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Managing Knowledge in MNCs

-The case of the knowledge management initiative in the Volvo Group

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Abstract

It is imperative to never forget that *knowledge is power*, as it is the one and only true sustainable source of competitive advantage. Financial crisis or not, smart organizations are those which continuously utilize knowledge residing in the individual workers. In Multinational Corporations workers are dispersed across the globe, which offers opportunities arising from the variety of knowledge. However, introducing Knowledge Management (KM) initiatives does not automatically result in success, unless continuous participation of all individual workers in KM processes is ensured. The workers' participation in these processes must be embedded in their daily routines, and Knowledge Management Systems (KMS) need to be designed to support these routines. The aim of this study is to investigate the factors behind workers' involvement in KM processes and their usage of KMS. Hence, the new KM initiative in Volvo Group has been chosen as a case where workers in two of its factories have been interviewed. It has been revealed that the factors influencing workers' involvement in KM processes and their KMS usage are predominantly related to management, organizational culture and usability of KMS and content.

Keywords

Knowledge, Data, Information, Knowledge Management, KM, Knowledge Management Systems, KMS, Knowledge Management Challenges, ICT, KM Processes, MNC, Volvo, Volvo Production System, Volvo Production System Academy, VPSA, Good Examples.

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On her behalf, Sona would like to dedicate this thesis to Professor Spartak Gevorgian of Chalmers University of Technology. Some years ago I got really frustrated with the realization, that what I learn from my courses I tend to forget with time. We discussed that some degree of "forgetting" is necessary in order to take in new information. He explained that by studying something, we create references in our brain and later when we need this information, certain parts of it can be retrieved. This conversation with him engaged me into thinking about learning in a new way. I would like to thank him for being a lifetime mentor and an inspiration for all the good things I do.

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Table of Content

1. Introduction

The access to similar resources and markets has led to increasingly fierce competition between companies. Organizations determined to survive and thrive, look beyond the obvious, seeking sustainable sources of competitive advantage. The most successful ones are those that have recognized that knowledge is the only sure source of sustainable competitive advantage (e.g. Birkinshaw, 2001; Lermusiaux, 2002; Halawi et al., 2005; Nonaka, 2008), and have also taken action towards utilizing all relevant knowledge. These organizations have realized that all relevant knowledge is not held solely by the top management with the long-term perspective to make the big decisions, but also by all other workers who practice their knowledge to carry out the daily activities (Wiig, 2004). Knowledge is referred to as the intangible by-product of ideas and decisions of the minds of knowledge-practicing workers (*cf.* Bryan and Joyce, 2007). Nevertheless, an individual worker's knowledge cannot be fully utilized by the organization unless it is institutionalized, which means that it is turned into organizational knowledge (Baron and Armstrong, 2007). The purpose of this is to enable the knowledge possessed by one worker to be accessed and thereafter used by all other workers who need it in order to better perform their tasks. In this way organizations can avoid reinventing or externally purchasing knowledge that is already held by somebody within the organization. Moreover, with wider usage, this knowledge can be further upgraded and improved. (Davenport and Prusak, 1998) The effectuation of the knowledge dispersed among individuals throughout an organization for the purpose of not only avoiding 'reinventing the wheel', but also starting to invent the 'uninvented', is the main idea of Knowledge Management (KM). (Dixon, 2000; Mertins, 2003)

It is argued that Multinational Corporations (MNCs) possess the most widely dispersed and varied knowledge. Due to reasons such as geographical, socio-political, demographic, cultural and product-line spread of MNC subsidiaries, workers as knowledge carriers are dispersed across various contexts. Therefore KM has to be given a particular attention in the case of MNCs. (Davis et al., 1999; Andersson, 2003) KM provides MNCs the possibility of utilizing economies of scale through exploiting synergies between workers that belong to different subsidiaries. Nevertheless, due to the dispersal of workers in MNCs, making use of their knowledge is as challenging as it is important for these organizations.

Ever since the 1990's, KM as a discipline has gained enormous attention from the academic world and continues to be a popular area of research due to its abundant unexplored issues. There have been constant efforts from companies and researchers in developing means of supporting KM in organizations. Knowledge Management Systems (KMS) are such means that have become most widely accepted as necessary for KM (Caesarius, 2008). KMS entail usage of Information and Communication Technology (ICT) for the purpose of managing knowledge. Considering the vast potential of ICT, it is argued that KMS perform intrinsically

important role in enabling KM initiatives (e.g. Alavi and Leidner, 2001; Jennex, 2005), in the provision of the right knowledge to the right workers at the right time (van Ewyk, 2000; Thomas et al, 2001).

Although KMS have the potential of providing enormous benefits, merely implementing one does not guarantee a support for KM, and such systems often fail to function in a considerable number of MNCs (e.g. Fahey and Prusak, 1998; Newell et al., 1999; Storey and Barnett, 2000; Schultze and Boland, 2000; Lindgren and Henfridsson, 2002). Thus, full utilization of KMS in MNCs often turns out to be only an illusion. Thomas et al. (2001) argues that a number of organizations believe to be managing the workers' knowledge by simply making it widely available through KMS, what Dixon (2000) refers to as a "warehouses" of information. Nevertheless the management of such organizations often fails to realize that this information has to be used and thereafter understood, absorbed and applied by individual workers in order to be considered as knowledge in their service. Moreover it needs to be commonly shared through KMS for the benefit of the MNC in general. (Thomas et al., 2001) KMS is an unnecessary cost, unless they are used by intended workers. There are many important worker-related factors to be considered as essential for KM and for the design and implementation of KMS, which presently the KM theory pays predominantly modest attention to (Thomas et al., 2001; Smith and McLaughlin, 2004).

According to the above elaboration, this study will investigate worker-related factors affecting the utilization of KM and KMS. In order to be able to obtain a solid understanding of these factors, we contend that it is vital to focus on the perspectives of individual workers, since those are the ones around whom knowledge revolves. By this logic individual workers should not only be treated as the targets whose knowledge needs to be managed, but also as active participants that need to be engaged in the process of KM in MNCs. It is therefore important to explore how individual workers involve in KM in MNCs, and how they use KMS as a support in this process. Mapping workers' position in KM within an MNC is important for building a better understanding of the complexity of KM, and for pointing out vital factors, some of which possibly have been underestimated in the existing literature. In line with this standpoint, the main question of this study is:

> *In an MNC, which factors influence individual workers' involvement in Knowledge Management and their usage of Knowledge Management Systems?*

The purpose of the above question is to explore which factors are stimulating or hindering individual workers' involvement in KM process in MNCs. Further focus is given to investigating the factors behind KMS usage. As a contribution to academia, this study is expected to add to the literature which places individual workers in the locus of KM.

Moreover it is intended to complement those views which contend that it is necessary to explore how workers use ICT-based KMS. This is an aspect that has not been given sufficient emphasis in previous research. As a contribution to the business community, this study is expected to reveal aspects that require greater attention when conveying a KM in organizations, and when designing KMS to support KM.

In order to carry out our investigation we intend to explore the Volvo Group, an MNC which is trying to utilize the knowledge interweaved in their individual workers, and thereby to enhance the organizational knowledge base in the quest of attaining sustainable development and competitive performance. The observation of this MNC reveals an interesting example of how a KM initiative is regarded by the top management as a crucial component in the pursuit for operational excellence. This MNC, however, is not an exception when it comes to various challenges in the KM implementation and KMS development. What makes this case interesting is that the KM initiative is very recent, and the KMS is at the initiation stage, thus there is a greater likelihood for obtaining fresh and genuine reactions from the workers.

1.1. Delimitations

It is important to clarify the boundaries of this study before answering the research question, since different scopes may be possible for such investigation.

Firstly, especially in large organizations, KM is highly complex area to be fully observed by one study. Therefore, as we will explain in the empirical findings, the KM initiative in Volvo Group is examined by focusing on a specific type of knowledge (which is applied for standardization of working processes).

Secondly, both of the factories we investigate are located in Sweden. The decision upon the location of these two factories was based on convenience and on predefined criteria. Even though we have chosen to import the MNC context into the scope of this study, we decided to refrain from exploring factors influencing workers' involvement in KM and their KMS usage, which may stem from cross-border divergences within MNCs. In this respect, although we do not investigate divergences related to geographical proximity and local country culture, we do not overlook the concept of organizational culture as a potentially relevant factor for our investigation.

1.2. Thesis Outline

Part 1

The introduction begins with Knowledge Management in MNCs as a study topic, leading to the problem discussion as a basis of the research question. The purpose of the study is discussed and its delimitations are presented.

The theoretical framework unravels the concept of Knowledge and links it with Knowledge Management. Knowledge Management Systems as tools and Knowledge Management Processes are elaborated. Finally the challenges related to KM are presented.

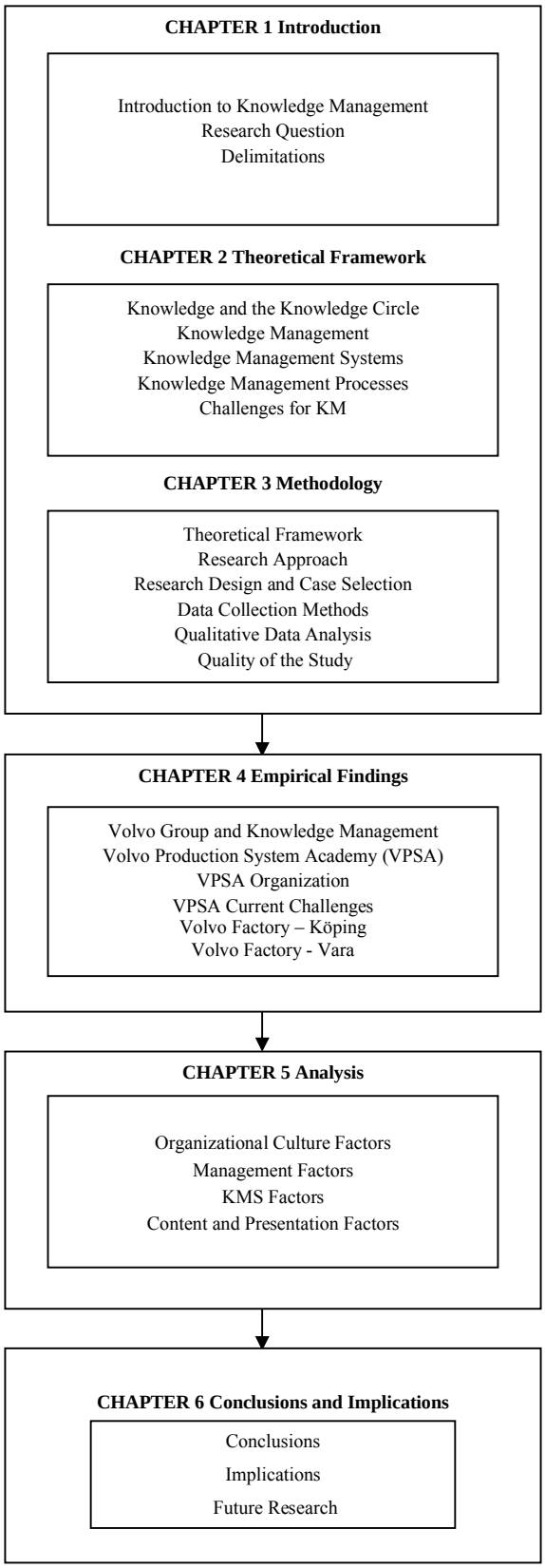
The research method that is used for this study is presented and justified.

Part 2

The background of the Volvo Group case is provided, focusing on the newly initiated KM supported by Volvo Production System Academy. In continuation, empirical findings from sub-cases are delineated, the Volvo factories in Köping and Vara.

The analysis of the empirical findings is delineated, interpreting the empirical finings with the help of the theoretical framework. The focus here is given on identifying and discussing the major factors that influence workers involvement in KM processes and KMS usage in Volvo group.

The major conclusions of this study are drawn. Further discussion on the implications of this study is discussed together with propositions for further research



2. Theoretical Framework

In this chapter a theoretical framework related to the knowledge management in organizations is provided. The chapter is divided in three main sections. In the first section an elaboration of knowledge as a fundamental unit of analysis is presented. In the second section the Knowledge Management topic is elaborated, where a comprehensive definition of Knowledge Management is given, and particular focus is put on the usage of Knowledge Management Systems, their types and application. In the third and last section a theoretical discussion on the challenges regarding Knowledge Management in MNCs is expounded.

2.1. Knowledge and the Knowledge Circle

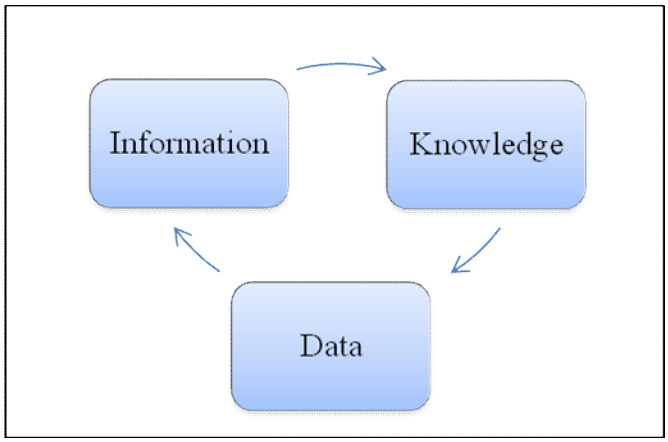
To be able to understand knowledge management, a comprehensive elaboration on the concept of knowledge is needed as a starting point. Knowledge is a complex concept, and attempts to comprehend and define it in a straightforward way have been epistemologists´ task for centuries (Alavi and Leidner, 2001). For the purpose of this research it is important to define knowledge in a less philosophical and more pragmatic manner, in order to fit organizational contexts.

Oftentimes, there is confusion that knowledge is the same as information or data, and that these three entities are often used interchangeably. Therefore, identification of the differences between data, information and knowledge can help business managers to make more accurate choices when it comes to utilization of one or more of these entities. (Davenport and Prusak, 1998; Tuomi, 1999). Data is a collection of objective facts that is specific to some events; if it is taken out of context it does not have a purpose. When data is calculated, categorized and contextualized to be used for a specific purpose, it can be considered as information. This implies that information represents data which is useful for the recipient. Information has enough weight to affect one's judgment and behavior, thus it serves as a basis of action. (Davenport and Prusak, 1998) In contrast with knowledge, information can be easily communicated, (Davenport and Prusak, 1998; Alavi and Leidner, 2001), and it is capable to yield knowledge (Nonaka, 1994). Knowledge is personalized information possessed in the mind of an individual, which allows for dealing with complex situations (Alavi and Leidner, 2001). While information affects one's judgment, knowledge includes personal judgment, by attaching meaning to information (Davenport and Prusak, 1998). When we talk about knowledge, we refer to"…a fluid mix of framed experiences, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information" (Davenport and Prusak, 1998, p. 5).

A portion of theorists claim that initially data is needed for information to be generated and subsequently for knowledge to be created (e.g. Davenport and Prusak, 1998). In contrast to

this conception, some argue that initially it is the knowledge possessed by the individual that influences the identification of data and extraction of information from it (Tuomi, 1999). We regard both of these views as relevant and not mutually exclusive. It is because of this that we posit a circle view of the relationships between data information and knowledge, as presented in Figure 1. We refer to this as a 'knowledge circle'.

Figure 1: Knowledge Circle



Source: Authors' own interpretation

The figure signifies the strong mutually supporting relationship between the three entities. This means that the knowledge possessed by an individual is influencing the identification of data and extraction of information valuable for that individual. Consequently, identified data and hence extracted information are influencing the knowledge base of the individual. (*cf.* Alavi and Leidner, 2001). The knowledge circle indicates the interrelatedness between data, information and knowledge, as none of these three entities can be treated in isolation.

Knowledge is explained to have explicit and tacit dimensions. Explicit refers to knowledge which can be codified and articulated in words or symbols, formulae, guidelines and so forth (Nonaka and Konno, 1998), hence it easy for this knowledge to be communicated (Grant, 1996). In organisations, communication of explicit knowledge can take place formally and systematically (Nonaka and Konno, 1998). Explicit knowledge can be linked to the concepts of data and information, in a sense that once codified, articulated and communicated by a knower, it can represent data or information for a recipient (Grant, 1996). It is relatively easy for one individual to comprehend and apply explicit knowledge communicated by another individual, as long as both of them share sufficient knowledge space. Knowledge space is referred to as the overlap between the knowledge bases of individuals. It is therefore argued that the greater this overlap in knowledge bases between individuals, the less context they need to be able to comprehend each other's knowledge. This overlap is mostly tacit knowledge. (Grant, 1996; Davenport and Prusak, 1998; Tuomi, 1999; Alavi and Leidner, 2001; Gottschalk, 2002) As suggested by some studies, most of the knowledge residing in

individuals is highly tacit and non-codifiable. Hence, transmission of such personal knowledge poses higher barriers, since tacit knowledge is embedded in an individual's values and beliefs, emotions and mental models, etc. (Nonaka and Konno, 1998) This aspect of tacit knowledge is identified as cognitive and it helps the individual to "perceive and define their world" (Nonaka, 1994 p16). Even the technical aspect of tacit knowledge representing 'know-how' is rooted in the individual's actions and experiences and cannot be easily replicated. Consequently, organizations struggle in particular with management of tacit knowledge of the individual workers. (Nonaka and Konno, 1998)

Before exploring the possibilities of managing knowledge in organizations, it is important to discuss if knowledge exists solely on an individual level or if it can also exist on an organizational level. Researches in various studies have attempted to exemplify knowledge existing on both levels. In some studies knowledge is said to be existing on individual levels: in the minds of the workers, as well as on collective levels: held between workers (Nonaka and Takeuchi, 1995), in close-knit function-related communities of practice (Brown and Diguit, 1991). In other studies researchers go even further, arguing that knowledge, besides in and between individuals, also resides in technology (hardware and software) and tasks (organizational goals, intentions and purposes) (Argote and Ingram, 2000), as well as in organizational roles and structures, standard operating procedures, organizational culture and physical workplace structures (Walsh and Ungson, 1991). Nevertheless, bearing in mind that knowledge is a mix of "…framed experiences, values, contextual information, and expert insight" by an individual (Davenport and Prusak, 1998, p.5), it is rather straightforward to argue that only individuals can hold knowledge. What is said to be knowledge on collective or organizational levels, for individual workers in fact represents information, communicated to them in one way or another, to which they may attach personal meaning and judgment, and use in a given context. This information comes from any workers' knowledge which is codified or articulated in some form, institutionalized and made available for the other workers in an organization to use. (*cf.* Davenport and Prusak, 1998) Having said this, it is important to explore the process of converting individual level knowledge to collective and organizational levels, and thereafter back to individual level, which is the essence of KM.

