as the basis also for the registration of individual experiences, formulated in terms of competence-in-stock put in the situated context of a project. Such a semi-automated system would however need to be just that, semi-automated, as previous studies (Lindgren *et al.*, 2004) have clarified the importance of the individual's ownership of data that is disclosed about her. For this reason, the automation should only concern suggestions for publication while the actual publication of experiences on an individual's profile would be done by the individual herself, allowing her to edit it before publication. Moreover, the supply side of competence information has made it clear that experience as a carrier of competence information should be complemented by allowance for the individual to publish also her areas of interest regardless of where her experience lies.

As for the explicit research questions, RQ0:

> *What are the historical foundations on which current CMS is built?*

The answer to this question is the foundation for the study as a whole and is summarized in Table 7. Considering further RQ1:

> *What information about competence is necessary for successful allocation of competence resources to projects?*

The present study finds that the most relevant competence information in the FA SD setting by necessity concerns the complete picture of a person, including personality and contextual experience. Practically this implies that information concerning contextual experience is of primary concern as it encompasses information concerning both behavioral characteristics as well as about know-how. There are also indications that individual interest integration would be beneficial to display in connection to contextual experiences. There are also indications that findings apply to more mature areas within Company X (Demand11). Also, it is not always information about competence that is the highest priority. In particularly new areas or in significant technological leaps within mature areas there is a primary need to specify competence gaps before it is even possible to specify information about the competence that is needed.

RQ2:

> *From where can the competence information that is necessary for competence resource allocation be extracted?*

Project roles are to be imported into TOOL 6 one way or another, depending on the administrative system used for project management. This information also encompasses the information needed to formulate experiences presently in the making. Concerning competence-in-the-making, individual interests are currently managed in connection to career planning in TOOL 4. This information could be relevant also to enrich a semi-automatically

generated CV of contextual experience. As for external recruiting, the formulation of requirements on the recruit encompasses much of the information needed for formulation of previous experiences but efforts would need to be made manually to explicitly include non–Company X experiences in the system. Also, the findings in this study indicate that competence description gaps as well as competences should be collaboratively defined involving the people closest to the competence-in-use as well as such people that need the competence resources.

RQ3:

> *How can competence information that is necessary for competence resource allocation be effectively used to operatively allocate competence resources?*

This study suggests that real-time capture of the making of experiences could be a vehicle for describing professionals' competence development with a life-cycle perspective. This pre-supposes that project roles are defined in terms of competence-in-stock (portfolio competencies in the case of FA SD at Company X) and that such information is possible to handle both within competence profile management systems (TOOL 5) as well as in allocation systems (TOOL 6). Also, to capture competence-in-the-making, information currently generated and stored in TOOL 4 related to career planning could plausibly be displayed in connection to experience-centered competence profiles in TOOL 5/TOOL 6.

The conclusions can be summarized by Figure 7 where (A) can be interpreted as the requirements given to designers for the integration of experience handling (that includes the formulation of experiences in terms of portfolio competencies), between TOOL 5 and TOOL 6. (B) can be seen both as the design of said integration but also as the professionals' ownership and editing of the automatically generated experience suggestions. (B) also encompasses the addition of areas of interest (in terms of portfolio competencies) of individual professionals into competence profiles. (C) indicates the supportive role of information systems relatively an operative competence resource management centered around the management of contextual experiences. (D) supporting professionals with automatically generated CVs allowing them to edit and publish unbiased relates of their experience with the addition of their areas of interests (B).
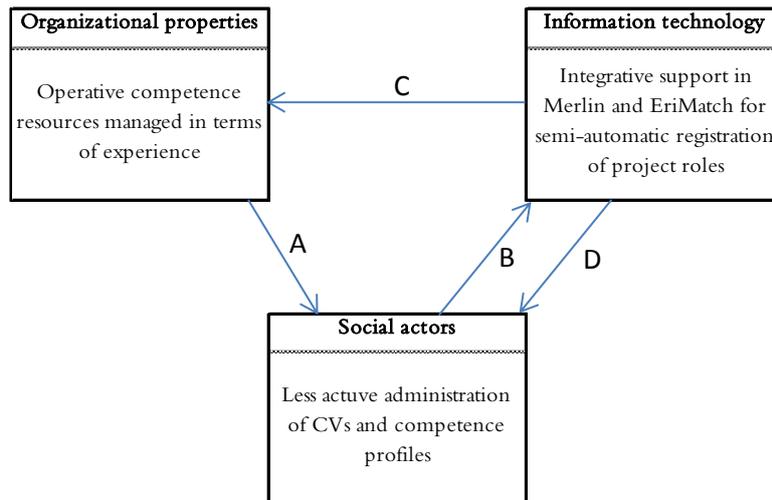
Figure 7 – Future CMS, seen as an integrative system of information technology, social actors and organizational properties (Inspired by Orlikowski (1992) and Lamb and Kling (2003)).