2.2. Knowledge Management

Recognition of knowledge as the only true source of competitive advantage has led to the conclusion that its management is a necessity for organizations, and possibilities to manage knowledge have been created. However, it can be rather difficult for a bystander or even a business manager to imagine how intangible assets residing in workers' minds can be managed. Ever since the 1990's, along with the vast wave of company initiatives to utilize the knowledge residing in their workers, countless studies have been conveyed in order to determine how knowledge can be managed, and hence various definitions of knowledge

management have taken shape (e.g. von Krogh, 1998; van Ewyk, 2000; Call, 2005; Jennex, 2006;).

From an organizational viewpoint, KM is "a conscious strategy of getting the right knowledge to the right workers at the right time and helping workers share and put information into action" (van Ewyk, 2000). This implies utilizing knowledge from past experiences to present and future decision making (Jennex, 2006), thus achieving and sustaining organizational competitive advantage (von Krogh, 1998; Drucker, 1999). To elaborate this concept on an individual level, KM provides the necessary information for the individual to learn how to continuously improve one's job performance (Call, 2005). In sum, the concept of KM in organizations refers to institutionalizing knowledge that resides in workers, making it available and hence used by the workers who need it to perform their tasks better. KM in this way is expected to yield sustainable competitive advantage for organizations.

Following the above depiction, KM in organizations is comprised of several major processes. Although variations exist in the literature when it comes to labeling and the number of processes constituting KM, the underlying concepts behind these processes seem similar. For the purpose of this study, we have developed a construct consisting four KM processes, based on a broad literature review (e.g. Davenport and Prusak, 1998; Alavi and Leidner, 2001; Jennex, 2006; Ichijo, 2007). Thus we consider creation, storage/retrieval, sharing and discarding of knowledge as processes constituting KM (*cf.* Davenport and Prusak, 1998; Alavi and Leidner, 2001; Jennex, 2006; Ichijo, 2007). Before elaborating KM in organizations through the prism of these processes, it is necessary to discuss KMS as arguably the most advanced means meant to help workers involve in KM.

2.3. Knowledge Management Systems: Definition and Applications

It is generally agreed that KMS are valuable instruments for conveying KM in organizations. KMS are Information and Communication Technology (ICT) based systems, (Hansen et al., 1999; Zack 1999) which facilitate the involvement of workers in the organization's KM processes of knowledge creation, storage/retrieval, sharing and discarding (*cf.* Alavi and Leidner, 2001; Maier, 2004; Jennex, 2005 Wickramasinghe, 2003). Based on a broad literature review, we acknowledge that KMS integrate technology and workers throughout the KM processes in organizations.

Technology is regarded as a platform of KMS. In fact, the revolution in technology is something that triggered the opportunity of mobilizing knowledge. This is especially relevant for MNCs where knowledge is spread on remote locations (Singh, 2006). Although it is often questioned if ICT can be applied to all the issues of KM, it is undoubtedly identified as powerful enabler of almost every KM initiative (Alavi and Leidner, 2001). ICT constituting

KMS is designed and developed to leverage and make codified or articulated knowledge available in organizations on one hand (Wickramasinghe, 2003), and support contextualized application of that knowledge on the other (Maier, 2004; Jennex, 2005). Workers are meant to use this technology in sharing information about past experiences and making sense of this information, while performing their tasks (Wickramasinghe, 2003).

The most common ICT support for KM can be divided in: (1) conventional-based, and (2) modern, artificial intelligence-based (Edwards et al., 2005), the types of which are specified in Table 1. What differentiates conventional from artificial intelligence-based ICT is that the former is used to store information and to facilitate communication between workers, and the latter is basically processing information and generating decisions and courses of action (Russel and Norvig, 2003).

Table 1: Common types of ICT support for KM

Conventional	Artificial Intelligence – based
Bulletin boards	Case-based reasoning
Computer-supported cooperative work	Data mining
Databases	Expert systems
Data warehousing	Genetic algorithms
Decision support systems	Intelligent agents
Discussion forums	Knowledge-based systems
Document management	Multi-agent systems
Electronic publishing	Neutral networks
E-mail	"Push" technology
Executive information systems	
Groupware	
Information retrieval	
Intranets	
Multimedia / Hypermedia	
Natural language processing	
People finder "yellow Pages"	
Search engines	
Workflow management	

Source: Edwards et al. 2005

In order to support their KM initiatives, organizations choose to engage different sets of ICT (Table 1). Bearing this in mind, one can argue that there is no universal KMS application suitable for all organizations. Nevertheless, looking at the literature, and real-time case studies, it can be noted that these systems can be categorized to the extent that in present-day organizations, they have one or more of the three most common applications: (1) *KMS as Information repositories*- systems used for sharing codified best practices, (e.g. databases), (2) *KMS as directories of internal expertise* - mapping the workers with expert knowledge for the purpose of connecting knowledge seekers with knowledge holders (e.g. multi-agent systems),

and (3) *KMS as knowledge-networks facilitators* – enabling virtual communication, (e.g. forums). (Hansen et al., 1999; Zack 1999; Schultze and Boland, 2000; Alavi and Leidner, 2001; Hsiao et al. 2006)

Serving as information repositories, KMS support organizations deploying codification KM strategy (Hansen et al., 1999), facilitating predominantly explicit knowledge sharing (Zack, 1999). KMS of this category provide wide range of information (Hahn and Subramani, 2000) that everyone in the organization can use in their regular work (Jennex and Olfman, 2004). When personalization KM strategy is in the locus (Hansen et al., 1999), where predominantly tacit knowledge is being shared (Zack, 1999), then KMS can be designed as directories of expertise and/or knowledge-networks facilitators. In the case of these two KMS application categories, information is targeted to specific users who are meant to interactively collaborate on performing a common task (Jennex and Olfman, 2004).

The three most common categories of KMS application elaborated above imply that at present, organizations are mostly using conventional ICT. Moreover, studies have shown that even the organizations which employ conventional ICT in their KMS, are predominantly using information repositories. Thus, by neglecting the 'communication' aspect of ICT, organizations are mostly focused on making codified explicit knowledge widely available. This suggests that ICT comprising KMS in organizations nowadays is far from being in line with the modern technological trends and advancements. (Edwards et al., 2005)

As systems aimed at supporting and enhancing knowledge management initiatives on individual and organizational levels, KMS need to be designed to correspond with the types of knowledge that is to be managed in organizations. In order to thoroughly understand how knowledge is managed with the support of KMS, we have to investigate the various KM processes as well as how ICT can support knowledge workers in these processes.

2.4. Knowledge Management Processes

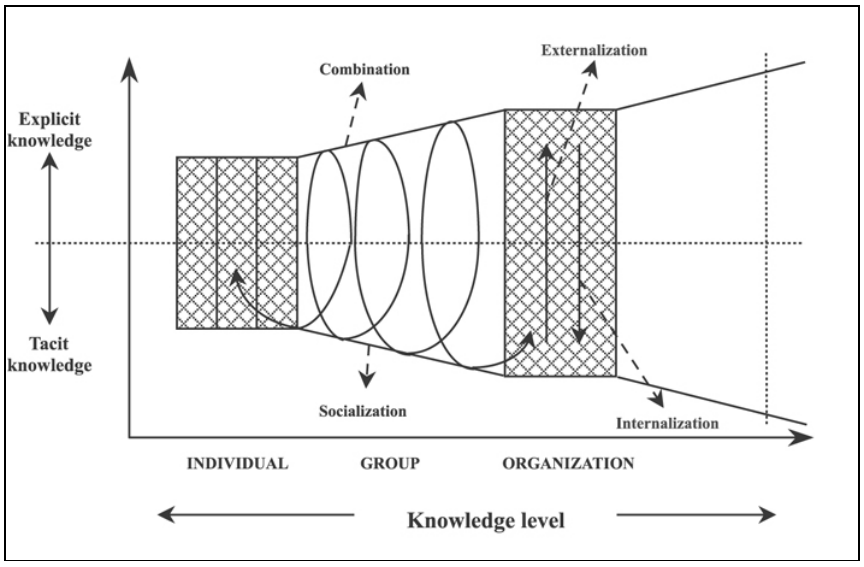
As discussed in the KM section, based on a broad literature review, we have developed a construct consisted of four KM processes, namely knowledge creation, storage/retrieval, sharing and discarding. The definition of these KM processes is elaborated in the following sections, together with the ways in which workers are meant to involve in them. Further focus is given on how usage of KMS can provide support in these processes.

2.4.1. Knowledge Creation

The knowledge creation includes developing new or replacing the existing elements of organization's tacit or explicit knowledge base (Alavi and Leidner, 2001).

Knowledge on individual level is created through cognitive processes of an individual (e.g. reflection) and through social and collaborative processes between different individuals (e.g. group problem solving). The knowledge stemming from individuals and groups of individuals is then amplified to organizational level knowledge, in a continual cycle of conversion between tacit and explicit forms. This continual conversion is conveyed through information sharing in the processes of socialization (tacit to tacit), externalization (tacit to explicit), combination (explicit to explicit) and internalization (explicit to tacit). Socialization is identified as a mode of creating tacit knowledge from tacit knowledge, through individuals' active interaction in form of observation, imitation and practice (e.g. apprenticeship). Externalization mode serves in converting tacit into a form that is more comprehensible and accessible for individuals (e.g. articulation of best practices). The combination mode is exemplified by creation of new explicit knowledge through systematization, communication and diffusion of existing explicit knowledge (e.g. reports). Lastly, internalization refers to creation of tacit knowledge from explicit knowledge and is similar to traditional learning (e.g. the learning as a result of a discussion). While through the initial three modes of conversion knowledge is spread and enlarged from individual to group and thereafter organizational level, in the last mode of conversion the individuals internalize organizational knowledge, thus expanding their personal knowledge base. This process is illustrated in Figure 2, as a spiral of organizational knowledge creation. (Nonaka, 1994; Alavi and Leidner, 2001; Vorakulpipat and Rezgui, 2008)

Figure 2: Knowledge Creation Spiral



Source: Adapted from Nonaka and Takeuchi (1995) and Nonaka and Konno (1998)

The knowledge creation within the spiral may consist of dedication of resources (e.g. in R&D teams), fusion (gathering workers with different perspectives to create a joint solution),

adaptation (referring to a crisis in the environment) and networks (self-organized internal networks, which may eventually be formalized) for internal knowledge generation. Nevertheless, besides the knowledge creation within organizations, organizational knowledge can be generated through acquisition (e.g. acquired company) or rental (e.g. outsourcing of R&D, paying a consultant on a project). (Davenport and Prusak, 1998)

As elaborated earlier, the greater the knowledge space shared between individuals, the easier it is for those individuals to comprehend each other's knowledge. Hence, with regards to the knowledge creation spiral, it should be noted that for continuous conversion between tacit and explicit knowledge among individuals within an organization, a shared knowledge space must exist between them. (*cf.* Davenport and Prusak, 1998; Alavi and Leidner, 2001)

It is accepted that KMS are predominantly capable of supporting the combination mode of explicit knowledge creation from codified explicit knowledge (e.g. database retrieval) (Nonaka and Konno, 1998). Nevertheless, acknowledging the advancements of modern ICT, it is evident that KMS can enable and support the other knowledge creation modes. For instance, the internalization mode can be supported by KMS (e.g. intranets), wherein workers make observations and interpretations of exposed information (codified explicit knowledge), which in turn can stimulate creation of new tacit knowledge for them. KMS can further foster socialization and externalization modes by serving as a forum where workers can communicate virtually, and thus generate consensual understandings and exchange new ideas (e.g. discussion forums, groupware, bulletin boards). In this way, KMS are able to support workers in creation of tacit and explicit knowledge from tacit knowledge which other workers have codified in electronic forms. (Alavi and Leidner, 2001) This exemplifies that ICT enabled KMS can play an important role in the entire knowledge creation process as opposed to only some of its elements.

2.4.2. Knowledge Storage and Retrieval

It is important that organizations prevent losing created knowledge through codification and thereafter storage for the purpose of its future reuse after retrieval. Storage and retrieval of knowledge in organizations are processes also known as organizational memory (Walsh and Ungson, 1991), representing an important aspect of KM especially in preventing organizations' loss of knowledge (Alavi and Leidner, 2001). Organizational memory refers to all knowledge within an organization, from knowledge codified in written documentation, organizational procedures, structured information stored in databases, codified knowledge stored in expert systems to tacit knowledge acquired by individuals or networks of individuals (Tan et al., 1998). Memory has two dimensions – individual and organizational (Stein and Zwass, 1995). While the individual memory is built on the basis of person's observations, experiences and actions (Sanderlands and Stablein, 1987), the organizational memory is a

broader concept, defined as a cumulated past knowledge within an organization which influences present activities. (Stein and Zwass, 1995). The organizational memory can be subdivided on semantic and episodic. Semantic organizational memory refers to generalized, explicit and articulated knowledge (e.g. annual reports), and episodic memory is described as context specific knowledge (e.g. particular organizational decisions together with their context and outcomes) (Alavi and Leidner, 2001).

The organizational memory can have positive and negative impacts on performance and behavior. On the positive side, storing and reapplying already established solutions or experiences prevents work replication and waste of organizational resources and alleviates implementation of organizational change. On the negative side however, inaccurate or outdated knowledge may bias the process of decision making for some individuals. Moreover, organizational memory may stiffen the organizational flexibility to change or accept new viewpoints. (Alavi and Leidner, 2001) Considering these positive and negative aspects of organizational memory or storage and retrieval of knowledge, organizations have to pay a close attention to this KM process in order for the knowledge stored/retrieved to be kept relevant and up-to-date for the maximal service of organizational performance. (Alavi and Leidner, 2001)

ICT constituting KMS can play significant role in the processes of storage and retrieval. Thus, sophisticated computer storage technology and retrieval techniques (e.g. databases, query language) are able to advance the storage and further ease and increase retrieval possibilities for knowledge workers. Moreover, it can support the semantic and episodic memory by facilitating the storage/retrieval of both structured and unstructured information, and as well of explicit and context specific knowledge. It can be observed here that one of the major contributions of organizational KMS is that these systems increase organizational memory by making knowledge widely available and easily accessible, which is a significant aspect that the entire philosophy of KM rests on. (Alavi and Leidner, 2001)

2.4.3. Knowledge Sharing

Knowledge sharing incorporates both transfer and application of articulated and codified knowledge. Transferred knowledge represents only information for its recipient unless it is applied in the recipient's context (Szulanski, 1996). Thus, only when information is used in a certain situation, it becomes knowledge for the recipient, making its transfer purposeful. (*cf.* Davenport and Prusak, 1998) to develop an understanding of workers' involvement in the process of knowledge sharing, an investigation of the concepts behind information transfer and application is required.

Information Transfer

In the processes of knowledge creation and storage and retrieval, transfer of information takes place between individuals. The term 'transfer' is used to signify the movement of codified or articulated knowledge, or in other words information, from one individual to another, thus emphasizing that this movement within an organization is a distinct experience that depends on the characteristics of everyone involved (*cf.* Szulanski, 1996).

Within an organization, information transfer is triggered by discovery of a need and subsequent search for information to satisfy that need. What follows is evaluation of the potential of the identified information to satisfy the focal need. The actual transfer occurs after a decision is made upon satisfying the focal need with the new information. (Szulanski, 1996) Information transfer takes place when individuals retrieve information which is codified and stored by others in organizational repositories, or when individuals obtain information which is articulated in a direct communication with others in the organization.

Information stemming from one individual's explicit knowledge can be transferred to others through the organization's semantic memory (Alavi and Leidner, 2001). Examples of this type of transfer are when an individual stores a report on a company server which afterwards is retrieved by others, or when an individual holds a presentation regarding a report. Information stemming from one individual's tacit knowledge can be transferred to others through the organization's episodic memory (Alavi and Leidner, 2001). Examples of this type of transfer are when an individual publishes a video on a company server showing how this person carries out a particular task, which thereafter is retrieved and used by others, or when an individual trains others regarding the execution of a task.

It is important to note that information transfer channels can be classified as formal and informal, personal and impersonal (Holtham and Courtney, 1998). Formal channels such as apprenticeships, trainings and teamwork are means by which information can be distributed effectively and in a planned way, although possibly restraining individual creativity. On the other hand, informal channels such as unofficial meetings or coffee breaks are useful means for information transfer through socialization and casual interaction, however not sufficient for wide and efficient dissemination of information. Personal channels such as meetings and discussions may be useful for contextualized information transfer, while impersonal channels such as databases may be useful for transfer of more generalized information that can be applied in other contexts. (Alavi and Leidner, 2001)

The use of organizational KMS can lead to increased information transfer by expanding the worker's contacts beyond the regular communication lines. In regular daily working environments, if ICT is excluded, the worker's search for information sources is limited to

coworkers in the close surrounding. (Alavi and Leidner, 2001) Still, individual workers are less likely to detect new information in their immediate professional networks, because quite often individuals in the same network possess similar knowledge. Therefore, by using KMS, workers are able to expand their networks to a wider range of connections, which in turn results with increased exposure to new ideas and information. This is of utmost importance for the transfer of information on organizational levels. (Robertson et al., 1996) Indeed, a handful of ICT can extend the worker's network far beyond his/her immediate work-surrounding. Thus for instance, through technologies like digital bulletin boards or discussion forums, an individual in need of information can establish direct communication with a coworker who's knowledge can satisfy this need (Alavi and Leidner, 2001), or individuals can work together on a common task, even though they may be situated in distant locations. This personal mean is efficient in transferring information stemming from individual's knowledge in an organizational episodic memory. Moreover, an individual can be exposed to new information coming from elsewhere in the organization, or can input own codified or articulated knowledge in organizations semantic memory in more impersonal ways through for example intranets, databases, etc. These capabilities of KMS are undoubtedly intrinsically important for greater mobility of knowledge within an organization.

Information Application

The knowledge sharing between individuals can be considered as complete only if the transferred information is being applied by those who receive it. Hence, the term 'application' is used to signify the contextual application and practice of the received information.

Application of transferred information begins when the recipient starts using this information. During this time the recipient is mainly concerned with identifying and resolving issues that might hamper the most effective use of the received information. When the recipient obtains results using the received information, it is considered that the information has been applied and personalized, and has become knowledge for the recipient. With continuous practice, this knowledge becomes routinized for the recipient, as the actions based on it have more predictable outcomes. (Szulanski, 1996)

In organizations, application of information can be facilitated mainly through four mechanisms: (1) rules and directives, (2) sequencing, (3) routines and (4) group problem solving and decision making (Grant, 1996). Rules and directives are formal impersonal standards intended to govern interaction between individuals in organizations. These standards provide means by which tacit knowledge can be converted into explicit, for large amount of workers, as opposed to training of every one of them successively (e.g. work instructions). Sequencing refers to the means by which experts can integrate and apply their knowledge to a common project, working independently in successive time slots (e.g. an

automobile assembly line). (Grant, 1996) Routines embody the development of patterns, protocols and specifications ensuring simultaneity of individuals' task performance, minimizing the need of communication (Grant, 1996; Alavi and Leidner, 2001). Routines can range from simple (e.g. workers assembling a chair) to highly complex (e.g. surgical operating team) patterns of interactions, in absence of rules, procedures or even considerable verbal communication. Although the above mechanisms serve the purpose of information application while minimizing the need for personal interaction between individuals, they may be insufficient with increasing task complexity. Hence, these mechanisms can be supplemented by forming task teams for group problem solving and decision making. (Grant, 1996) In this way, individuals can make use of each other's knowledge by working tightly on a common task.