7.1 A note on transferability

Our findings are to a large extent built on a case study at Energy and Utilities at Company X, an area with mostly senior professionals with a wide range of previous experiences. Their input correspondingly provides some support for the transferability of our findings to other settings. However, even though the findings connected to research questions 1-3 are based on a single case study the findings are in accordance with various standardized competence typologies such as O★NET and DISCO as well the typology provided by Lindgren *et al.* (2004). The conclusion that contextual experience is a good carrier of competence information could equally have been drawn from either of these typologies based on the same logic we used inspired by the design principles of Lindgren *et al.* (2004). The relevance of managing competence resources as individuals with needs and wants, rather than prescribed roles for individuals to fit into, is quite established (Lawler & Ledford, 1992; Lawler, 1994; Lindgren *et al.*, 2003; Lindgren *et al.*, 2004; Soderquist *et al.*, 2010; Stevens, 2013). It is therefore plausible to consider our findings at least to some extent transferrable to other large, project oriented organizations that have needs for accessible, up-to-date information concerning competence for operative resource allocation.

7.2 Sustainability

This thesis provides possible solutions for improving CMS at large knowledge intensive firms, providing opportunities for better resource usage in terms of right person for the right project at the right time. This implies a minimization of waste in terms of travel, waiting times, and frustration. A preventable issue for Company X is the need for external consultants that cut into profit margins, a need that stem from lack of possibility in some cases to find internal competence resources even though they "should" be existing in the organization.

Last but not least, by involving individuals' interests in the CMS, the wellbeing ought to be increased. And this solely by individuals' getting the chance to do something they are interested in and not only something they are good at or have done previously.

7.3 Future Research and Managerial Implications

Having focused on the area of Energy & Utilities the transferability of the findings of this study would be clarified through similar study designs applied to more established areas in an organization. It would be interesting to find out how information concerning contextual experience would be differently applicable in more mature and standardized contexts.

The present study has had a conceptual scope as opposed to a more technical one. The implementations of the recommendations entailing the present study would be of interest to follow up once TOOL 5 and TOOL 6 are up and running.

We also find the unofficial, emerging systems and tools quite interesting. The triggers of such emergence as well as how the solutions gain usage and reputation in the different communities of practice in the organization would be of great interest as a study of sociomateriality in organizations. The locally emerging tools can also be considered a clear indication of the need for CMS in organizations such as Company X.

The findings of this study highlight the importance of how competence is presented, not only how it is categorized and described. This conclusion is derived from circumstances such as varying legislative complications in different parts of the world concerning the storage and diffusion of personal information, but also due to the need for a notion of such information, however implicitly it is given. It is clear that information about competence for the purpose of operative resource allocation preferably should be unbiased, rich, and describing people rather than itemized resources.

8 References

8.1 Publications

Abel, M.-H. (2008) 'Competencies management and learning organizational memory', *Journal of knowledge management*, Vol. 12, No. 6, pp.15-30.

Agha, S., Alrubaiee, L. and Jamhour, M. (2012) 'Effect of core competence on competitive advantage and organizational performance', *International Journal of Business and management*, Vol. 7, No. 1, pp.192-204.

Ajzen, I. (1991) 'The theory of planned behavior', *Organizational behavior and human decision processes*, Vol. 50, No. 2, pp.179-211.

Allwood, C. M. (2012) 'The distinction between qualitative and quantitative research methods is problematic', *Quality & Quantity*, Vol. 46, No. 5, pp.1417-1429.

Alter, S. (2008) 'Defining information systems as work systems: implications for the IS field', *European Journal of Information Systems*, Vol. 17, No. 5, pp.448-469.

Baladi, P. (1999) 'Knowledge and competence management: Company X business consulting', *Business Strategy Review*, Vol. 10, No. 4, pp.20-28.

Benbasat, I. and Barki, H. (2007) 'Quo vadis TAM?', *Journal of the association for information systems*, Vol. 8, No. 4, p.7.

Bogner, W. C., Thomas, H. and McGee, J. (1999) 'Competence and competitive advantage: towards a dynamic model', *British journal of management*, Vol. 10, No. 4, pp.275-290.

Boudreau, M.-C. and Robey, D. (2005) 'Enacting integrated information technology: A human agency perspective', *Organization science*, Vol. 16, No. 1, pp.3-18.

Bryman, A. and Bell, E. (2011) *Business research methods*, 3rd ed., Cambridge ; New York, NY: Oxford University Press.

Burrus, J., Jackson, T., Xi, N. and Steinberg, J. (2013) 'Identifying the most important 21st century workforce competencies: An analysis of the Occupational Information Network (O* NET)', *ETS Research Report Series*, Vol. 2013, No. 2, pp.i-55.

Calantone, R. J., Cavusgil, S. T. and Zhao, Y. (2002) 'Learning orientation, firm innovation capability, and firm performance', *Industrial Marketing Management*, Vol. 31, No. 6, pp.515-524.

Cecez-Kecmanovic, D., Galliers, R. D., Henfridsson, O., Newell, S. and Vidgen, R. (2014) 'The sociomateriality of information systems: current status, future directions', *Mis Quarterly*, Vol. 38, No. 3, pp.809-830.

Chalmers (2011) *Chalmers Writing Guide* [online], available: https://student.portal.chalmers.se/en/contactservice/studysupport/writing-guide/Pages/default.aspx [accessed 20160425].

Commission, E. (2016) *Data Protection* [online], available: http://ec.europa.eu/justice/data-protection/ [accessed 20160513].

Comstock, M. and Winroth, M. (1999) 'Fordism, Sociotechnical Systems, Toyodism and Future Systems'.

Cronin, P., Ryan, F. and Coughlan, M. (2008) 'Undertaking a literature review: a step-by-step approach'.

Davis Jr, F. D. (1986) *A technology acceptance model for empirically testing new end-user information systems: Theory and results*, unpublished thesis Massachusetts Institute of Technology.

Dorn, J., Pichlmair, M., Schimper, K. and Tellioğlu, H. (2008) 'Supporting Competence Management in Software Projects', in *Proceedings of International Conference on Concurrent Enterprising*, 451-458.

Dubois, A. and Gadde, L.-E. (2002) 'Systematic combining: an abductive approach to case research', *Journal of business research*, Vol. 55, No. 7, pp.553-560.

GmbH, s. U. (2012) *DISCO Project information* [online], available: http://disco-tools.eu/disco2_portal/projectInformation.php [accessed 20160426].

Gregor, S. (2006) 'The nature of theory in information systems', *Mis Quarterly*, pp.611-642.

Guba, E. G. and Lincoln, Y. S. (1994) 'Competing Paradigms in Qualitative Research' in Denzin, N. K. and Lincoln, Y. S., eds., *Handbook for Qualitative Research*, Thousand Oaks, CA: Sage, 105-117.

Hansson, B. (2011) *Skapa vetande: vetenskapsteori från grunden*, Lund: Studentlitteratur.

Hart, C. (1998) *Doing a literature review: Releasing the social science research imagination*, Sage.

Hustad, E. and Munkvold, B. E. (2005) 'IT-supported competence management: A case study at Company X', *Information Systems Management*, Vol. 22, No. 2, pp.78-88.

Javidan, M. (1998) 'Core competence: what does it mean in practice?', *Long range planning*, Vol. 31, No. 1, pp.60-71.

Jones, M., Orlikowski, W. and Munir, K. (2004) 'Structuration theory and information systems: A critical reappraisal' in Mingers, J. and Willcocks, L., eds., *Social theory and philosophy for information systems*John Wiley & Sons, Ltd, 297-328.

Jones, M. R. and Karsten, H. (2008) 'Giddens's structuration theory and information systems research', *Mis Quarterly*, Vol. 32, No. 1, pp.127-157.

Kallinikos, J. (2011) *The regulative regime of technology*, Springer.

Kvale, S. (1994) 'Ten standard objections to qualitative research interviews', *Journal of phenomenological psychology*, Vol. 25, No. 2, pp.147-173.

Lamb, R. and Kling, R. (2003) 'Reconceptualizing users as social actors in information systems research', *Mis Quarterly*, pp.197-236.