ICT constituting KMS can have a positive influence on application of information in organizations, by (1) facilitating the capturing, updating and accessing of organizational directives, (2) enabling and supporting accurate sequencing, (3) codifying and automating organizational routines, (Alavi and Leidner, 2001) and (4) facilitating communication of task teams. For example, many organizations use intranets to enhance the ease of access and upholding of their directives, such as policies, standards and repair manuals (Alavi and Leidner, 2001). As an effect, the speed of application of changes increases and different organizational units are enabled to learn from each-other's experiences in change processes. Furthermore, workflow management systems are often used for automatic routing of information, rules, documents and activities, in order to establish efficient use of organizational routines (Alavi and Leidner, 2001) and sequential processes. Lastly, KMS as for example discussion forums, can be an important support for workers in task-teams, in their attainment and application of each others' knowledge.

2.4.4. Knowledge Discarding

Knowledge discarding is a process without which KM cannot be complete. In an organization, outdated knowledge needs to be discarded whenever necessary for creation of new knowledge to be promoted or implemented. On an individual level, in order to acquire new knowledge, a worker has to discard knowledge that becomes obsolete in the light of the newly acquired knowledge (Ichijo, 2007). For instance, this happens when a worker who performs the same task for years is presented with a new good example or instruction about the same task, which somewhat contradicts the person's previous experience. In that case, the worker has to abandon the previous logic about performing the task in order to begin performing it in a different way. Abandoning previous logic and mental models and thereby discarding elements of existing knowledge (patterns of performance), is necessary if an individual is to acquire new knowledge (Guzman and Wilson, 2005; Call, 2005). Nevertheless, it should be noted that knowledge discarding is not a straightforward process, due to the human tendency to preserve

a certain point of view, which might prevent individuals to abandon old practices and persuasions in order to acquire new knowledge (Pourdehnad et al., 2006). Hence organizations need to stimulate knowledge discarding by individual workers as important KM process (Ichijo, 2007). In this respect, ICT consisting KMS can foster this process, through exposing individual workers to information stemming from others' knowledge elsewhere in the organization.

The processes of knowledge creation, storage/retrieval, sharing and discarding are vital to conveying KM in organizations. Until now, we have elaborated how workers are meant to involve in these processes in organizations and how KMS can support them along the way. Nevertheless, in practice, KM processes in organizations do not function in a straightforward manner, due to various factors which may pose challenges to KM. These challenges tend to increase as organizations grow in complexity. Having said this, it can be argued that MNCs as composites of subsidiaries dispersed around the globe face additional dimensions of challenges in KM implementation. In what follows, we elaborate KM challenges which have been commonly addressed in the literature.

2.5. Challenges for Knowledge Management

KM implementation has become a daunting experience for many organizations, due to the vast array of challenges it bears and the lack of awareness and understanding of those challenges by organizations. Workers' involvement in KM may be hindered by a wide range of factors which can differ between organizations. The range of these factors is especially large in MNCs. The fact that workers in these organizations are dispersed across subsidiaries operating in different geographical, socio-political, demographic, cultural and product-line contexts, may pose additional challenges for their involvement in KM. (e.g. Davenport and Prusak, 1998; Alavi and Leidner, 2001; O'Sullivan, 2008) Due to the differing settings of each subsidiary, workers' behavior is influenced in different ways. Hence it is rather shallow to attempt to observe KM solely on an overall MNC level. On the contrary, KM on the subsidiary level should also be taken into consideration, if one tries to understand the factors which pose challenges for workers' involvement in KM of MNCs (*c.f.* Forsgren et. al., 2006), and not least because each subsidiary can be considered as an organization within a larger organization (McDermott and O'Dell, 2001). We take the MNC and subsidiary-levels into additional consideration when delineating what literature regards as challenges to KM in organizations. Based on a broad review (e.g. McDermott, O'Dell, 2001; Disterer, 2003; Riege, 2005; Chua and Lam, 2005; Anantatmula, 2008), we subdivide KM challenges into five major groups: (1) Management-related, (2) Organizational Culture-related, (3) Individual-related, (4) Content and Presentation-related and (5) ICT-related.

2.5.1. Management-related Challenges to KM

Probably the most frequently emphasized management-related challenge is the lack of management commitment to KM. In absence of a solid alignment of a KM strategy with the corporate vision and goals, KM is likely to fail in delivering its promise of achieving sustainable competitive advantage. Unless this alignment is created on a top managerial level, it may be impossible to deliver a clear message regarding a KM strategy to the management on lower levels, and subsequently to workers. The absence of clearly defined and communicated goals and likely outcomes of a KM strategy as a part of the corporate vision may prevent workers from understanding the purpose of KM processes, which is why they may abstain from involving in these processes. (Riege, 2005; Akhavan et al. 2005; Hart and Warne, 2006; Anantatmula, 2008) Moreover, lack of clearly defined roles for, and expectations from individual workers, may influence their ability to allocate themselves in KM processes and hence deliver required results.

Challenges for KM may stem from management failing to develop the appropriate skills of workers for the purpose of their involvement in KM processes. It is rather pointless for goals and expectations to be communicated to workers when it comes to their involvement in KM processes, if at the same time the management fails to develop the skills and capabilities of workers necessary for delivering those expectations. (*cf.* Davenport and Prusak, 1998) Furthermore, if formal means of measuring results are not in place, it can be problematic to estimate individual contribution in a uniform manner. (Anantatmula, 2008) In addition, KM initiatives can be doomed to failure if management on all levels does not provide the organizational support for the workers, in terms of technical experts and necessary resources to sustain these initiatives (Akhavan et al. 2005; Chua and Lam, 2005; Anantatmula, 2008). Finally, low managerial performance in terms of establishing trust between workers, lack of commitment in conflict management, underestimation of KM costs, poor publication of success stories and involvement of numerous external consultants may create additional confusion and underperformance of individual workers in KM processes (Disterer, 2003; Chua and Lam, 2005). Low managerial commitment may leave workers with the impression that KM is merely a time constrained project which will soon fade away, and that avoiding it is an option (McDermott and O'Dell, 2001; Riege, 2005; Chua and Lam, 2005; Anantatmula, 2008).

Even in cases where the management is committed to KM, challenges for workers' involvement in KM processes can stem from the management imbalance between 'pushing' information to workers and enabling them 'pulling' it when needed. It is because of this imbalance caused by the management, workers may be either too reluctant or unmotivated to involve in KM processes. (Edwards et al., 2005)

In MNCs, managerial challenges to KM may as well stem from the subsidiary autonomy. Management on subsidiary level may have divergent goals in comparison to the overall MNC goals and often find limited incentives to involve in KM processes on overall MNC-level, especially if that means deploying own resources, experts or technology in doing so. Moreover, subsidiary management may show reluctance to involve in an MNC-level KM, due to a fear of losing its unique position and bargaining power within the MNC as a result of disclosing competitive knowledge. (Björkman et al., 2004)

2.5.2. Organizational Culture-related Challenges to KM

It is argued that poor understanding of how individuals work in the context of the organizational culture, leads to a poor design and performance of KM initiatives (Hart and Warne, 2006). Organizational culture represents the shared core values, beliefs, norms and foundational assumptions between workers within an organization, including power structures, organizational structures and control systems, determining individual behavior under a common set of patterns. Individual workers belonging to a specific organizational culture are expected to possess, to some degree, a common identity with other members of the organization, common understanding of their organizational world, and to be consistent with their organization's goals. (Leidner et al., 2006; Hart and Warne, 2006) A potential cause to KM failure can be identified in cases where companies' are attempting to adjust their organizational cultures to fit KM strategies and goals (Riege, 2005).

Additionally, it is imperative to acknowledge that organizational culture influences KM through the individualistic vs. collectivistic behavior, (Leidner et al., 2006): that is to say that the individuals' perception and attitudes towards themselves in social contexts (*cf.* Earley, 1994) will determine their KM behavior. Organizational cultures are regarded as individualistic, when pursuit of individual's goals is encouraged and individual achievements are rewarded, whereas those cultures regarded as collectivistic prioritize collective goals and reward organizational achievements (Earley, 1994; Leidner et al., 2006).

In an MNC, although the subsidiaries may share elements of a unitary organizational culture, they often have differences, thus subsidiary cultures can be viewed as sub-cultures within an MNC (McDermott, O'Dell, 2001). The differences in sub-cultures arise from different factors, including but not limited to subsidiaries' core values (McDermott, O'Dell, 2001), their bargaining power in the MNC (Forsgren et al., 2006) and the local country culture (Royle, 1995). It is of utmost importance to observe how workers in a subsidiary perceive the subsidiary's role and significance in the MNC. For example, if workers feel that the subsidiary has a role of a competitor within the MNC, hoarding knowledge and lack of trust can be expected, while if it has a collaborative role, they might see mutual benefit in sharing (Szulanski, 2000, p.12). Similarly, if the workers feel that the subsidiary has a history of

influencing the decisions made on MNC level, they may be hostile to new ideas in which they did not have an input. In literature, this is known as "not-invented-here syndrome" (Davenport and Prusak, 1998). Moreover, if it is in a subsidiary's culture to be self-sufficient, taking ideas from others can raise feelings of inadequacy for the workers who are forced to act as receivers, consequently hurting their pride and creating resistance (Chua and Lam, 2005). To add to this, it is challenging to implement centralized KM initiatives and KMS in decentralized MNCs. The independent subsidiaries that comprise such organizations, may perceive central KM initiatives as forced, and hence not comply with them. (Edwards et al., 2005) In addition to the impact that the above discussed organizational culture-related challenges can have on KM processes among subsidiaries in an MNC, they also can affect these processes within subsidiaries.

2.5.3. Individual-related Challenges to KM

On a microscopic level, there are individual-related challenges, many of which are influenced by the organizational culture. Nevertheless even after working many years with a company, individuals are different and so is their level of alignment with the corporate culture. KM challenges originating from individual behavior are manifold (Riege, 2005). One significant source of individual-related challenges is the insufficient degree of motivation of individuals to involve in the KM (e.g. Szulanski, 2003; Disterer, 2003). There are many factors that can be connected to motivation. Some workers may not be willing to involve in KM as they perceive that it is an 'extra', time-consuming activity added to their main work (Disterer, 2003; Riege, 2005). Others do not engage in KM for reasons such as uncertainty, revelation and loss of power. Individuals can be uncertain about who might hold the information they need, or who might need the information they hold, and hence remain passive as information recipients and/or senders. Uncertainty may also be a result of potential senders' lack of understanding or ability to judge the value that their knowledge can represent for others. Also, potential recipients may be unwilling to retrieve or use information, if they lack trust and confidence in the source (Szulanski, 2000; Dixon, 2002). Revelation refers to proclaiming value for one's own knowledge by making it publicly available. However, the recipients may disagree on the correctness of this knowledge or point out shortcomings in order to accentuate their own expertise. Consequently, some senders may abstain from knowledge sharing to avoid embarrassment or 'losing face' (Riege, 2005; Ardishvili, et. al, 2006). Individuals may be left outside KM processes as a result of their insufficient absorptive and retentive capacity. Absorptive capacity refers to individuals' inability to understand information sent to them due to insufficient knowledge space shared with the senders (Tuomi, 1999) and scarcity of preexisting stock of knowledge. Retentive capacity is the recipients' ability to apply received information in their own context. (Davenport and Prusak, 1998; Szulanski, 2000) In other instances, knowledge as well as being 'hard won' (Dixon, 2002) can be perceived as the main source of individuals' power: the ability to act or influence others (Davenport and Prusak,

1998; Riege, 2005). Sharing such knowledge may be considered as 'act of generosity' (Dixon, 2002) and be perceived as serious threat to such things as the individuals' performance, status and job security (Riege, 2005; Thompson, 2008).

2.5.4. Content and Presentation-related Challenges to KM

As knowledge is the focal element of KM, the manner in which it is codified and presented affects the success or failure of KM in organizations. Thus, content which is ill-structured, out-dated, irrelevant or inadequate for the users, may pose significant challenges to their involvement in KM of an organization. To explain this further, it is not uncommon that KM fails to deliver due to the fact that the content provided is not structured in a format that is meaningful to the users, and moreover it is not contextualized, hence users may not find such content digestible or sufficient for their tasks. In addition to this, content that is not current and not updated can lead to user dissatisfaction, loss of trust in the KM and can be perceived as not relevant to meet the present needs. Content that is developed fragmentally by different groups of KM users across the organization makes it is difficult for a cross functional knowledge to be captured. Finally, valuable knowledge is lost in many organizations due to the lack of mechanisms to distill knowledge from discussions and debriefs.

All of these content-related challenges are even more plausible in MNCs, where content is formed in and aimed to serve in diverse contexts. (Chua and Lam, 2005) Here, in addition to the above factors, even differences in the language, vocabularies and terminology employed by workers in different locations can pose limitations to usage of content between individuals in different subsidiaries (Davenport and Prusak, 1998; Disterer, 2003). Furthermore, numerous organizations account for challenges tied to the tensions between the quantity and the quality of information. Researchers have repeatedly shown that bulks of information, if not useful, are of little value for workers. Hence, there has to be a balance achieved between the amount and the usefulness of the information provided to the workers in an organization. (Alavi and Leidner, 2001; Edwards et al., 2005) In sum, tailoring content according to the needs of its intended users dispersed across subsidiaries in various contexts can be regarded as of highest importance for KM in organizations.

2.5.5. ICT-related Challenges to KM

As already elaborated, although widely considered as powerful tools that enable KM in organizations, KMS can pose challenges due to different factors. Although these factors can be associated to the previously discussed categories, there are some that are specifically related either to the characteristics of the ICT comprising KMS, or the usage of that technology by individuals. Thus, limited capability of the technical infrastructure constituting a KMS can be a hurdle for users (e.g. bandwidth limitation), resulting in dissatisfaction and reluctance to use it. Adding to this, high technology maintenance costs can result in

management disinvesting in the KM initiative. Finally, KMS which comprise ICT that does not fit the users' needs or it is too complicated to use, may lead to unwillingness of using that tool. (Chua and Lam, 2005)

2.5.6. Summarizing Challenges to KM

All of the above discussed factors that can pose challenges to KM in organizations can be cumulatively described by the so-called 'performance-based approach to KM', introduced by Smith (1993). This model describes the performance of a KM in an organization, as dependant of the balance between three aspects: Focus, Capability and Will.

'Focus' represents a plain definition and understanding of the proposed performance, and it is characterized by explication of questions such as Why…?; When…?; Where…?; How…?; and the like. 'Capability' refers to wherewithal to achieve the performance delineated in 'Focus'. It basically posits building the capability within an organization, in terms of skills, infrastructure, physical assets, tools, budgets etc., needed for accomplishment of whatever is defined as a 'Focus'. Finally, 'Will' signifies the vigor of the intent to effectuate the defined 'Focus' performance, and it is characterized by mindsets, emotions, beliefs, attitudes and motivation for action. Having this in consideration, an organization is said to achieve optimal performance in KM by crafting a symbiosis and self-reinforcing system between 'Focus', 'Capability' and 'Will' on individual as well as organizational levels. Thus management on every level needs to be involved in creating an organizational learning culture where individuals are pulled and focused towards accomplishing the goals of the organization's KM strategy. In this process, management needs to support individual workers through building their capabilities, constructing technology and content, and stimulating their motivation, all of which will serve their involvement into the organizational KM processes. (Smith and McLaughlin, 2004) Only an organization in which every individual worker is aware, ready and willing to involve in the KM processes can be considered as a good case of KM implementation. On the other side of the coin, in an organization where discord exists between a clear focus, a matching capability and a determined will, KM is considered to be facing challenges and a risk of failure.

2.6. Concluding Remarks of the Theoretical Framework

This chapter provided an extensive literature overview of KM in organizations. As it is claimed, utilizing knowledge which resides in individual workers is what provides organizations with the opportunities of achieving sustainable competitive advantage. Due to this, in present-day fierce competition, effective KM for organizations is a necessity. The theory presented here is describing KM in organizations from the perspective of workers, as according to our contention it is the workers who need to be actively involved in the management of their knowledge. Hence, a discussion was provided of how workers are meant

to involve in the processes of knowledge creation, storage/retrieval, sharing and discarding, that is to say the processes which comprise KM in organizations. In addition, KMS constituted of ICT were argued to be the most prominent means enabling workers' involvement in KM processes. Thus, an overview of how workers can use such systems throughout these processes was provided. Finally, we offered a classification of the major challenges pertaining to workers' involvement in KM processes and KMS usage. Here the MNC context was emphasized, as we believe that the settings specific to this type of organizations can add further dimensions to the KM challenges. In sum, the presented theoretical framework provides a comprehensive outline of what is important to consider in the attempt to answer our research question.

3. Methodology

In this chapter the research methodology of this study is presented. In the following sections a description and explanation of the theoretical framework is delineated together with reasoning behind the choices and the decisions undertaken. The reader is guided through the logic behind the research approach and research design that according to our stance is necessary for conveying this study. Furthermore, a justification for the case study selection is provided as well as our approach to the data collection and analysis is discussed. We conclude this chapter by presenting the arguments regarding the quality of this study.

3.1. Theoretical Framework

Our study topic was initiated due to the notorious claim that knowledge is the sole source of sustainable competitive advantage and that KM is the way to utilize individual knowledge for the benefit of the MNC. We discovered that the existing KM literature lacks focus on the perspective of the workers as the main actors in KM.

The theoretical framework guided us in refining our research question and furthermore designing questions that would serve as basis of our data collection. Moreover, our theoretical framework represented a roadmap of how to structure the gathered data in a systematic way, for coherent and logical analysis.

As a starting point, we looked into the knowledge circle, to comprehend the relationship between data, information and knowledge as a foundation of our theoretical framework building. It was only by distinguishing individual and organizational knowledge, as well as differentiating between types of knowledge in question we felt confident to start investigating KM. Hence, we conducted a broad literature review in order to identify how knowledge is managed in organizations. In relation to this, we outlined the relevant KM processes and described how KMS applies as a support tool in these processes. Since our research question is concerned with the factors behind individuals' involvement in KM, we used the findings of numerous theorists to group challenges into categories. This helped us connect the challenges to their potential source of origin. The holistic view of KM coupled with KMS and the associated challenges were a much needed construct to be confronted by the empirical findings and to gain further understanding regarding this area.

3.2. Research Approach

This research is explorative in nature, due to the fact that without having presumptions and prior expectations we want to understand how workers involve in KM processes and how they use KMS in doing this. We observed lack of studies describing the everyday activities of individual workers within MNCs through the prism KM, which is another reason for

conducting an explorative study. The theoretical framework provided in this thesis reveals possible factors that might influence the worker's involvement in KM using KMS. We coupled the explorative approach with a qualitative research method in order to gain a solid understanding of the connection between these possible factors, the extent of their impact in a real company case and to possibly uncover new important factors. Qualitative research is a method proper for a solid understanding of an area which still bears unanswered questions (*cf.* Strauss and Corbin, 1990). As elaborated earlier, individual knowledge by its nature is something intangible that companies try to manage. However, since it is deeply embedded in the worker's mind, it is difficult to comprehend how individual knowledge can be institutionalized and utilized by organizations. We therefore use a qualitative research for the purpose of collecting and capturing the tacit components in individual workers' behavior, as a part of the MNC wide KM processes, using KMS.

3.3. Research Design and Case Selection

Following the explorative, qualitative approach, conducting a case study was deemed the most appropriate. A case study represents an empirical investigation of a contemporary phenomenon conveyed in its real-life context (Yin, 2003). Investigation of a problem consisted of numerous interrelated variables in complex structures requires deep exploration of one case study, as opposed to a number of cases (Dubois and Gadde, 1999), which is the reasoning behind our decision of a single case study. In this thesis, new KM initiative in the Volvo Group is used as a case for the purpose of exploring how individual workers are using KMS and the factors behind their involvement in the KM processes of this MNC.

The Volvo Group as the largest Swedish MNC, has subsidiaries dispersed all over the globe, which due to the decentralized nature of this organization are embedded in their external contexts and acting as organizations of their own. Aiming to achieve sustainable competitive advantage, the top-management of the Volvo Group has decided to put forward a new KM initiative, and a corresponding KMS, which would allow workers from different subsidiaries to involve in the organization's KM processes. The focal knowledge that needs to be managed among factory workers is related to consistency and continuous improvement of the operations in production. The KM initiative entails developing a Volvo Production System (VPS) model which serves as a unifying framework for defining and managing this type of knowledge. The department responsible for initiation and support of this KM initiative is the Volvo Production System Academy (VPSA). Nevertheless this KM initiative and the KMS designed to support it, are not immune to challenges, stemming from various factors. All of these aspects exemplified, to our perception, that the KM initiative in the Volvo Group would be a very appealing company-case to investigate for the purpose of this study.

Due to the fact that the VPS model is large, dealing with numerous aspects regarding consistency and continuous improvement of the operations in production, we have decided to focus our study on one particular type of knowledge described by this model. Thus, we have taken 'Standardized Work' - a part of the VPS model related to standardization and improvement of the work processes (elaborated in detail later in this paper). VPSA considers 'Standardized Work' to be fundamental knowledge that needs to be managed for an optimal implementation of the rest of the VPS model. This knowledge is closely related to workers' daily activities, which guarantees extensive empirical data.

Aiming to conduct an in-depth investigation, we subdivided the case study on multiple sub-cases. The sampling was carried out primarily based on convenience, where we chose Sweden as a location, which represented higher accessibility, lower costs, as well as better time management opportunity for our study. Nevertheless, choosing Sweden as a location still left us with a range of possible choices of factories belonging to different Volvo Group subsidiaries. Due to this, we based our further choice on typical sampling, aiming to choose factories which reflect differences in the general attitudes towards the KM initiative in the Volvo Group. Moreover, we targeted factories belonging to subsidiaries with differences in bargaining power, which in addition represented differences in size, product area, subcultures, etc. Finally, based on recommendations of VPSA, and due to accessibility, we chose two factories as sub-cases, one in Vara and one in Köping, which reflect the above prerequisites. In the Köping factory we chose to study a division which is comparable with the Vara factory in size and type of production. Both of the sub-cases have similar levels of 'Standardized Work' implementation, as they have initiated this process fairly recently. In these two sub-cases we investigated the workers' involvement in the creating, storing/retrieving, sharing and discarding knowledge related to 'Standardized Work', starting from individual, through collective, to subsidiary and overall MNC levels. Using this as a base, we are aiming to investigate the factors behind workers' involvement in KM processes and their KMS usage.

3.4. Data Collection Methods

To carry out a qualitative research, a multi-method data collection was conducted, which refers to using combinations of data collection techniques (*c.f* Saunders et. al, 2007). This means that we studied documents and materials for gathering secondary data, while making observations and conducting in-depth interviews for obtaining primary data.

3.4.1. Secondary Data

Secondary is a type of data, which is said to have been originally collected to serve a different purpose then the one of the focal study (Saunders et. al, 2007). Our initial step in this explorative study has been collection of such data. To get an overview of the company, as well as, among other things, the subsidiaries' product areas, size and location, we used Volvo

Group's Annual Report. Furthermore, to gain an understanding of what VPSA and VPS model represent, and in order to connect the research topic to a real-life context, we have used VPSA produced documents (VPS reference material, published good examples of VPS implementation, assessment reports, etc.). Moreover, information from Volvo Group's external and internal websites helped us learn about the chosen subsidiaries to which our sub-cases (factories) belong. When writing the empirical findings, we used the secondary data in describing the background and characteristics of the case and the sub-cases.

3.4.2. Primary Data

Primary data is a type of data that is collected for the study which is being undertaken (*c.f* Saunders et. al, 2007). Our second step for data collection included specific meetings and observations supplementary to our main primary-data source: the interviews in the factories.

3.4.2.1. Meetings and Observations

During the study we were located in VPSA offices and collaborated closely with the persons in the frontline of the KM initiative. We had numerous meetings with different representatives of the Volvo Group, which predominantly had educative purposes. In the initial meetings we listened to presentations and got acquainted with the Volvo Group in general, thereafter with the position and role of VPSA within the Group, as well as gained insight to the idea and strategy behind the VPS model. During the subsequent meetings with several VPSA representatives, we learned the details of the VPS model and VPSA's perspective of the way this model should be implemented. This information helped us gain a more profound understanding about the KM in the Volvo Group and the challenges that needed to be investigated. Further, we used the information gained in these meetings in choosing the sub-cases, together with the part of the VPS model which would be investigated in the sub-cases.

We carried out observations at the factories in Vara and Köping, which consisted of guided factory tours, where we visited the workstations, and got acquainted with the work processes. This provided us with the opportunity to visualize the workstations and processes.

In sum, the information from the meetings, and the observations in the factories enabled us to construct and subsequently ask our interview questions in more focused and informed manner.

3.4.2.2. Interviews

The main source of our data are the interviews, due to the fact that they served as the means of direct interaction with workers, whose perspective we intended to study. The interviewee selection, the structure of the interviews and situations in which they were conducted are elaborated below.

Interview Selection

In line with our research question, we interviewed workers on all levels relevant to the implementation of the KM initiative. To understand the vision and strategy of the people behind the VPS model, and particularly 'Standardized Work' together with the perceived issues associated with its implementation, we conducted interviews with the director of the VPSA. Moreover, we interviewed a number of other members at this department who are involved with the development of the VPS material regarding 'Standardized Work'. It was them who advised us which are the different levels of workers that should be involved in the implementation of the VPS model. Since our intention was to construct a holistic view using as many levels of relevant workers as possible, six key levels were emphasized: Operators, Team Leaders, Production Engineers, Quality Managers, Factory Managers, and factory specific VPS Coordinators.

Operators are the workers who carry out the work at the factory floor, and who are supposed to use the VPS model for each step of the work. Consequently, we approached the operators as our first level of interviewees. Therefore, their opinion matters when it comes to the design of their work processes. In one of the factories we interviewed one group of two operators and in the other two groups of three operators.

Team leaders are the ones who are in charge of the operators' work teams and their role it to assure that the teams are functioning as required. Hence, the purpose of interviewing them was to find out their views, roles, and attitudes when it comes to the VPS model. We targeted one team leader in each factory who was responsible for the operators that we had previously interviewed.

Production Engineers working at the factories are viewed as expects that represent technical support in all areas of the production processes. Their expertise is needed for designing correct guidelines and work instructions. The importance of interviewing them lies in the fact that they have an extensive role in the implementation of the VPS model in the factory's processes.

Quality Managers are the workers who ensure that the quality is maintained in the production processes and work with quality issued on different levels. They as well, should have a significant role in the implementation of the VPS model, to ensure that every step taken incorporates quality and certain level of standards.

Factory Managers (Vara) and Production Manager (Köping) are in charge of organizing everything taking place in the factory and division respectively, and are the individuals with

the holistic view of the business operations. Their attitude towards a new initiative can play a decisive role in the outcome.

The VPS Coordinator is an individual on the factory level who represents a link between VPSA and the factory. This worker is responsible for supporting the VPS model implementation in the factory.

Interview Structure

For this study, we used semi-structured type of interviews in order to capture the depth of an unstructured interview while having a premeditated configuration of aspects which we wanted to acknowledge from the interviewees (*cf.* Saunders et al., 2007). Thus, the interviewees had a considerable amount of liberty in expression, however at the same time the discussions were steered through a number of specific questions reflecting the area of interest of this study. The questions for the interviews were followed as close possible to the manner in which they were designed, in terms of wording and chronology, although there were some additional questions asked for the purpose of clarifying interviewee statements.

The interview questions were synthesized in six discussion guidelines (Appendix 1), which were designed respectively to the different levels of workers. The discussion guidelines were based on the theoretical framework presented in Chapter two. These guidelines cover three main areas. The first area is directed to the workers' daily activities and working processes. The second area focuses deeper into 'Standardized Work' as a specific type of knowledge described by the VPS model. Finally, the third area aims at investigating the workers perceptions of and involvement in the activities steered by VPSA, as well as usage of the provided KMS. It should be noted here that although these three areas can be identified in the discussion guidelines, no significant distinction was made between them. Structuring these interviews in this manner, we were able to gain contextual understanding of the workers' daily activities, their involvement in the creation, storage/retrieval, sharing and discarding of a specific type of knowledge (Standardized Work described in the VPS model), as well as their perception and possible engagement in the activities of VPSA, with a further focus to the usage of KMS.

The discussion guidelines were constructed in an order by which the most open questions were asked first in order to extract a non-directed view from the interviewees (*cf.* Bryman and Bell, 2003). More specific questions followed once a general attitude towards our areas of interest was provided. The questions predominantly were open to the extent that they are leaving interviewees the opportunity to generally define the area of our interest and to express their sincere perceptions regarding it. Nevertheless, with the numerous sub-questions the interviewees were further guided in order to be able to give answers more relevant to our

interest. Moreover, the sub-questions prevented from 'yes' or 'no' answers on the main questions. In addition to the answers, special attention was given to the interviewees' physical and verbal reactions regarding the asked questions, which are taken into consideration when analyzing the answers. Most of the interviews were conveyed through developing an interesting and natural discussion whereas some required slightly stronger efforts in providing guidance and additional explanation for the questions asked.

In this respect, the questions constituting the discussion guidelines allowed conducting semi-structured interviews, for the purpose of gaining deep understanding of individual activities, feelings and perceptions with regards to workers' involvement in KM processes and KMS usage.

Interview Situation

Being supported by VPSA, we have been able to easily book the interviewees, and ensured that the interviews are taken seriously. We have been appointed VPSA supervisors, who established the initial contacts and introduced us to responsible contact persons in the two factories. In the correspondence that followed, we provided the contact persons from the factories with an outline of the scope and purpose of the study, as well as a list of the different levels of workers we were planning to interview. These contact persons were then responsible of booking individual interviews, and informing interviewees regarding the scope and purpose of our study. This helped us in assuring that the interviewees are highly responsive and are approaching our questions with a significant level of seriousness. Our task was then to make sure that we conduct each interview in a relaxed atmosphere, making a sincere conversation regarding issues important from their perspective.

The conducted interviews were projected to last one hour. This projection was generally accomplished, although there were some interviewees taking less or more than an hour, depending mostly on the amount of questions we needed to additionally ask in order to extract the necessary information.

Regarding to the interview type, we conducted personal interviews, telephone interviews and e-mail follow-ups. Personal interviews were predominant, as we decided upon this type of interviews as being the most appropriate for explorative qualitative study. In addition to this, we perceive personal interviews as the 'best fit' with the observations we have made and our willingness to enrich the statements of the interviewees with their physical and verbal reactions for the questions asked. It should be noted here that during the interviews with a group of operators, each operator was given a turn to answer the questions, and at some instances conversations occurred between the operators as a consequence of their answers. We have been engaged in stimulating and steering such discussions as we believe that

important conclusions can be drawn from them. One of the interviews was conveyed through the telephone due to the distance and unavailability of the interviewee. In addition to the personal and telephone interviews we occasionally followed up with emails, once we needed additional information. According to our general observation, there was a high level of cooperation from the interviewees and all of the interviews were carried out in a comfortable atmosphere.

Both personal and telephone interviews were recorded in order to capture the answers in detail and not to cause distraction by extensive note taking. Notes were only taken to describe some aspects that could not be recorded, such as for example the body language, laughter, hesitation and strong emphasis on some issues. The interviewees were always asked for a permission to record the interviews, in order to eliminate self-consciousness regarding the fact that their statements are recorded and preserved. Recording the interviews allowed a better analysis of the answers, as we have been able to listen the interviews several times in order to ensure that all points are taken into consideration.

The language was one factor that affected the interview situation. The interviews were conducted in English. Although neither the interviewees nor the interviewers are native English speakers, it is the only language that both parties share sufficient command of. In addition, we made it clear to the interviewees that once they had difficulties to express themselves in English, they could switch to Swedish. This resulted with more comfortable interviews, where interviewees simply briefly switched to Swedish, instead of getting discouraged to give a full answer once they have trouble expressing themselves in English. Hence, most of the interviews proceeded fully in English, except for one which was carried out partially in Swedish. This could also be perceived as a barrier, as only one of us has fluent command of Swedish, thus the interpretation of this interview has been mostly dependant mostly on one of us. Cumulatively, the interview process has been carried out without any significant discrepancy from the plan and it produced a solid volume of information valuable for analysis.

3.5. Qualitative Data Analysis

The interviews yielded a large amount of qualitative data, which is why a categorization was needed for the analytical interpretation of the empirical findings.

Firstly, the empirical findings are generally subdivided in relation to the two factories, due to the fact that we wanted to illustrate the possible different patterns of behavior regarding workers' involvement in KM processes and KMS usage. This implies more precise identification of factors behind these different behaviors, since we know that these two factories have been chosen due to the dissimilar attitudes towards the KM initiative.

Secondly, the presentation of the empirical findings is based on the theoretical framework of this study. Thus, the findings from each factory are presented in a manner that exemplifies if and how various levels of workers, executing their daily activities, are involved in creation, storage, retrieval, sharing and discarding of knowledge. This is discussed on an individual level, group level and organizational levels (in subsidiary and between subsidiaries). Additionally, the ways in which individuals use KMS throughout these KM processes is interwoven in the presentation of the empirical findings. The empirical findings are presented as a coherent story compiled from the statements of all interviewed workers. It should be noted however, that we were careful in distinguishing and interpreting divergences in statements.

The final step is the analysis of the empirical findings. Here, using the theory to critically reflect on the empirical findings, we provide a comprehensive overview of factors influencing the workers involvement in the KM processes and the usage of KMS.

3.6. Quality of the Study

If a study is to be perceived useful for academia and practitioners need to meet certain level of quality. For our qualitative exploratory study we are assessing quality through two main criteria proposed by Guba and Lincoln (1994), namely, (1) trustworthiness and (2) authenticity (Bryman and Bell, 2003).

3.6.1. Trustworthiness of the Study

Guba and Lincoln (1994) suggest that trustworthiness of a study can be observed through credibility, transferability, dependability and conformability of its empirical findings (Bryman and Bell, 2003). In what follows, we evaluate the trustworthiness of our study in light of these criteria

Credibility

According to Guba and Lincoln (1994), in a study, credibility of the empirical findings entails both ensuring that the research is conducted in a manner that corresponds to the code of good practice, and that the researchers have correctly understood and interpreted information on which these empirical findings are based (Bryman and Bell, 2003). Thus the credibility reflects the extent to which the study corresponds with the reality. In this particular study, we have put our utmost on considering all possible factors that can lead to increased credibility of the empirical findings. This required us to pay additional attention to our ability to ask the right interview questions as well as to observe and interpret the answers.

Lacking an extensive experience in conducting semi-structured interviews, we have composed well thought-out discussion guidelines based primarily on the theoretical framework of this

study. A consideration here was given to composing questions which cover all the important matters discussed in the theoretical framework, in order to make it possible to obtain the information needed to answer the research question of this study. We have further tailored these questions to fit the organization-specific context, using the information attained from the meetings with the VPSA representatives and the observations in the investigated factories. To be well prepared, we have tested the discussion guidelines through two pilot interviews, one of which was conducted with our VPSA supervisor and the other with two former employees from a Volvo factory in Gothenburg, Sweden. This enabled us to refine the questions in a manner that assures validity for the context, comprehensibility by the interviewees, and higher level of consistency. In addition, these pilot interviews were of immense help, as they allowed us to get a practical experience before the actual interviews in the intended factories.

We have considered the interview settings as an important aspect pertaining to the credibility of the empirical findings. Thus we ensured that the interviews are conducted in a relaxed atmosphere. Firstly, we traveled to the factories in Vara and Köping, where the interviewees worked. Secondly, we always explained the scope and purpose of the study before starting the interviews. We believe that this helped in ensuring that the interviews are taken seriously and the answers given are sincere.

Further, we have used triangulation of the gathered information from different sources as another mean to increase the credibility of the empirical findings. Triangulation by combining multiple methods, data sources, theories and observers, can be used to surpass inherent bias that may come from single-method, single data-source, single-theory, and single-observer studies (Patton, 2002). In this study we have firstly gathered information, combining multiple methods, namely interviewing, observations and secondary data analysis. By this we wanted to ensure that the information gathered is observed from various perspectives and is thus as close to the reality as possible. Secondly, we compared the perspectives of numerous levels of workers, from the experts in VPSA to workers in the two investigated factories. Thirdly, we used various theoretical perspectives in interpreting gathered information, and in understanding and illuminating inconsistencies between the theories and the gathered information. Moreover, the both of us were involved in interpretations of data in order to assure relevancy. Additionally, the paper benefited from a critical expert reviews by our supervisors: one at the academia, and another in at VPSA.

Another relevant point in credibility is the language of the study. English was our interview language, although neither the interviewees nor the interviewers are native speakers of it, can be observed as an impediment to the credibility of the empirical findings in this study. Thus, in such settings interviewees might have difficulties in expressing information that corresponds to their own viewpoints, while the interviewers might experience difficulties in

correctly understanding and interpreting this information. To overcome this impediment, we provided the interviewees with the opportunity to switch to Swedish, once they felt hindered in expressing their thoughts. The statements provided in Swedish have been subsequently translated by the one of the researcher who has command of the language.