Lawler, E. and Ledford, G. (1992) 'A skill-based approach to human resource management', *European Management Journal*, Vol. 10, No. 4, pp.383-391.

Lawler, E. E. (1994) 'From job-based to competency-based organizations', *Journal of organizational behavior*, Vol. 15, No. 1, pp.3-15.

Le Deist, F. D. and Winterton, J. (2005) 'What is competence?', *Human resource development international*, Vol. 8, No. 1, pp.27-46.

Lee, Y., Kozar, K. A. and Larsen, K. R. (2003) 'The technology acceptance model: Past, present, and future', *Communications of the Association for information systems*, Vol. 12, No. 1, p.50.

Leydesdorff, L. (2010) 'The communication of meaning and the structuration of expectations: Giddens'"structuration theory" and Luhmann's "self-organization"', *Journal of the American Society for Information Science and Technology*, Vol. 61, No. 10, pp.2138-2150.

Lincoln, Y. S. and Guba, E. G. (1985) *Naturalistic inquiry*, Beverly Hills, CA: Sage.

Lindgren, R., Henfridsson, O. and Schultze, U. (2004) 'Design principles for competence management systems: a synthesis of an action research study', *Mis Quarterly*, pp.435-472.

Lindgren, R., Stenmark, D. and Ljungberg, J. (2003) 'Rethinking competence systems for knowledge-based organizations', *European Journal of Information Systems*, Vol. 12, No. 1, pp.18-29.

Markowitsch, J. and Plaimauer, C. (2009) 'Descriptors for competence: towards an international standard classification for skills and competences', *Journal of European Industrial Training*, Vol. 33, No. 8/9, pp.817-837.

Miconnet and Alänge (1999) 'Global Diffusion of Best Practices', *SIQ Kundorienterat*, pp.6-7.

Mignerat, M. and Rivard, S. (2009) 'Positioning the institutional perspective in information systems research', *Journal of Information Technology*, Vol. 24, No. 4, pp.369-391.

Miles, M. B. and Huberman, A. M. (1994) *Qualitative data analysis: An expanded sourcebook*, Sage.

Mills, J., Bonner, A. and Francis, K. (2006) 'The development of constructivist grounded theory', *International journal of qualitative methods*, Vol. 5, No. 1, pp.25-35.

Morgan, D. L. (2007) 'Paradigms lost and pragmatism regained methodological implications of combining qualitative and quantitative methods', *Journal of mixed methods research*, Vol. 1, No. 1, pp.48-76.

Mulder, M. (2001) 'Competence development-some background thoughts 1', *The Journal of Agricultural Education and Extension*, Vol. 7, No. 4, pp.147-158.

Norris, N. (1991) 'The trouble with competence', *Cambridge Journal of Education*, Vol. 21, No. 3, pp.331-341.

North, K., Reinhardt, K. and Sieber-Suter, B. (2012) *Kompetenzmanagement in der Praxis: Mitarbeiterkompetenzen systematisch identifizieren, nutzen und entwickeln Mit vielen Fallbeispielen*, Springer-Verlag.

Orlikowski, W. J. (1992) 'The duality of technology: Rethinking the concept of technology in organizations', *Organization science*, Vol. 3, No. 3, pp.398-427.

Orlikowski, W. J. (2007) 'Sociomaterial Practices: Exploring Technology at Work', *Organization Studies*, Vol. 28, No. 9, pp.1435-1448.

Orlikowski, W. J. (2010) 'The sociomateriality of organisational life: considering technology in management research', *Cambridge Journal of Economics*, Vol. 34, No. 1, pp.125-141.

Orlikowski, W. J. and Barley, S. R. (2001) 'Technology and institutions: What can research on information technology and research on organizations learn from each other?', *Mis Quarterly*, Vol. 25, No. 2, pp.145-165.

Orlikowski, W. J. and Scott, S. V. (2008) '10 sociomateriality: challenging the separation of technology, work and organization', *The Academy of Management Annals*, Vol. 2, No. 1, pp.433-474.

Pavur Jr, E. J. (2010) 'Use job descriptions to support leadership', *The Psychologist-Manager Journal*, Vol. 13, No. 2, pp.119-122.

Peterson, N. G., Mumford, M. D., Borman, W. C., Jeanneret, P. R., Fleishman, E. A., Levin, K. Y., Campion, M. A., Mayfield, M. S., Morgeson, F. P. and Pearlman, K. (2001) 'Understanding work using the Occupational Information Network (O* NET): Implications for practice and research', *Personnel psychology*, Vol. 54, No. 2, pp.451-492.