Transferability

Transferability of empirical findings according to Guba and Lincoln (1994) refers to the extent to which these findings can be generalized or transferred to other contexts than that under investigation. The issue of transferability is a common weakness for qualitative studies in which a limited sample is explored. (Bryman and Bell, 2003) Considering its qualitative and explorative nature, this study is not an exception from being challenged when it comes to transferability. Nevertheless, using numerous means, we have been constantly striving to make our empirical findings as transferable as possible.

The fact that the sample of this study consisted of only two factories located in Sweden can be observed as a significant reason due to which the empirical findings may be difficult to use in other organizational, cultural or geographical contexts. Moreover, the theoretical framework of this study suggests that KM initiatives and KMS are rather organization-specific, which is an additional reason limiting the transferability of the empirical findings of this study. We tried to counterbalance these hindering aspects by providing a thick in-depth description of the ways in which individuals involve in KM processes and use KMS as a support. Doing this, we intended to elucidate numerous aspects and visible trends, which other organizations may find similarities with. Furthermore, from the VPS model, we have intentionally considered 'Standardized Work', the knowledge about which is not necessarily Volvo specific, due to its usability in different industries. Finally, the extensively described empirical findings entail numerous factors that are of importance regarding the workers' involvement in KM processes and KMS usage. These challenges are consistent with the categories of challenges provided in the theoretical framework, which makes it easier for them to be generalized. For example, the managerial challenges, although much tied to the Volvo-settings, can be very useful to other organizations, as a factor to consider when implementing KM.

Dependability

Guba and Lincoln (1985) argue that in further search of trustworthiness, researchers should strive for dependability by continuous audits throughout the research process (Bryman and Bell, 2003).

In pursuit of a thorough and carefully designed research, we used a thesis diary throughout the different stages of our study. The entries included notes from initial brainstorming about the

research topic and stepwise formulation of the research question, to notes from observations, meetings and relevant literature. This helped us in making decisions with consideration of important aspects and it also functioned as a support tool when explicating the logic behind the development of our study.

When collecting primary data, we used a high-quality digital recorder for recording each interview. Thereafter, we transcribed all of the interviews into the questionnaire templates and saved them in digital and paper formats, for unobstructed accessibility. This way we could easily access the interviews that we wanted to analyze and even find the answers to particular questions quickly, due to the fact that we assembled the questions in a uniform way for all of the interviews.

Conformability

To ensure the conformability, that is to say the researcher's objectivity, the both of us studied each interview multiple times. Afterwards, we have carried out discussions about our perceptions of the findings to make sure that we agree on one view which could be supported by objective argumentation. We expected this process to minimize the risk of embedding one's subjectivity into the analysis. Moreover, to make sure that we were not becoming blind to possibilities of detecting additional relevant theories, we took into consideration unanticipated aspects brought up by responding interviewees. Hence, even when steering the discussions, we did not force the answers into the direction of any particular theory, and we were careful not to make suggestive comments when the respondents were hesitant or could not find the right words. As an additional means of maintaining objectivity we had continuous meetings with the two supervisors. By suggesting alternative views, they helped us to keep an open mind and not to create fixed expectation of findings.

3.6.2. Authenticity

Authenticity can be evaluated through five criteria: fairness, ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity.

Fairness, according to Guba and Lincoln (1994) signifies the representativeness of the collected information, with respect to the different viewpoints held by different members of the group under study (Bryman and Bell, 2003). To be able to give a fair view of the workers perspective on their involvement in KM and their usage of KMS, we interviewed representatives from multiple levels of workers. While we chose to speak to one representative from each level in both factories, when it came to the operators we decided to talk to a number of them in groups. This is due to the fact that the operators have higher degree of direct interaction with 'Standardized Work' and also because the proportion of operators to any other level in the factories is always higher. Moreover, for our results to be

representative of every person in study, we were cautious to take into account even those views which diverged from that of the majority.

The ontological authenticity perspective, as described by Guba and Lincoln (1994) is concerned with the contribution of the study results to those who have been studied (Bryman and Bell, 2003). Considering this perspective, we expect this research to add to at minimum VPS-coordinators' and the factory managers' knowledge about the important aspects regarding KM implementation.

Further, educative authenticity perspective as explained by Guba and Lincoln (1994) is concerned with the contribution of the study in helping members in the same social settings to gain deeper understanding of the perspectives of other members (Bryman and Bell, 2003). We would argue that this study will add to the understanding of the VPSA members about the perspectives of workers in the sub-case study factories.

According to Guba and Lincoln (1994), the catalytic authenticity perspective is concerned with the ability of the research to act as a momentum for implementing changes. Adding to that, tactical authenticity questions if those under study had perceived that the research provided enough weight for engaging in action. (Bryman and Bell, 2003) Since at this time the results are yet to be published, we expect the study to influence certain strategic decisions concerning the KM and KMS facilitated by VPSA, due to the fact that we have collaborated closely with this department. However, such outcomes are yet to be observed.

4. Empirical Findings

This chapter is divided into two sections. In the first section a general overview of Volvo Group is provided, together with a description of the role of Volvo Production System Academy. Moreover, in this section an elaboration of the Volvo Production System model is given, with a specific focus on the knowledge related to 'Standardized Work'. In the second section, the background and findings of the Volvo factory in Vara and a division of the Volvo factory in Köping is provided.

"VPS is the natural way to take advantage of what the Group has to offer and learn from each other"

Leif Johansson, CEO Volvo Group

4.1. Volvo Group and Knowledge Management

With a vision of being valued as "the world's leading supplier of commercial transport solutions" (The Volvo Group, 2008, p.2), today the Volvo Group is one of the leaders in its industry with production facilities in 19 and sales in more than 180 countries. In 2008 the number of employees reached some 100.000, with the majority located in Sweden, France, Japan, USA, China, Brazil and South Korea. The industry that the Volvo Group operates in, is technology and knowledge intensive. Its product range comprises construction equipment, trucks and buses, aircraft engine components, drive system for marine and industrial applications. The Volvo Group is comprised of numerous subsidiaries, so-called product related Business Areas (BA) and supporting Business Units (BU).

The BAs are responsible for manufacturing the product range for their respective customers. The BUs execute support functions for BAs and are organized globally in order to create economies of scale in their provided services. They are responsible for such services as product planning and purchasing, component development and delivery, property management, coordination of financing and so on. (The Volvo Group, 2008) This type of organization is aimed to permit "companies to work closely with their customers and efficiently utilize Group-wide resources" (The Volvo Group, 2008, p.6). As the Group continued growing, it came to be recognized that the diversity that the subsidiaries represent could serve as opportunity to utilize all the knowledge within the Volvo Group. A global KM initiative was needed in order to eliminate waste of resources in terms of recreating knowledge in one subsidiary, while already possessing it in another. In addition, this kind of an initiative can potentially serve as means of discovering new synergies in the Group that may lead to new inventions. Hence, the Volvo Production System Academy was launched in 2008, aiming to undertake and support such a common group KM initiative, regarded as of high significance for the Volvo Group.

4.2. Volvo Production System Academy

The VPSA is a part of Volvo Technology Corporation - a BU which is the centre for research, development and innovation in the Volvo Group. The Academy is meant to represent a customer driven, worker oriented, and unifying central intelligence unit which:

- Serves as a source of the *common VPS guiding principles* and ensures *good example* sharing.
- Performs *assessments*, evaluating the level of application of the VPS model in the operations, and provides support for reaching superior levels of implementation.

These services that VPSA provides constitute the fundaments of the KM initiative, and should be used by workers in all subsidiaries in the Volvo Group.

4.2.1. VPSA: Source of Common VPS Guiding Principles and Good Examples Sharing

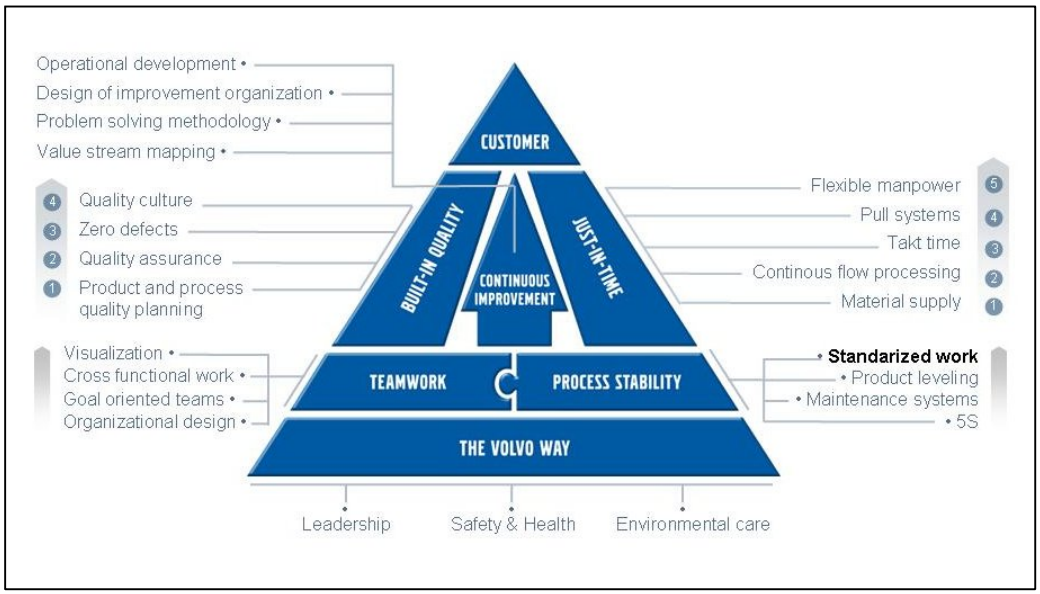
Common Principles

The common guiding principles developed by VPSA provide detailed guidance for the factory workers for achieving consistency and continuous improvement of the operations in production. Following these guiding principles, workers are meant to improve the operations in terms of increased quality, securing the delivery and elimination of unnecessary waste in the operations[1]. VPSA considers that Volvo factories in which workers operate in accordance with the VPS principles are advancing on the path towards operational excellence, sustainable profitability and most importantly, leadership in customer satisfaction.

Theoretically, all common guiding principles can be considered as pieces of a puzzle, the precise interconnection of which is described by the VPS model (Figure 3). According to this model, the orientation towards the *customer* is in the zenith, whereas the purpose of the principles of *teamwork*, *process stability, built-in quality, continuous improvement* and *just-in-time* is to enable consistency of system thinking and decision making. All of this is done while holding true to the *The Volvo Way* values, culture and leadership. These principles are further subdivided on so-called *modules* in order to serve as guidance for certain elements of the operations.

[1] Waste in processes occurs when more resources are consumed than are necessary to produce the goods or provide the service that the customer actually wants.

Figure 3: The Volvo Production System Model



Source: Volvo Production System Academy 2009

The reasoning behind the VPS model as a composite of guiding principles for continuous improvement in operations can be found in the philosophy of Lean Production.[2]

The detailed specifications of the principles and modules belonging to the VPS model are described in detail through internal documents called 'Reference Material', stored in central database and provided through the VPSA Intranet portal. The database and the Intranet portal on which the information from the database is available, represents the core of the KMS provided by VPSA and our focus point, although a number of other means of interaction and sharing are used in the Volvo Group.

Standardized Work

'Standardized Work' is one module in the VPS model. Knowledge regarding 'Standardized Work' is in the focus of this study, as it serves as a base for stable and continuously improving processes in organizations, and a foundational step towards VPS implementation. 'Standardized Work' is predefined set of work procedures, which are supposed to deploy the best-known method for executing each work process. It defines the exact steps that the workers should undertake to produce a certain product, in the most effective, efficient and safe manner. Hence, standardized work is supposed to represent the most effective combination of manpower, materials and machinery. Organizations implementing 'Standardized Work' in their processes are developing standards for every task, described in a

[2] Lean production is a generic process management philosophy related to the production practice which considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination. Basically, lean is cantered around creating more value with less work.

form of working instructions, which are repeatedly followed by workers. Once standards are in place, workers need to be involved in a continuous improvement of these standards, thereby increasing production, improving quality, and enjoying safer, predictable working environment. Therefore, standardized work implementation is a prerequisite for continuous improvement.

According to VPSA representatives, what makes 'Standardized Work' interesting is that besides being a necessity for the implementation of the rest of VPS, it represents one of the biggest challenges in the VPS model. This is due to the fact that workers perceive standardization of their work as a purposeless step and an unnecessary burden.

In a factory, workers on all levels are meant to be engaged in development and implementation of 'Standardized Work'. Thus, managers on all levels, starting from the factory manager to individual team leaders, are important as they are in a position to make decisions and to establish a push for their implementation. The production engineers are the ones who possess the technical knowledge needed to construct standardized working procedures of operators, as a mean to enhance productivity and minimize waste. Moreover developing standardized working procedures requires the expertise from Health and Safety, and Quality representatives, as a major impact of 'Standardized Work' is on workers' safety of and product quality. Finally the operators are the ones who are meant to work according to working procedures developed according to 'Standardized Work' guidelines. Hence their feedback is valuable for the development and continuous improvement of these procedures.

Good Example Sharing

A good example represents a visual illustration of exceptional execution of a specific module described in the VPS model in a factory belonging to a Volvo Group subsidiary. Good examples from various factories are stored in the central database in addition to the principles, and available on the Intranet portal. The good examples are either submitted by the factories and then quality-proofed by VPSA, or spotted in the assessments that VPSA conducts. They are written in a uniform manner and often with various visual descriptions in addition. Hence, by sharing them through the Intranet portal, good examples are meant to serve factories from different subsidiaries to locally implement the VPS modules by exploiting mutual synergies and learning from each other's knowledge and experiences.

4.2.2. VPSA Assessment and Support

In order to acknowledge the level of implementation of the VPS model in the factories, VPSA also provides assessments. Hence, areas for improvement are identified, as well as what needs to be done for the factory to progress with the implementation of the VPS model. Moreover, VPSA provides support to the factories in terms of training and pilot implementation.

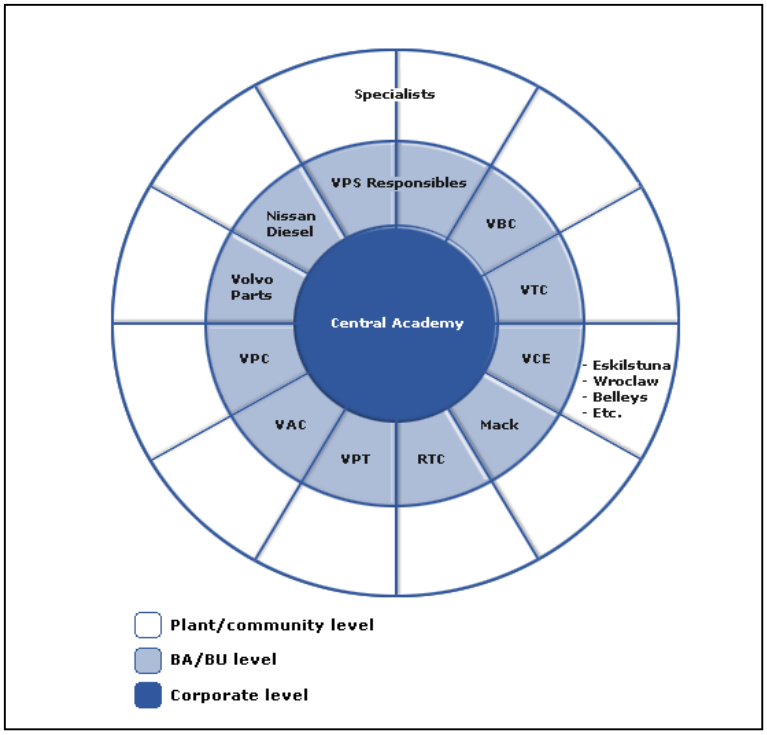
Through these assessments, VPSA is as well spotting good examples which later are placed in the database.

Providing assessments and support is a role of crucial importance, due to the fact that in addition to the provided VPS model, it creates awareness of its implementation levels in the factories, and offers support for improvement.

4.2.3. VPSA Organization

As shown in Figure 4 VPSA holds the central position in the Volvo Group with regards to VPS model implementation. Every BA/BU of the Group possesses its own VPS unit which in collaboration with VPSA is supposed to coordinate implementation of the VPS model in the respective subsidiary. Furthermore, for the local adaptation and implementation of VPS model on a factory level, each factory employs a VPS coordinator that works as an extended hand of VPSA. The VPS coordinator is the main link between the central unit and a particular factory. This person is meant to support and guide workers with regards to their involvement in the VPS model implementation, and to drive the capturing and sharing of good examples with other factories through the central VPSA Intranet portal. Capturing and sharing good examples is supposed to be conveyed by workers on all levels in the factories.

Figure 4: Organization of VPSA in the Volvo Group



Source: Volvo Production System Academy 2009

4.2.4. VPSA Current Challenges

According to the VPSA assessments, with some exceptions, factories across the Volvo Group note modest levels of VPS model implementation in operations. The implementation of 'Standardized Work' in particular is an area with one of the lowest scores in implementation progress, for nearly all factories. Moreover, according to VPSA representatives, the central database is far from being rich with good examples submitted by factories, and the Internet portal is not sufficiently used. Bearing this in mind and considering the purpose of this study, we will further describe this KM initiative from the perspective of the factory workers, which are those who this initiative truly affects.

4.3. VPS Implementation: The Factories in Vara and Köping

We have studied the workers' perspectives regarding the VPS implementation in the Volvo factories located in Vara and Köping, Sweden. The findings from both factories are presented in this section.

4.3.1. Background Vara Factory

The Volvo factory in Vara, Sweden was founded in 1976, with production starting in 1977. This factory became a part of the Volvo Penta Business Area in 1990, after going through a process of reorganization. Volvo Penta offers complete marine power systems and services for leisure boats, workboats and industrial applications. As a part of Volvo Penta, the Vara factory instigated production of marine engines for several different types of boats. Today, this factory represents the world's only engine factory specialized in volume production of marine diesel engines. The factory conveys in-house production of two types of marine engines and assembly of one engine type from parts produced in other Volvo factories. There are approximately 140 employees, in 11 different sections, being organized in 17 teams. With this layout, the Vara factory is relatively small, and moreover it belongs to a small subsidiary, as compared to some of the other Group's subsidiaries, such as Volvo Powertrain.