Prahalad, C. K. and Hamel, G. (1990) 'The Core Competence of the Corporation', *Harvard Business Review*, Vol. 68, No. 5, pp.79-91.

Rozewski, P., Malachowski, B., Jankowski, J., Prys, M. and Danczura, P. (2013) 'Preliminaries for dynamic competence management system building', in *Computer Science and Information Systems (FedCSIS), 2013 Federated Conference on*, IEEE, 1291-1297.

Saunders, M., Lewis, P. and Thornhill, A. (2009) *Research methods for business students*, 5th ed., Harlow, UK: Pearson Education Limited.

Schein, E. H. (1992) *Organizational leadership and culture*, San Francisco: Jossey-Bass.

Shenton, A. K. (2004) 'Strategies for ensuring trustworthiness in qualitative research projects', *Education for information*, Vol. 22, No. 2, pp.63-75.

Shippmann, J. S., Ash, R. A., Batjtsta, M., Carr, L., Eyde, L. D., Hesketh, B., Kehoe, J., Pearlman, K., Prien, E. P. and Sanchez, J. I. (2000) 'The practice of competency modeling', *Personnel psychology*, Vol. 53, No. 3, pp.703-740.

Soderquist, K. E., Papalexandris, A., Ioannou, G. and Prastacos, G. (2010) 'From task-based to competency-based: A typology and process supporting a critical HRM transition', *Personnel Review*, Vol. 39, No. 3, pp.325-346.

Stevens, G. W. (2013) 'A critical review of the science and practice of competency modeling', *Human Resource Development Review*, Vol. 12, No. 1, pp.86-107.

Strauss, A. and Corbin, J. (1998) *Basics of qualitative research: Procedures and techniques for developing grounded theory*, Thousand Oaks, CA: Sage.

Urquhart, N., Washington, N., Teslenko, M. and Elfving, S. W. (2013) *Service Operations and Workforce Optimization (SOWO) - Final Report*, Company X.

USDOL, N. C. f. O. N. D. f. *The O*NET® Content Model - Detailed Outline with Descriptions*, National Center for O*NET Development for USDOLhttp://www.onetcenter.org/content.html [accessed 20160425].

Wallén, G. (1996) *Vetenskapsteori och forskningsmetodik*, Lund: Studentlitteratur.

van Klink, M. R. d. and Boon, J. (2003) 'Competencies: The triumph of a fuzzy concept', *International Journal of Human Resources Development and Management*, Vol. 3, No. 2, pp.125-137.

8.2 Internal Company X Documents

Company X (2014) *Baseline Privacy Requirements*, Unpublished Internal Document: Company X.

Company X (2015a) *Competence Model Description*, Unpublished Internal Document: Company X.

Company X (2015b) *Definitions - Career & competence model architecture*, Unpublished Internal Document: Company X.

8.3 Interviews

This sub–section list all interviews referred to in the text and not a complete list of interviews.

Advisor2 and Advisor1 Role: Competence Manager/Supervisor

Supervisor, Interview: Introductions, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2015-12-14.

Architecture2 Role: Competence Management, Interview: Architecture1, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-02-04.

Architecture2 Role: Competence Management, Interview: Architecture2, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-14.

Architecture7 Role: Operational Development, Interview: Architecture, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-02-17.

Architecture9 Role: Competence Management, Interview: Architecture, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-01.

Architecture10 Role: HR Line Manager, Interview: Architecture1, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-01.

Architecture13 and Architecture14 Role: HR Business Partner;Learning & Performance Specialist, Interview: Architecture, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-23.

Architecture18 Role: Security Manager, Interview: Personal integrity, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-02-09.

Architecture21 Role: Learning & Performance Specialist, Interview: HR-perspective on competence, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-09.

Demand3 Role: Program Director, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-02-25.

Demand4 Role: Cheif Operating Officer, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-02-25.

Demand5 Role: Line Manager, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-02-26.

Demand7 Role: Line Manager, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-01.

Demand8 Role: Line Manager, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-02.

Demand9 Role: Project Manager, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-03.

Demand10 Role: Program Manager, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-04.

Demand11 Role: Product Manager, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-04-20.

Demand12 Role: Line Manager, Interview: Demand, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-10.

Supply1 Role: Senior Solution Architect, Interview: Supply, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-02-23.