4.3.2. Background of VPS in Vara

Operating according to lean principles is not something new for the Vara factory. In fact lean principles have been in management's agendas for years back. The initial steps towards lean thinking have been taken with the so-called Vara Lean Production, which was a project meant to be conveyed in three subsequent years, serving as a mean of reorganization, development and improvement of the operations in the factory. Even though this project accounted for some improvements, it did not take too long before it became obvious that achieving expected satisfactory results from lean implementation requires considerably more time than the projected three years. The more lean principles as a part of the Vara Lean Production were introduced to the workers, the more apparent was the difficulty of making every worker aware of and working according to these principles. Nevertheless, although not as successful as it

was initially meant to be, this project placed the baselines for lean thinking in the Vara factory, in terms of structures to facilitate its implementation, and building elementary understanding among the workers. The new VPS model initiated throughout the Volvo Group has been adopted by the Vara factory in 2008, as an appreciated continuation of their efforts in lean implementation. What was before regarded as Vara Lean Production is now being converted to Vara – VPS. Unlike the earlier model, VPS is a model which contains 'Volvo genes' which according to the factory officials is vital for long term commitment to lean throughout the Volvo Group.

Nearly a year has passed since the introduction of the VPS model to the workers in the Vara factory. The VPS coordinator has formed teams to start implementing some of the VPS modules. The transition from the previous Vara Lean Production project is undertaken gradually, as only a few modules from the VPS model are being initiated at a time. According to the VPSA assessments and the factory officials, the present level of the VPS implementation in this factory is still below expectations. Nevertheless, things are progressively moving to the desired direction. What workers unanimously agree about is that the continuous initiatives undertaken by the VPS coordinator and the frequent visits by VPSA experts, stimulates them to increasingly perceive the process of working according to the VPS model, as something entrenched in their daily activities, and not a separate task. According to the VPS coordinator in the Vara factory, it was only several months ago when he was 'pushing' the VPS guidelines down to workers on the factory floor, trying to introduce them with new information about the VPS model. However, nowadays workers are more and more 'pulling' information themselves, occasionally contacting the VPS coordinator and trying to obtain new information regarding the VPS modules which are being implemented in the factory. This is predominantly due to the increased awareness about the benefits from VPS implementation shown on the factory floor, and the change in workers' perceptions, as they are starting to realize that VPS is a long term activity, and not something that will eventually fade away.

4.3.3. Understanding about VPSA, VPS Model and Standardized Work

There is a general perception in the Vara factory, that the VPSA supports the workers in a very favorable manner. Numerous workers recall the productive meetings with experts coming from the VPSA, where they were enlightened about various aspects of the VPS model. As the VPS model is rather new in the Vara factory, most of the workers share a common awareness that the help and support from the VPSA is necessary in order to achieve satisfactory levels of the VPS implementation. Nevertheless, the understanding of the complete role and responsibilities of the VPSA is rather unclear for most of the workers. Workers on all levels consider the VPSA as an 'external entity', from which representatives are coming occasionally in the factory to help the workers in the VPS implementation. They

do not perceive the VPSA as directly connected to the Vara VPS coordinator, but as a separate unit working in parallel to this person.

Although it clearly has an imprint on the perceptions of workers, the VPS model is understood differently among various levels of workers. Thus, operators in the Vara factory do not possess a clear comprehension about the details of the VPS model. According to some of them, the VPS is generally related to change and improvement. They observe this model as means to help them establish more comprehensible, better and simpler working processes, which in turn will imply improved and more efficient factory. Other operators in the Vara factory associate the VPS model only to some of its modules that are currently being initiated on the factory floor. Among these modules, 'Standardized Work' is the one that has been in the focus of implementation in recent months. Although operators are very well aware of the concept behind 'Standardized Work', and are beginning to use it on the factory, they still feel the lack of fundamental understanding about it. Some of them relate it with continuous update of working instructions, and all of them agree that it is positive and beneficial to work according to this module as a part of their daily activities. Nevertheless, the benefits that operators perceive from implementation of modules from the VPS model help them realize the necessity of receiving appropriate training to serve them in embodying this model in their daily activities. Their immediate supervisors – the team leaders, have relatively solid comprehension regarding the entire VPS model, as most of them have obtained some form of lean training. At present it is the team leaders who constantly attempt to stimulate operators in thinking and working according to the VPS model. In this quest, they seek support and guidance from the VPS coordinator, who is perceived as a person whose expertise and support is vital to VPS implementation in the factory.

Workers on higher levels, such as representatives from Quality department and production engineers, have general understanding of the VPS model, as they are also engaged in its implementation on the factory floor. They regard the implementation of this model as a positive change coming to the Vara factory, due to their perception that it alters their functions from being rather reactive and problem solving to becoming more proactive and focused on continuous improvement. However, they still feel lack of clearly defined roles and responsibilities in the VPS-related activities undertaken in the Vara factory. With regards to 'Standardized Work', the workers from the Quality department and production engineers consider working according to this concept as a much needed improvement on the factory floor, especially beneficial for product quality. They have a clear understanding of this concept and they are trying to work together with the operators and other factory workers in order to incorporate 'Standardized Work' in the activities on the factory floor. Nevertheless, they feel a need of stronger managerial support for the decisions they make, in order for every

individual operator to be involved in the implementation of this 'Standardized Work' in the factory.

Although very optimistic with regards to the implementation of the VPS in the factory, the factory manager possesses modest understanding about the concept behind the VPS model, and it appears that in his perception, the previous lean project is still not abandoned. The Vara factory manager is leading a lean steering committee where current VPS-related issues are discussed and decisions regarding further steps for the VPS implementation are made. Moreover, he hires experts to drive the VPS model implementation in the factory. However, there is a clear lack of the factory manager's commitment to delivering a long-term action plan for the VPS implementation, and provision of a more plausible and frequent support for the workers on the factory floor.

The VPS coordinator is the expert that all other workers point out as key figure for the VPS implementation in the Vara factory. In their opinion, this person possesses solid understanding of concept of lean production, and takes numerous initiatives in the VPS implementation on the factory floor. Ever since the introduction of lean in the factory until today's activities according to the VPS model, the VPS coordinator together with the factory management is creating various teams to work with some lean principles. Gradually introducing principles from the VPS model, the VPS coordinator tries to continue from where the factory has stopped with the Vara Lean Production project. These principles however, are not introduced in accordance to the universal roadmap recommended by the VPSA. The reasoning here is that no single roadmap can be recommended to all factories in the Volvo Group, because different factories have different traditions and levels of lean implementation. Hence, as he expressed: "…*what shows that this (VPSA-proposed) roadmap is right for this factory?*" Currently, the VPS coordinator is in the process of organizing an extensive lean education supplemented with VPS model-specific training as means to provide support for all workers, regarding their involvement in the VPS implementation. The lean trainings conveyed in the past were appearing incidentally and did not involve all the workers. In contrast, nowadays the trainings are planned and provided to every single worker in the Vara factory.

4.3.4. The Process of Standardized Work Implementation

In the Vara factory, the process of standardization of the working processes, according to the VPS model begins with the management. The top managers of the factory, together with the VPS coordinator, decide upon a roadmap, timeline and suitable persons for carrying out the 'Standardized Work' implementation. These decisions are then proceeded to team leaders who manage teams of operators divided on several workstations. Thus, the operators are encouraged to work in their teams on standardization of their working processes, continuously updating and improving their working instructions. They are supported by the VPS

coordinator in terms of provided technical expertise, and adapted VPS material and good examples regarding ‘Standardized Work’.

Applying Standardized Work on the Factory Floor

The VPS coordinator is the one who retrieves the material describing modules of the VPS model, from the VPSA Intranet portal. This person makes further efforts of adapting the VPSA material, as in his perception, this material is not fully applicable to the Vara factory. This, according to the VPS coordinator is due to several reasons. One major reason is the fact that the VPS material is written in English, which for workers who are not proficient in this language may cause lack of understanding. Moreover, according to the VPS coordinator, the material provided on the VPSA Intranet portal is rather ‘heavy’ to be digested by workers who are not possessing sufficient knowledge about lean. According to him, even the good examples published on the VPSA Intranet portal are not comprehensible enough. In addition, the VPS coordinator feels that searching for material on this portal is rather difficult, mostly due to a lack of categorization of and a concern if this material is being continuously updated. He as well would prefer the portal to provide the possibility of establishing a direct contact with the senders of good examples, as a way to obtain further information regarding the implementation of such examples.

Due to the above issues, the VPS coordinator makes efforts in translating and further adapting the VPS material. This material is then used to standardize the working processes in several workstations selected as pilot areas. Here, the VPS coordinator works together with technicians and team leaders, observing the working processes in the pilot areas and making sense of the VPSA material, or good examples from another Volvo factory. Throughout this process, operators from the pilot areas are constantly engaged in providing their opinions, as they are most knowledgeable about the working processes in their workstation. Hence, through ‘leaning by doing’ in the pilot areas, enhanced competence about standardization of working processes is created. Thereafter, from the experiences on the pilot areas, new material regarding implementation of ‘Standardized Work’ is documented. In this way, the VPS material generated by the VPSA is adapted to the Vara factory needs, which is much required for more organized ‘Standardized Work’ implementation in the factory. The VPS coordinator makes all of this adapted material available to all workers through the Vara factory’s local Intranet team-place site.

Further competence regarding ‘Standardized Work’ implementation is created in the Vara factory during the VPSA assessments. Along with these assessments, the VPSA experts conduct simulations on some workstations, regarding how working processes can be standardized. Here they teach operators how their work can be organized in a way that matches the requirements of ’Standardized Work’, as described in the VPS model. The

operators are then encouraged to further improve their working processes by collaborating with their team members.

In the Vara factory, operators are meeting on a weekly basis to discuss in what way their work can be standardized, and moreover to share ideas of how it can be continuously improved. Every team of operators attains separate meeting, concerning the working processes only in their workstations. It has not always been easy to have every one of the operators to participate in these meetings. According to some of the operators, certain time has passed before all of their coworkers have realized the benefits of such informal gathering, in which they can discuss about improvement of their work. Nevertheless, nowadays everyone is 'on board', discussing, giving ideas, making suggestions and raising concerns, all of which in order to create improved instructions upon which they collectively agree. On these meetings, operators get acquainted with the material regarding 'Standardized Work' and together try to make sense of it. Often, they visit their workstations, where they can directly demonstrate and discuss some new improvements. At the end of these meetings, operators create a bullet point list of the changes they have commonly agreed to make.

Changes or ideas coming from these team meetings, which need more time and resources for their implementation, are directly communicated to the higher management via written correspondence. In other cases, changes agreed upon in the team meetings for which operators' expertise is sufficient, are directly implemented in the working processes. The implementation initially starts with testing proposed changes in a workstation. If the agreed and anticipated outcome of the changes is achieved during the testing, the team leaders have the responsibility to import these changes into the working instructions. In this way, newly developed instructions about performing a particular activity are meant to be uniformly used by all operators in a team.

Operators belonging to different teams in the Vara factory seem satisfied with the fact that through the team meetings, they are able to directly affect their workstations, to solve issues, make changes and improve the working processes. Nevertheless, one aspect that some operators are emphasizing is that management and technical experts do not attend these meetings. These operators feel that engagement of such workers is needed in the team meetings if larger changes are to be made, and if higher performance in 'Standardized Work' implementation is to be achieved.

Although in the Vara factory operators belonging to a same team closely collaborate in 'Standardized Work' implementation, they agree that the cooperation between different teams is nearly nonexistent. Hence, knowledge regarding standardization of working processes remains mainly embedded among operators belonging to a same team. While in some teams,

operators have implemented a variety of changes in their working processes, in others they still do not have a clear picture of the 'Standardized Work' concept. Even though it is not uncommon that operators belonging to different teams visit each other on the workstations and share positive experiences, the effect of this collaboration is sporadic and minor.

The Vara Intranet teamplace-site is regarded by the VPS coordinator as means by which cooperation among teams can be established in the Vara factory. Presently, this site contains, among other, documented material composed from the standardization of working processes in the pilot areas. In addition, this site is intended to serve as a point of collaboration between teams in the factory, where workers from different teams can share their experiences of 'Standardized Work' implementation on their own workstations. Nevertheless, according to the VPS coordinator, this teamplace-site is still far from being actively used by all operators in the Vara factory. Even the ones that use this site only utilize a small portion of the documented material and still do not upload material documented on their own workstation. At present the VPS coordinator is undertaking activities towards further introduction of the teamplace-site, empowering team leaders to motivate operators to use this site as a valuable tool.

Workers from other Volvo Factories are Our Teammates

Workers on all levels in the Vara factory consider that there is a potential benefit of learning from documented good examples which come from other factories of the Volvo Group. Especially operators and their team leaders have generally positive attitude towards such examples, as they realize that progresses made in standardization of working processes elsewhere in the Group, can be of enormous help for them. Some operators recall good examples being brought by their colleagues who have visited another Volvo factory and observed the improvements there. Although these operators regard factory visits as a useful way to obtain external good examples, they agree that it cannot be sustainable as such visits are too costly and cannot be performed continuously. At present, operators do not think that many external good examples are being introduced to them. They however are becoming aware that the VPSA experts which occasionally visit the Vara factory can provide them with good examples and moreover can show how these examples can be implemented. The VPS coordinator points out that all workers in the Vara factory need to see 'extremely' good examples. According to him, workers sometimes do not believe that 'Standardized Work' can be implemented to the degree of detail described by the VPS model. However, by showing examples of factories where actually this level has been achieved, the VPS coordinator aims to motivate workers to strive even more for 'Standardized Work' implementation.

Finally, not many good examples from the Vara factory are being uploaded on the VPSA Intranet portal, in order to be shared with other factories in the Volvo Group. According to the

VPS coordinator, some teams in the factory have come far in 'Standardized Work' implementation in their workstations. However, most of these teams of workers think that what they can show is not good enough in comparison to the achievements being made in other Volvo factories. On the other hand, there are some who are willing to show what they have done in their workstations. These workers feel good about sharing their good examples with other Volvo factories, expecting only appreciation and maybe some good example from those factories in return. However, since all workers have not been informed about the VPSA Intranet portal, most of them are not aware of the possibilities this portal provides in terms of good example-sharing with other factories. Some workers even think that they do not have access to that portal on the Intranet. Given the explanation about what possibilities the VPSA Intranet portal offers, workers are rather impressed and regard it as a potentially beneficial tool for their future endeavors in 'Standardized Work' implementation. As it is now, most of the workers who document good examples turn to the VPS coordinator for assistance regarding sharing their examples. The VPS coordinator thereafter sends such good examples directly to VPSA, and in addition is publishing them on the local teamplace-site.

In sum, the Vara factory is an open environment which allows workers on different levels to collaborate in the quest of standardizing their working processes. Much has been done in this respect, however everyone is aware that this is only the beginning. The major challenges are yet to be overcome and all workers know that a lot more needs to be done if 'Standardized Work' is to be fully implemented in the Vara factory.

4.4. Background: Köping Factory

The Volvo factory in Köping, Sweden was founded in 1856, but it was not until 1942 that it came into Volvo's possession. In 2001, this factory became a part of the newly formed Volvo Powertrain, a Business Unit within the Volvo Group responsible for developing as well as the manufacturing of heavy diesel engines, gearboxes and drives shafts. The factory in Köping is comprised of the Marine, Powertronic and Gearbox divisions, where manufacture and assembly takes place. Development of marine drives is also included in the scope of the activities in this factory. Volvo Powertrain is said to be one of the largest in its industry with 8,000 employees in Sweden, France, the US and Brazil. The Köping factory employs about 1200 of which 70 work in the Marine - the smallest division. With high level of automation, this factory is one of the technologically most advanced factories in Europe. (Volvo Intranet, 2009)

4.4.1. Background of VPS in Köping

In March 2009, the corporate magazine of Volvo Powertrain, *Powernews*, published 'VPS special issue'. This issue was meant to reach all Powertrain's employees and was intended to give a "*deeper insight into why VPS is so important*". Phrases such as "*a guiding star for*

Volvo Powertrain" and a "*key to operational excellence*" were used to describe the Volvo Production Systems (VPS) model (Powernews, 2009, pp.2-3).

Before the idea of VPS was introduced in the Köping factory, a system called Operational Development was in place. One and a half years ago a VPS Working Team for Powertrain was formed to support the implementation of a 'unified production system' - VPS. Before the introduction of the VPS, the Powertrain factories were using different systems, however sharing best practices with each other. Presently, the VPS Working Team is comprised of the local VPS Coordinators from all of Powertrain factories and is led by a global VPS coordinator. The local VPS Coordinator is in charge of supporting improvement activities at all levels, and the factory manager is responsible for the implementation of the VPS.

VPS or WCM in a VPS outfit?

When the implementation of the unified system was deemed necessary, Powertrain took a decision within the 'Global Manufacturing' management team to employ a methodology called World Class Manufacturing (WCM) to support the VPS implementation. For the past six months the Köping factory has been working with an external WCM consultant, who became highly involved in training and guiding the workers in using WCM tools. Some workers believe, that the VPS model is nothing new, but it is more focused, and while before these workers experienced lack of appropriate tools, now they are better equipped for problem elimination.

The global as well as the local VPS coordinators regard the WCM implementation methodology as more result oriented and less theoretical, in comparison to VPS implementation tools suggested by the VPSA. The managers and the VPS coordinator in the Köping factory believe that by using specific 'focus areas', they can prioritize problems by conducting cost-benefit analysis. This way they can focus the VPS model implementation initially on the weakest areas and then move on to the rest. The global VPS coordinator justifies this with the words: "*If I have a small scratch in one part of my body and bleeding in another, I should attack the bleeding first*" This coordinator generally agrees with the principles of the VPS model (Figure 3) as they are described by the VPSA. However, he disagrees with the VPSA's description of the modules within the VPS principles. Instead, the WCM concept is used to describe how specific modules can be implemented in the Powertrain factories. The different levels of the management in the Marine division in the Köping factory does not perceive such significant differences, besides the belief that WCM incorporates more focused and result oriented methodology in comparison to the VPS model

suggested by the VPSA, which in their eyes is rather process oriented[3]. The VPS coordinator in Köping perceives the VPS model as a vision, which does not specify what to do. Hence, in the Powertrain factories eleven focus areas are used, and in each factory there is a working group associated with each of those areas. In each factory there is a person from the factory's top management who is responsible for every focus area. This person is coordinated by the VPS coordinator, to make sure there is an information flow throughout the VPS implementation.

When problems are discovered in a focus area, they are solved in order of prioritization. This means that modules such as 'Standardized Work' are not implemented throughout the entire factory at once, but only on workstations where the problems are stemming from lack of standardization of working processes.

According to the production manager, the level of the VPS implementation in the Köping factory's Marine division is still basic and there are still many problems to overcome. As a production engineer puts it, "*You see Toyota Way in the early 50's and it takes many years to change the thinking*". The way of working has been the same for many years prior to this change, and when a change is being implemented the workers do not automatically grasp their role in the change process. The management is aware that without the involvement of all workers in the VPS implementation, the progress will be slow and will not reach a satisfactory level. Lack of a structured way of working with the VPS implementation tools is identified as an issue in the Marine division. However, according to the production manager, compared to a year before there is already a difference in the workers' attitudes towards the change. Now, the workers on different levels want to learn more about the VPS as they are beginning to understand that in order to succeed in own work, they need to become part of the VPS implementation. The production manager, who is responsible for the teams of three team leaders, admits that he does not recall his own way of thinking two years ago: "…*something has happened with me also*". There is a general perception among the workers in this division, that the support from the external WCM consultant in form of questioning operators and showing what and how to do, has had a significant impact on workers' way of thinking about 'lean'. In contrast, generally workers in the Marine division of the Köping factory do not seem to give a great importance to the role of the VPSA in this factory's VPS implementation.

4.4.2. Understanding about the VPSA, the VPS model and Standardized Work

The role of the VPSA is not clear to all the workers in the Marine division. While every worker in the Marine division has a comprehension of the external WCM consultant's

[3] Process oriented refers to focusing on implementation of processes, which will in turn bring results.

function in their division, it is not the case with regards to the VPSA. Moreover, the connection between VPS and WCM is not delineated clearly for the workers in the division. As the top management seems to favor the Powertrain's autonomy in the VPS implementation, it is rather obvious that the workers generally do not associate VPSA with the VPS model. Moreover, the lower a worker is positioned in the factory, the less likelihood there is to have any knowledge about the VPSA. However, those who have general understanding about the VPSA show diverging opinions about its role and the potential benefits it can bring to the Marine division in the Köping factory. The VPSA has very limited resources with regards to manpower and most of the workers in the factory have not met any VPSA representatives. Generally, workers do not perceive the VPS coordinator as a link between their factory and the VPSA. In these workers' eyes 'VPSA' is just another acronym in Volvo, which does not necessarily concern their daily work. Workers who are aware of the VPS implementation assessments that VPSA representatives conduct in the Marine division of the Köping factory, often undermine the importance of those assessments. It is rather noticeable, that the factory is more focused on the WCM audits provided by the external WCM consultant. However, the workers in Marine division feel that there is still lack of education regarding the VPS model, an area where they believe, the VPSA may be able to provide great support.

Since the efforts in the VPS implementation have been particularly intense during the past six months, there have been overwhelming amount of changes and tools brought in by the global VPS coordinator, the external WCM consultant and the local VPS coordinator. Although the workers are gradually altering their thinking and begin to understand the reason behind the recent changes, they still have difficulties 'connecting the dots'. While 'struggling in the dark' and not knowing what is expected of them in the changing environment, many do not know who to approach for information regarding the VPS model. Those who find their way to the VPS coordinator may be unsuccessful in obtaining the information they seek. The VPS coordinator identifies that in the past there was a 'bottleneck' between the managers and the operators, where the managers did not spread the information to the operators in their teams. However, recently the information 'push' from him turned into information 'pull' due to workers engagement, and this made him a 'bottleneck'.

In recent months, the operators in the Marine division have participated in so-called 'lean games' to be able to grasp the lean production concepts. They are becoming knowledgeable about the tools and the modules that they have started to work with, but not about the complete VPS model. Experienced managers know that teaching methods such as distributing study material for self-study are generally not effective for operators. Lectures do not hold good results either, as this is just a time off-work. When the operators are involved in active training with practical examples, they see the improvements they can make in their working

processes and how those improvements can make their work easier. The trainings are complemented by the external WCM consultant's and the global VPS coordinator's visits to the factory, where operators are asked questions and shown how to work. After these visits, operators usually gain better understanding of 'Standardized Work' and tend to be more willing to work in a new way.

The managers and the supervisors of the Marine division have been engaged in 'lean-thinking trainings', which included elaboration about the VPS model. The production managers of the Marine division explained that after taking a training of three days and in total of eight times "*...we think we know something by now*". He added that the some of the team leaders have received this kind of training three times. With respect to 'Standardized Work' the team leaders have a clear understanding of what it entails and that it is important for productivity, safety, quality and continuous improvement. This is also the case for the production engineer, who is directly involved in designing 'Standardized Work' processes. In contrast, the representatives of the Quality department in the Marine division have been given a single lean-training some six months ago, and their responsibilities are within a WCM focus area called 'Quality'. In these conditions, it is not likely to possess a comprehensive understanding about the details of the VPS model. Today, those quality representatives are not involved in setting standards for 'Standardized Work', even if they may consider that such involvement is needed. On the other hand, the quality managers are frequently asked to approve work-instructions for operators, but this has its own approval-process related problems.

The opinions about the acceptable degree of standardization may have slight divergences across different levels of workers. But even the operators, who are the targets of the standardized work, agree that standards are needed, once they understand the benefits of working in standardized manner.

4.4.3. The Process of Standardized Work Implementation

Decisions on Global Level

Since in Powertrain the content of the VPS model, including the methods and the tools for its implementation are decided in the 'Global Manufacturing' management team (factory managers, the global VPS coordinator and the head of 'Global Manufacturing'), the initial decisions about the 'Standardized Work' begin already on this level. According to the global VPS coordinator, 'Standardized Work' is important for the Powertrain factories, but the factory in Köping is not yet ready to implement this process in all workstations. However, on factory level, it is the VPS coordinator who is responsible for the VPS implementation road-map. In the Köping factory, 'Standardized Work' is part of a focus area called 'Workplace Organization'. Other 'Non-Value-Added' activities within the focus area must be eliminated, before standardization of working processes can be introduced. Moreover, since the factory's

main goal is to produce, there are limited resources for improvements, and standardization of work processes takes place when 'non-standardized work' is causing problems. Moreover, such implementation must result in high level of benefit, in comparison to the costs involved with the implementation process.

Standardization Process at the Marine division

In the Marine division at the Köping factory, the standardization of work has begun as a pilot study. The pilot involves engineers and technicians who are responsible for correctly designing work processes, as well as some operators for giving practical input from their own experience of the daily work at the workstation. The material regarding 'Standardized Work' is obtained by the production engineer from the factory's internal lean-educator, which means that the engineer exercises a certain degree of personal interpretation. The production engineer and the technicians have been filming how the operators work. By using this method, the filming team observes the entire work process of an operator at a workstation. In these observations, the team discovers the unnecessary movements and other details that can have a negative effect on production efficiency, quality, operator's health and safety. This helps the filming team to determine how to improve the working process. When designing the work-instructions, in order to ensure that important issues are not overlooked, the operators contribute with practical inputs. Moreover, visually following and timing each sequence of the work process, the operators are able to understand why the changes are being implemented. After implementation of 'Standardized Work' at the workstation, the responsible steering-group which includes the managers for engineering and the assembly is meant to ensure that the standards are followed. Generally, managers believe that the beginning is difficult, but once some operators at the workstation adapt the standards, the rest will see the benefits and they will change their ways of working as well.

Until now, all new employees in the Marine division learned to work by 'shadowing' an experienced colleague and following instructions. According to the production engineer, as the experienced operators have their 'personalized' way of working, all new employees have been learning to do the same work differently. With the implementation of 'Standardized Work' however, once the work-instruction is developed by engineers, technicians and operators, it is expected that every operator follows only these instructions for the given workstation.

According to managers, in order to continuously improve the standards of working processes, all operators should be willing to share their ideas more actively. However, those managers are aware that operators often do not share ideas due to the lack of defined responsibilities and suitable conditions for communication with others. Until now operators have been giving improvement ideas on a random, one-on-one dialogs with their team leader. The operators

have more time for such dialogs, when the production volume is low. If the idea is feasible, it is tested and if it is successful the suggestions are implemented. Moreover, the team leader speaks to his counterparts within the Marine division to determine if the idea can be useful for any other areas. Nevertheless, according to operators, the success of their suggestions sometimes depends on the team leader's willingness to listen. There are also weekly mandatory group meetings, where operators meet technicians for discussing the problems related to machine disturbances.

Spreading the Standardization Further and Sharing Experiences

To continue diffusing the standardization of working processes within the Marine division, once the results are tested in the pilot area and anticipated outcome is achieved, the engineers and the technicians use the knowledge they have developed to implement 'Standardized Work' on other workstations. This way of working is expected to accelerate the implementation process, due to the increasing experience of the engineers and the technicians.

With respect to sharing experiences and good examples between the divisions, there are several hindering factors. For example, the VPS coordinator and the production manager agreed that the Gearbox division has significantly more resources and may be able to adapt good examples from the Marine, however, as a 'big brother' the Gearbox underestimates the value that the Marine can bring. Meanwhile the Marine might want to implement good examples from the other divisions, however it might be hindered by its lesser resources. The VPS coordinator acknowledged that spreading good examples between the Marine and Powertronic divisions would not function, due to such things as different set-ups in the assemblies. Whenever good examples are brought to one division from another, it is mainly through the plant manager. Moreover, another issue is the fact that the divisions feel that they are competing with each other in performance. The VPS coordinator believes that much can be improved regarding the sharing of good examples between the three divisions.

The operators believe that good examples created in one location can be used elsewhere. As one of them puts it, "*You can look at the Toyota Way. Everybody uses it in some form*". Nevertheless, there can be numerous issues with respect to sharing of the good examples. For instance, the operators' lack of means for documenting the results of their work is a vivid example. However, when they capture good examples, those can be given either to the VPS coordinator or the team leader, who then will communicate those further. The team leaders' means of communicating the good examples include meetings with the VPS coordinator or the global VPS coordinator, meetings with own managers, or by sending plain text or documents via e-mail and contacting them by telephone. Another means to make good examples public within the Marine division is to publish those documents on the internal teamplace-site. Issues related with passing the good examples to mangers or coordinators are

that, usually the worker who passed the good example is never informed about the destiny of that document. Moreover, in general workers on different levels may feel that their good examples are not good enough to be publicized.

According to the workers in the Marine division of the Köping factory, the VPSA Intranet portal is not used for storing good examples with the rest of the Volvo Group, and neither it is used for retrieving good examples from other factories. On the other hand, external good examples from other Volvo Group BA/BUs, such as Renault Trucks are brought in the Marine division by the global VPS coordinator. Moreover, the external WCM consultant brings good examples from other players in the industry, such as Fiat. Yet, each Powertrain factory is still spending time on separately producing such simple documents as templates, when the means for eliminating duplication are available.

5. Analysis

In this chapter the empirical findings are analyzed with the support of the theoretical framework outlined in Chapter 2, in order to answer the research question of this study. In the following sections a discussion is provided about the factors which influence individual workers' involvement in Knowledge Management and their usage of Knowledge Management Systems in an MNC context. The most important factors are identified and an elaboration is presented about those factors' impact in MNCs.

As illustrated in the previous chapter the knowledge creation, storage/retrieval, sharing and discarding processes in present in both factories. Although we have observed that most of the workers are involved in these processes on individual and collective levels, it is apparent that not all of these workers are part of the processes taking place on organizational (subsidiary and MNC) levels.

The empirical findings revealed an array of factors that may potentially influence workers' involvement in KM processes and their KMS usage. Analyzing these findings, we present factors related to the: (1) Organizational Culture, (2) Management, (3) KMS and (4) Content and Presentation.

5.1. Organizational Culture Factors

In line with the theory presented in the paper, factors related to organizational culture have significant impact on the KM processes. An organizational culture that nurtures cooperation and team-spirit is necessary for KM implementation among workers. In the two factories we have observed collaborative environments, where workers do not hesitate to approach and share thoughts with their team members or managers. Workers are prone to a certain degree of collective problem-solving and working towards a mutual goal, which positively influences their involvement in KM processes. Nevertheless, even in collaborative environments cooperation among workers is influenced by competition between teams or divisions. Although competition as a component of organization's culture may have an effect on stimulating innovative thinking, the findings in the Köping factory exemplify that it hinders the knowledge sharing between divisions. Thus, each of the three divisions is striving to perform better than the others, and is not willing to voluntarily share the knowledge created within its boundaries. Further analyzing the relationships between the divisions in the Köping factory, we observe the perceptions of superiority as a hinder to knowledge sharing. Namely, due to its predominant position within the factory, the Gearbox division is often unreceptive towards the knowledge which may come from a smaller and less significant source such as the Marine division.

Furthermore, the perceptions of autonomy of BA/BUs seem to be a major factor posing challenges for the KM implementation in the Volvo Group. Here, due to the differences between BA/BUs, the influence of organizational sub-cultures becomes evident. For instance, Powertrain is one of the essential BUs in the Volvo Group, and moreover it is considerably superior in size and resources than most of the other BA/BUs. Being such substantial part of a decentralized organization as the Volvo Group, Powertrain enjoys sufficient autonomy to refrain from following orders regarding the central KM initiative. Hence, Powertrain's top management is practicing its own methodology for VPS implementation in the Köping factory, which does not fully comply with the VPSA suggestions. This behavior evidently prevents workers in the Köping factory from involving in the KM processes on the Volvo Group level. This supports the theoretical argumentation, according to which implementing a central KM initiative in a decentralized organization can be highly challenging.

5.2. Management Factors

The above discussed factors related to the organizational culture are closely connected to managerial factors influencing the workers' involvement into KM processes. Looking at the empirical findings, we are able to conclude that managerial factors have the most significant influence on workers' involvement in KM. The managers in both of the investigated factories are lacking awareness and understanding with regards to what is expected from them in terms of VPS implementation. As a result, the roadmaps of VPS implementation are not consistent with the VPSA strategy and are not developed in detail. What we have observed is that in the Vara factory, the management still has not abandoned the previous lean project, and at the same time does not have a clear understanding of the VPS model. In addition the roadmap of the VPS implementation in this factory is not fully in line with the strategy stemming from the VPSA. In the Köping factory on the other hand, the diverging strategy coming from Powertrain is a significant interference which creates mixed signals for the factory workers. Hence, workers in this factory cannot understand in what way WCM is connected to the VPS model. In both of the factories, workers are generally left to take self-initiated steps in VPS implementation in their daily work, even though most of them have inadequate understanding of the concept and the goals behind the VPS-model.

According to the theoretical framework, successful KM implementation requires that workers on all levels are pulled and focused towards accomplishing the goals of the organization's KM strategy. This requires that every individual worker is aware, ready and willing to be involved in the KM processes. In this respect, the empirical findings from the two factories suggest that the workers' willingness to involve in the VPS implementation is dependent on their ability to understand why they would need the VPS and what they should do to incorporate it in their daily working processes. Hence, building aligned understanding through

training and education and creating precise roles, responsibilities and routines for workers on each level, is necessary for their involvement in KM processes.

The managerial responsibility of aligning the KM strategy throughout the MNC by assuring that all workers have clearly defined roles, routines and understanding is not enough for workers' involvement in the KM processes. In both factories, most of the workers have implied that it is important that their expertise is utilized in the implementation of the VPS on the factory floor. This exemplifies that workers themselves are not willing to be treated only as targets whose knowledge needs to be managed, but also as active participants that need to be engaged in the KM processes.

Furthermore, another factor to influence workers' involvement in KM processes is connected to their belief in the feasibility of the goals presented to them. For instance, some operators in the Vara factory were hesitant if full implementation of a module of the VPS model is possible. However, they gained enthusiasm once they were presented with 'exceptionally' good examples from other factories. Once again this is a factor related to the management's ability to correctly communicate goals with workers. In addition to this factor, managers' acknowledgement of the workers' contributions seems to be affecting their involvement in the KM processes. Workers in both of the factories identified that it is demotivating not to receive feedback about good examples that they have passed to their managers. Valuing the workers' efforts is a way of creating the necessary culture, where each worker identifies any lost opportunity of making a contribution as a wasted asset.

5.3. KMS Factors

As discussed in the theoretical framework of this study, workers' usage of the KMS as means of involvement in KM processes can be influenced by a number of factors in various organizations. Looking at the empirical findings, the usage of the VPSA's Intranet portal is very limited in the two factories. The most significant factors which we identify are connected either with the manner in which the central KMS is used in Volvo factories, or with the ICT of which it is comprised.

Firstly, in both of the factories the VPSA Intranet portal is not being promoted, which is why most of the interviewed workers do not have any knowledge about it. Instead, local teamplace-sites are created in both of the factories as means to locally adapt and better communicate the information provided on the VPSA Intranet portal. Nevertheless, the selection, adaptation and provision of information on these teamplace-sites depend on a limited number of persons in each factory. Hence, these persons act as 'gatekeepers' between the information provided through the central Intranet portal and the information provided through the local teamplace-sites. In cases like this, workers involvement in KM processes on

an overall MNC level is directly affected by such local 'gate keepers' who decide what information is provided to workers. Secondly, regarding the ICT of which Volvo Group's central KMS is constituted, one factor seems to be of considerable importance. Namely, the VPS Intranet portal at present supports sharing codified information in form of VPS material and good examples. In the theory, these types of KMS are referred to as 'information repositories'. According to the VPS coordinators from the two factories however, for better utilization of retrieved good examples, the VPSA Intranet portal should enable the users to establish a direct communication with the senders of good examples. Hence, a type of KMS functioning as a 'knowledge-network facilitator' is expected to positively influence the workers' KMS usage.

5.4. Content and Presentation Factors

When analyzing the empirical findings regarding the KMS factors influencing workers' involvement in Volvo Group's KM processes, issues related to content and presentation become apparent. Thus, a number of workers in the two investigated factories pointed out the need of documenting good examples in a unified manner. Workers find it difficult to use good examples created elsewhere in the Volvo Group, due to their divergent presentation. Even on a factory level, workers in different teams are documenting good examples in a differing way. Hence, the need of a 'standard keeper' on a factory and on an overall Volvo Group level has been pointed out as much needed for assuring information which is codified in an common style. Moreover, oftentimes workers find it pointless to retrieve and use VPS material due to their uncertainty if this material is continuously updated. Some workers have even recognized that further factors impeding their active usage of the VPS material are the large amount in which it is provided, its 'heaviness' and language in which it is codified. Indeed, these findings confirm the theoretical postulates regarding the challenges for workers' ability to use information provided through a KMS due to imbalance between the quantity and quality, the indigestibility and language in which such information is presented. Finally, the empirical findings reveal that potentially valuable ideas are lost in the factories, due to inexistence of mechanisms or workers appointed to extract those ideas from team meetings.

6. Conclusions, Implications and Future Research

In this chapter the major conclusions, implications and suggestions for future research are provided. The chapter is divided on three main sections. In the first section, conclusions are drawn upon the research question of this study, based on the analysis of the empirical findings. In the second section, managerial implications of this study are delineated. Finally, the third section provides recommendations for future research as a logical continuation of this study.

6.1. Conclusions

In the beginning of this paper, we stated that we choose to study individual workers' involvement in KM within MNCs, as according to our contention this is important for a better understanding of the complexity of KM. We further motivated our choice based on the absence of an extensive research in this area. At this point, being able to retrospectively view this study, we can conclude that it has provided a deeper insight of the factors which are stimulating or hindering the individual workers' involvement in KM processes in MNCs. For this purpose, we have chosen to examine a newly introduced KM initiative in the Volvo Group, where carrying out an investigation in two of its factories, we intended to answer the following question:

> *In an MNC, which factors influence individual workers' involvement in Knowledge Management and their usage of Knowledge Management Systems?*

The results of this investigation showed that ever since the introduction of the KM initiative in the factories, the workers have been struggling to cope with the change it posed and to understand their role in this change. In our observation workers' involvement in the KM processes in the Volvo Group is influenced by factors related to organizational culture, management, KMS and content.