Supply2 Role: Solution Architect, Interview: Supply, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-14.

Supply3 Role: Solution Architect, Interview: Supply, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-29.

Supply4 Role: Solution Architect, Interview: Supply, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-03-31.

Supply5 and Supply6 Role: Solution Architect, Interview: Supply, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-04-04.

Supply7 Role: Utilities Expert, Interview: Supply, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-04-08.

Supply8 Role: Solution Architect, Interview: Supply, *Interviewed by: Berglind Söderqvist, J. and Kööhler, O.*, 2016-04-11.

Appendix A – Interview template for Demand interviews

Regarding the data collection process as customer oriented, these interviews were carried out chronologically before the supply side was covered (see Appendix B). The interviews held based on the questions below were therefore intentionally rather open in their character and the interviewees were implicitly allowed to decide the order of questions. The interviewers only made sure that the below questions *were asked* at each interview in order to make responses somewhat comparable.

Desired competence information:

What information (type and level of detail) do you need to determine if an individual is suitable for your project?

Current infrastructure

How do you currently collect said information?

Desired infrastructure

How would you like to collect this information in an ideal future?

Appendix B – Interview template for Supply interviews

These interviews were held with only a brief introduction concerning we and our project, trying not to reveal anything concerning our findings so far in the project. The first set of questions then guided the mere part of the interview time, around 45 minutes in total, and the last part of the interview concerned the control parameters, filling out such information that not yet seemed to have been included in any answer. The control parameters served the purpose of validation of our findings from the demand side.

In the different stages of a E&U project, describe:

What competence types are most crucial for the fulfillment of the project?

What competence types are generalizable?

What contextual competence types are needed?

Can you give any examples of when the different competence types have been crucial and/or suitable?

Control parameters:

What know-how was relevant?

What contextual experience was relevant?

What behavioral characteristics were relevant?

Can you identify any other type of competence, if so, which?

How would you like to prioritize between the different competence types? (know-how, contextual experience, and behavioral characteristics)

Appendix C – *Orientation about the connection between sociology and CMS*

Concerning theoretical foundations in IS research

IS research being a broad field encompassing theoretical frameworks for different purposes. In an extensive literature study concerning the nature of theory in information systems Gregor (2006) identify five types of theory out of which she concludes that theory for design and action and theory for explaining and predicting are closely interrelated. The former would be the most closely related to the present study. Elaborating on this one might say that information technology capabilities and the understanding of people in a system are important in the design and development of IS. The same IS can also be the focal point of explanatory and predictive studies as to how said IS impacts a workplace or society.

Sociomateriality

Studying scholarly work on organization, Orlikowski and Scott (2008) identify two, sometimes conflicting perspectives on the role of technology in organizations, each represented by a research stream that they label *discrete entities* and *mutually dependent.* This refers to the perspective on the relation between technology and organization. To mitigate the conflict between the two streams they introduce the term *sociomateriality* providing a wording for the subject they consider to have been overlooked, causing the split in terms of perspective. Despite being a term under development it is generally agreed upon that it implies the ontological view that all events are ever emerging with states of stability only occurring temporarily, if at all (Cecez-Kecmanovic *et al.*, 2014), a perception suitable to describe the evolving business landscape for Company X. Moreover, an information system conversant with both social actors and technology and that processes information concerning competence by definition encompasses sociomateriality to a very high degree.

Sociology theories in IS research

In the study of IS in general, researchers have drawn on different social theories to conceptualize the phenomena of IS including symbolic interactionism, institutional theory, critical social theory and actor network theory (Jones & Karsten, 2008). Lindgren *et al.* (2004) build on work by Orlikowski (1992) when they conceptualize the role of a competence management system relatively core competence and competent actions respectively. Orlikowski (1992), in turn, build on structuration theory that is outlined in work by the British sociologist Anthony Giddens. Leydesdorff (2010) suggest that, as opposed to communication of Shannon-type information, structuration theory focus on meaning related to inter-human communication and intentional action.

However, the use of structuration theory in IS research should not be mistaken as a guidance on how to conduct IS research but it does suggest something about what IS are and also suggests what knowledge about it that is possible to attain (Jones *et al.*, 2004). Even though Anthony Giddens practically never considers information technology in his work it is widely cited in IS research and is preferred much because of its dynamic conceptualization of structure as continuously produced and reproduced through situated practice (Jones & Karsten, 2008).