Organizational culture has a powerful influence on workers' involvement in the KM processes and KMS usage, especially in decentralized MNCs. The existence of sub-cultures within an MNC can make it difficult for a central KM initiative to be implemented. Here, the autonomy of subsidiaries in the decision making regarding the KM implementation may hamper the ability of workers to involve in the KM processes on an overall MNC level. Even on a factory level, workers' involvement in KM processes may be limited to their own teams due to the influence of factors such as competition and feelings of superiority between teams.

Factors stemming from the organizational culture settings cannot be treated in isolation from managerial factors that influence the workers' involvement in KM processes and KMS usage.

According to our investigation, it is of chief importance that the KM implementation strategy developed on a top managerial level is appropriately cascaded down to management on subsidiary and subsequently on factory levels. Nevertheless, the various influences along the way, stemming from inadequate communication or subsidiary autonomy may limit the factory managers' ability to understand how this KM strategy can be executed on the factory floor. Our investigation showed that it is due to this that the factory managers are not able to deliver appropriate roles, responsibilities and routines for individual workers. Hence, the absence of clarity among workers regarding the KM initiative resulted with insufficient or inadequate involvement in the KM processes and usage of the KMS.

Further factors which according to our investigation influence workers' involvement in KM processes are KMS and content related. Firstly, the lack of awareness regarding the central KMS is what isolates factory workers from using this tool as an enabler to involve in the KM processes on an MNC level. Besides the insufficient promotion, the lack of such awareness is mostly dependant on a limited number of persons who act as 'gatekeepers', adapting the information from the central KMS and providing it through local KMS. The authority to make decisions upon what information from the central KMS is provided to workers may make such 'gatekeepers' a direct barrier for workers' involvement in KM processes on an overall MNC level. Nonetheless, the local adaptation of information from the central KMS has proven to be motivated by some issues which users face. Thus, among others, the large quantity, complexity and lack of continuous update of provided content are factors that impose difficulties for usage of the central KMS. In sum, tailoring KMS according to workers' needs is crucial for their involvement in KM processes.

Finally, our findings in the two factories suggest several other factors which are of importance for individual workers' involvement in KM processes. Thus, it has been discovered that the incomprehension of others' knowledge-needs may be a hindrance for an individual to share his/her knowledge. Moreover, workers often do not share own knowledge because they underestimate the value that their knowledge may represent to other workers. Additionally, recipient(s) appreciation and recognition of the value of the shared knowledge are factors stimulating knowledge sharing. We assume that if there were knowledge-sharing routines and structures in place, the aforementioned factors would be related to only some individuals in the investigated factories. However, due to the lack of such routines and structures in both of the factories, we contemplate that these factors can as well be caused by management.

6.2. Implications

Having read the cases of this paper, managers that were hesitant about implementing a KM initiative may feel that their fears about KM have been confirmed. However, this study also witnessed that organizations have a great need for managing their workers' knowledge.

The findings of this paper are intended to provide company managers with an insight into the important factors which can be decisive for KM success. We hope that our findings will help KM initiators when planning KM strategy and execution. It is in our belief that this paper can help the managers of different types of organizations, whether with centralized or decentralized structures, multinationals or simply those which would like to align and utilize the knowledge residing in parts of their organization.

For instance, our findings show that for all types of organizations, business strategy alignment with a KM strategy is imperative for the workers to comprehend and agree that they should be involved in the KM processes. Moreover, workers on all levels need trainings to be able to get exemplified practical experience. This will, among other things, give supervisors comprehension to set realistic goals and to define the roles of the workers, who in turn will be enabled to participate in the KM processes within their respective area of responsibility. Particularly for decentralized organizations, the managers should consider the implications of the centralized initiatives, and be prepared for possible hostility from autonomous units. Generally, there is a red thread throughout the findings, which shows that companies going through a significant change such as KM implementation must complement the KM by change management.

6.3. Future Research

The conclusions of this paper create opportunities for future research about workers' involvement in KM processes.

First of all, this study can serve as basis for a quantitative research on the factors influencing workers' involvement in KM processes and KMS usage, which will be beneficial for strengthening our conclusions and creating more generalizable results.

Moreover, we consider that it would be interesting if Management, Culture, Individual, KMS and Content -related factors are investigated separately. Even though, we are aware that in some instances those issues are interrelated and inseparable, we believe that it is possible to conduct studies where the main focus is one of the above factor-groups. The aim of this type of studies can be, among others, to present the extent to which each factor-group may influence the workers' involvement in KM.

Furthermore, we see a clear need to investigate factors related to change management in parallel with KM implementation, since as any other new initiative KM poses a significant change for workers.

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Appendix 1- Discussion Guidelines' Compilation

I. PLANT MANAGER

1. Please describe your role.
   - What do you do in your daily job?
   - How long have you been on this position? What were your previous positions?
   - Who are the people you work with daily?

2. Does your plant use the VPS model? Have you adapted it?
   - [YES] Why and how?
   - [NO] Why not?

3. How important do you perceive VPSA as a support unit?
   - What type of support do you need and get from VPSA?
   - What kind of information do you need from VPSA? What is the priority?
   - How would you like VPSA to share information about VPS with you?

4. How advanced is the plant in implementation of lean principles?
   - What do you do to achieve this?

5. Is information regarding implementation of lean principles shared in the plant?
   - What kind of information?
   - Who shares it?
   - How is it shared?

6. Do you think that reference material and good examples of lean principles created elsewhere in the Volvo Group can be of benefit for your plant?
   - Do you know that this information is available for your plant?
   - Is the plant using it? If not, why?
   - How should this information be modeled to fit your contextual needs?

7. Do you know about the "VPS Document search" on Violin?
   - Have you ever accessed it?
     - [YES] what was the reason to access it?
     - [NO] why not?
   - Have you used it? How?
   - Is it easy to find the documents in the search engine?
     - Is it easy to access it?

- Can you comment on the interface?
- Can you propose improvements?

STANDARDIZED WORK

8. What do you understand by standardized work process?
   - How standardized are the work processes in this plant?
   - Are you happy with this level of standardization?
   - What can be improved?

9. According to you, who is driving the implementation of Standardized Work?
   - Who sets the standards of Standardized Work?
   - How is this done?
   - How do you ensure that the standards are updated?

10. What are the attitudes of the workers towards standardization of their work processes?
    - What are the reasons behind their attitudes?

11. What needs to be done for successful implementation of standardized work?

12. Are good examples created and identified in your plant and thereafter shared with others in Volvo Group?
    - [YES] How is this done?
    - [NO] Why this is not done?
    - Do you see advantages of sharing your knowledge with the rest of the Group?

II. VPS COORDINATOR

1. Please describe your role as a VPS Coordinator?
   - What do you do as a VPS Coordinator?
   - Why have you been selected as VPS Coordinator?
   - How much time do you spend as VPS? Do you think that is enough?
   - Do you feel you have the means to perform your tasks?
   - Who do you work with performing your tasks as a VPS Coordinator?

2. Does your role include “pushing” for implementation of lean principles or acting as an expert support mechanism for the ones implementing those principles?

3. Does your plant use the VPS model? Have you adapted it?
   - [YES] Why and how?
   - [NO] Why not?

4. How important do you perceive VPSA as a support unit?
   - What type of support do you need and get from VPSA?
   - What kind of information do you need from VPSA? What is the priority?
   - How would you like VPSA to share information about VPS with you?

5. How advanced is the plant in implementation of lean principles?

6. Is information regarding implementation of lean principles shared in the plant?
   - What kind of information?
   - Who shares it?
   - How is it shared?

7. Do you think that reference material and good examples of lean principles created elsewhere in the Volvo Group can be of benefit for your plant?
   - Do you know if this information is available for you?
   - Have you ever used it? If not, why?
   - How should this information be modeled to fit your contextual needs?

8. Do you promote active usage of the tools for sharing the reference material and good examples, particularly the ”VPS Document search”?
   - Do you think this is important for continuous improvement?
   - How do you do that? To whom do you do that?

- Do you perceive benefits of such sharing?
    - Do you think the employees perceive benefits of such sharing?
- Do you perceive any obstacles for such sharing?
    - Do you think the employees perceive obstacles of such sharing?
- What are your comments on the Interface of the ”VPS Document search”?
    - Have you tried uploading? [YES]-Do you find that easy? [NO]-why?
    - What would you like to see in the ”VPS Document search” to be attractive to you?

STANDARDIZED WORK

9. According to you, who is driving the implementation of Standardized Work?
    - Who should actually be doing this?

10. Who sets the standards of Standardized Work? How is this done?

11. Who are the main actors that drive continuous improvement for Standardized Work?

12. Are good examples created and identified in your plant and thereafter shared with others in Volvo Group?
    - [YES] How is this done?
    - [NO] Why this is not done?
    - Do you see advantages of sharing your knowledge with the rest of the Group?

13. What do you think about the existing means of Managing the Expertise? IN KEYWORDS
    - Is it really effective?
    - How do you get individual knowledge to become organizational knowledge?
    - How do you get the organizational knowledge to reach the individual?

III. QUALITY DEPARTMENT

1. Please describe your role.
   - Why is your role important for the plant?
   - What tasks are you performing?
   - Do you feel you have the means to perform your tasks?
   - Who do you work with when performing your tasks?

2. Please describe what is Quality?
   - What does that concept mean for the plant?
   - Why is it important for the plant?

3. How can you describe today's level of Quality in your plant?
   - In your opinion, is this level satisfactory?

4. Can you identify what is necessary for a satisfactory level of Quality to be achieved?

5. Who should be responsible for ensuring Quality in the factory?
   - Based on whose opinions and what information do you develop standards?

6. What type of information (guidelines, standards) do you use, to ensure that Quality is being established?
   - On an overall plant level;
   - On an individual worker level;

7. Do you think that information created elsewhere in the Volvo Group (connected to your domain) can help you improve Quality?
   - Do you use such information?
   - [YES] What information, where and how do you retrieve it and how do you use it?
   - [NO] Why not?

8. Are good examples of Quality identified and thereafter shared with the rest of the plant? How?

9. Do you think it is necessary to share your good examples with the rest of the Volvo Group? Why?
   - Do you actually share good examples with the rest of the Volvo Group? How?

STANDARDIZED WORK

10. What is standardized work for you and how important do you find it?

11. Do some of your tasks have anything to do with standardization of work of the operators?

12. In your opinion, is it possible to link Standardized Work to Quality?
    - Why is that? Why not?

13. Are you involved in setting the standards for standardized work?
    - [YES] How?
    - [NO] Why not?
    - [NO] Since standardized work deals with improvement of Quality / elimination of hazards, don't you feel that you should be involved in setting the standards for standardized work?

14. If you are presented a good example of how standardized work can influence Quality, do you think you are the one that should use it?
    - [NO] Why not?
    - [YES] how would you use it?

15. Are you aware of the VPSA's role in improving the production processes?
    - Do you think VPSA can support your function in some way? Why/Why not?
    - Are you aware of their reference material? If yes, do you use it and how?

16. Do you use the tools for sharing the VPS reference material and good examples, particularly the"VPS Document search"?
    - Do you think this is important for continuous improvement?
    - How useful do you find it?
    - Do you perceive any obstacles using it?
        - Regarding the easiness to find it?
        - Regarding the interface?
        - Regarding the usability of the information?
    - Can you suggest any improvements?

IV. PRODUCTION ENGINEER

1. Please describe your role as a production engineer?
   - Why is your role important?
   - What tasks are you performing?

2. How many levels of workers you interact with to perform your tasks?
   - Who do you report to?
   - Who do you collaborate with?
   - How do you communicate with these workers?

STANDARDIZED WORK

3. What is standardized work?
   - Why is it important?

4. How standardized is the work in your plant?
   - Is that a high level? Do you think it can be improved and how?
   - Is it easy to implement standardized work?

5. Describe the process of designing work standards and instructions?
   - Who is involved in the process?
   - What material do you use for it?
   - Where do you get the input for designing standards and instructions?

6. How you implement standardized work in a workplace? Please, describe the process including the challenges.

7. What are the reactions of the people that get those instructions?
   - How do you monitor their reactions?
   - Do you consider any inputs from the operators? How?
   - Do you encourage any inputs from the operators?

8. Once you develop a guideline for standardization of work for a specific task, do you improve it after implementation?
   - [YES] Based on what do you improve the standardized work?
   - [YES] How do you make sure that you establish continuous improvement?

9. Which are the advantages and disadvantages of standardized work?

10. What do you know about VPSA?
    - Do you think that VPSA can help you with standardized work?
    - Do you know how VPSA can help you with lean processes?
    - Would you use their help?
    - In which way would you like to receive help from VPSA?

11. Are you aware of the VPS material produced through VPSA?
    - Have you used the material that VPSA is providing?
    - Where did you find it?
    - Do you find it useful?
    - What kind of material would be useful for you?

12. Can you comment on the "VPS Document search"?
    - Regarding the easiness to find it?
    - Regarding the interface?
    - What improvements would you suggest?

13. Have you used the good examples, the training material or the reference material?
    - How would you like this material to be?
    - How would you like to get it?

V. TEAM LEADER

1. What is your role as a team leader?
   - Which operators are you responsible for?
   - What functions are you responsible for?
   - Do you enjoy your work? What frustrates you in your work?

2. How many levels of workers you interact with to perform your tasks?
   - Who do you report to?
   - Who do you collaborate with?
   - How do you communicate with these workers?
   - In your opinion, are these communication methods effective?
   - Would you prefer another type of communication?

3. Who decides how the tasks should be performed in this team?
   - Who is supporting you when you experience problems?
   - Who designs the tasks and sets the standards for the tasks?

4. How do you support your operators? How do you make sure that they perform their work in the right way?
   - If the operators encounter a problem, how do they solve it?
   - How do you help them solve their problems?
   - Do you encourage team participation in finding solutions for problems?
   - Do you have enough time to interact with the operators and to listen to them?

5. Do you encourage suggestions from your team?
   - How do you make sure that suggestions and ideas are documented for improving work processes?

6. Do you share solutions and ideas created in your team with other teams in the plant for improvement of the processes?
   - [YES] How do you do this? [NO] Why not?
   - [YES] Do you think there is a better way of doing this?

7. Are other teams sharing their solutions and ideas with you?
   - [YES] How do you use this information?

8. Do you take solutions and ideas from other plants in the Volvo Group?

- Do you think that solutions created in other plants can help you improve your processes? [NO] why not?
- Do you think you can trust (have confidence in) such source of information?
- Have you ever used this kind of knowledge? How did you find it?

9. If you have some solution or idea, do you think it is good to share it with other plants?
   - [YES] Why is it good? Are you doing it? [NO] Why not?
   - [YES] What do you expect in return?
   - [YES] How would you share these solutions and ideas?
   - [YES] Out of everyone in this company, who would you help with everything this team knows, and whom not?

STANDARDIZED WORK

10. What does Standardized Work mean for you?
    - Do you think it is important to have standardized work?
    - Do you like the idea of standardized work?

11. Have you standardized the work in your team?
    - [YES] Is it easy to implement standardized work?
    - [YES] What is the attitude of the workers when it comes to standardized work?

12. How do you implement standardized work? Describe the process?
    - Where do you find guidelines for standardized work, how do you learn about it?
    - Who should set the standards?
    - Who is involved with ideas and suggestions in the process of standardization?

13. Is standardized work something that you implement at one instance or is it a continuous process?
    - In your opinion, how can standardized work be best Implemented in the processes?

14. Which are the advantages and disadvantages of standardized work?

15. Are you aware of VPSA?
    - Do you think that VPSA can help you with standardized work?
    - Do you know how VPSA can help you with lean processes?
    - How would you like to receive this help?

16. Are you aware of the VPS material (good examples, training material and reference material) provided on Violin?
    - Have you used this material?
    - Do you find it useful?
    - What kind of material would be useful for you?
    - How would you prefer to get this material?

17. Can you comment on the “VPS Document search”?
    - Regarding the easiness to find information that you need?
    - Regarding the interface?
    - Can you propose improvements?

VI. OPERATOR

1. What do you do in your work?
   - How did you learn to work on this task?
   - Do you do things the same way that another operator on the same workstation does? [NO]: Why not?
   - Do you have routines, standards, manuals of how to perform your tasks?
   - Do you enjoy your work? What frustrates you in your work?

2. What do you understand by Standardized process of Work? What do you associate it with?
   - Do you think you have been given enough information about Standardized Work process?
   - Do you think your work process is standardized?
   - Do you think there is some benefit if everyone on this workstation performed their tasks the same way?
   - Does everyone work the same amount of time? Do you often rotate?
   - Do you think standardization is important for your work? Why?
     - Can it improve Quality? Health and Safety?

3. How do you react when your team leader gives you new instructions about the task that you already know how to do?
   - Is it important that you give your opinions in developing instructions?

4. Do you like getting trainings? Do you have enough training?
   - What material are you using in the trainings?

5. When do you come across a problem for which you did not have training, what do you do?
   - Who do you ask for help? How?
   - Do you feel that you can easily get help from your colleagues?
   - What happens when you make a mistake? Are the team leaders helpful?
   - Who else do you think might be able to help you?
   - Can you suggest a better option of dealing with problems?

6. Do you make suggestions (ideas and concerns) to your team leaders, production engineers and other managers, of how to improve the work?
   - Do you have enough time to do this?

- How do you do this (who do you contact)?
- What happens when you give a suggestion?
- Do you think they should ask you for suggestions or do you feel free to contact them about it?
- [NO] Why not?

7. Do you think there is a better way of giving suggestions?

8. Do you have time to meet your colleagues and discuss about work related issues, problems or ideas?
   - [YES] How often you do this? Where?
   - [YES] Do you think it is helpful?
   - Do you feel you can talk openly about issues with co-workers, and do they generally accept each others' suggestions?

9. If you have some knowledge or idea that others don't, or if you have some new solution of a problem, do you think it is a good thing to share that knowledge with others in the plant?
   - [YES] Why is it good? Are you doing it?
   - [YES] How would you share this knowledge / ideas?
   - [YES] What do you expect in return?
   - [YES] Out of everyone in this company, who would you help with everything you know, and whom not?
   - Would you mind if your ideas are used other plants in Volvo Group?
   - [NO] Why not?

10. Do you think that solution of the same (or similar) problem, which somebody in another factory (and another country) has done, can help you solve your problem?
    - Do you think you can trust (have confidence in) such a person/source of information?
    - [YES] have you ever used this kind of knowledge? How did you find it?
    - [NO] why not?

11. Do you know what VPS is?
    - Do you know how standardized work is defined in VPS?
    - Do you know how VPS can help you in your work?
    - [Did you think VPS training is interesting]?
    - Do you have access to computers on the workplace? What do you do with the computers?