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Working with tacit knowledge

*An empirical investigation in glass blowing
tradition in Sweden*

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Abstract

Tacit knowledge is argued to be a crucial resource to organizations' competitive advantage. The majority of research on tacit knowledge is oriented towards the conversion of tacit knowledge into explicit knowledge, thus assuming that all knowledge can be made explicit and captured in formal ways. These approaches overlook the intangible nature of tacit knowledge by overestimating that explicit knowledge. This study takes a human centered approach with the aim to examine the factors that are necessary for an environment that works with tacit knowledge. A theoretical framework derived from the literature review and served as guidance for the data collection and analysis.

Hermeneutics is the underlying philosophy that guides this study. The study is qualitative study conducted in the glass blowing in Sweden, respectively in two sites Pukeberg and Transjö Hytta. Participants of the study were masters and apprentices from these two settings. Data collection methods included literature studies, documents, participant observation, informal interviews and semi-structured interviews.

Results from the analysis show the significance of several social factors that need to be present in an environment that involves tacit knowledge. These factors appeared to be related to each other. Data analysis indicated that not all factors are equally important, thus they have been classified into primary and secondary factors.

Executive summary

In the knowledge-driven society, tacit knowledge is argued to have become the primary resource for sustainable competitive advantage for organizations. The intangible nature that characterizes tacit knowledge is argued to provide organizations with unique market positions. Despite its importance, tacit knowledge has often been an ambiguous notion and often attributed as the opposite of the explicit knowledge. The majority of approaches focus towards the codification of tacit knowledge and ways of storing it into different Information Technology systems. These approaches treat knowledge as an object that can be detached from the humans, stored, transferred and shared.

This study has taken a human centred approach aiming to identify the necessary factors that enable effective working with tacit knowledge. The study is conducted in the glass blowing tradition in Sweden, respectively in two glass blowing facilities. The rationale on focusing the study in this tradition relies on the fact that this tradition has preserved the traditional master/apprentice relation. Data is collected from both settings through literature studies, documents, participant observations, informal interviews and semi-structured interviews.

Results from the data analysis show the significance of several social factors that need to be present in an environment that involves tacit knowledge. These factors appeared to be related to each other, some contributing to the others. Data analysis indicated that not all factors are equally important. Thus they have been classified into primary and secondary factors. Data collection and analysis revealed also some sub-factors and new factors that are important in working with tacit knowledge. Moreover the results indicated that tacit knowledge is rooted and expressed in action and is very context dependent. All the empirically investigated factors presented in the results chapter of the study are developed and evolve in the context of which tacit knowledge is a part of. Results of the study indicate that social factors play a crucial role in such environments. This study indicated that no codification of tacit knowledge took place, nonetheless the tacit dimension embodied in glass blowing skills was interiorized not as the knowledge transfer from the masters to apprentices but emerged as new knowledge developed through practice.

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1. Introduction

This chapter provides an introduction to the topic of the study. Initially the background and problem area are presented, followed by topic justification. Moreover the purpose of conducting this study and research question that guides the study is provided. The chapter concludes with scope and limitations as well as the importance of the study.

1.1 Background and Problem Area

Nowadays organizations are faced with quite a dynamic and chaotic environment that requires increased demand for flexibility, responsiveness and effective ways to achieve competitive advantage. The role of knowledge has shifted from being one of many resources (Stenmark, 2004) to becoming the primary resource and a critical indispensable asset for a sustainable competitive advantage for organizations (Nonaka, 1994; Herrgard, 2000).

Nevertheless Nissen (2006) argues that not all knowledge offers equal potential in terms of competitive advantage, referring to the two types of knowledge, explicit and tacit knowledge. Although this dichotomy explicit versus tacit knowledge is highly debatable, it is intentionally brought out here to make more obvious the overemphasis of the research and organizations on the explicit knowledge. Given that explicit knowledge is the knowledge that can be codified or digitalized, this type of knowledge can be very easily obtained and applied by competitors. Generally according to Saviotti (1998) the tendency towards making most knowledge explicit decreases in a large scale the competitive potential. Organizations cannot make use of any type of codified knowledge unless they have the skills and expertise to put that knowledge into practice.

On the other hand tacit knowledge is very context specific, rooted in practice and experience, expressed through action and transmitted by apprenticeship (Polanyi, 1966; Johannessen *et al*, 2001). Tacit knowledge is claimed to occupy a central place in the development of sustainable competitive advantage (Nonaka, 1991; Ambrosini and Bowman, 2001). Due to its intangible nature, this type of knowledge is difficult to be replicated, imitated and transferred, thus making it an idiosyncratic resource with a strategic importance for sustainability of competitive advantage.

Despite the widely acknowledged importance of the tacit knowledge, Tsoukas (2002) argues that in general, modernity mistrusts intuition and is not comfortable with ad hoc practices, instead preferring explicitly articulated statements and systematic procedures. Thus the research on Knowledge Management has so far been dominated by an IT perspective, resulting in an overemphasis on codification of knowledge, suitable for databases and other traditional IS solutions (Swan, Scarbrought, Preston, 1999).

1.2 Topic Justification

According to Busch (2008) studies related to the tacit knowledge usually fall under the umbrella of the area of Knowledge Management, and the capturing of tacit knowledge has been noted as being fundamental concept to such management. He further argues that the role of Information Systems (IS) has expanded from being only information processing machines into becoming rather knowledge oriented.

However according to Willcoks and Whitley (2009) only recently the topic of knowledge began to gain attention in the area of Information Systems. Nevertheless this is mainly due to the computerization, and in particular studies into artificial intelligence and technologies to manage the knowledge in organizations. They further argue that despite its crucial importance, knowledge has become a key, under-researched and under-philosophized concept for the IS field, that needs to be rebalanced. Moreover they claim that Polanyi's work has been largely misunderstood and his work can play a key role in re-conceptualizing and studying knowledge in the IS field. Same view is shared also by Ambrosini and Bowman (2001) who argue that the notion of tacit knowledge besides resisting operationalization, has been largely misunderstood and misinterpreted in management studies as well as in the KM field.

As mentioned briefly in the problem background, the literature on tacit knowledge puts a lot of emphasis on the dichotomy tacit-explicit knowledge. According to Alavi and Leidner (2001) often the literature on knowledge management on which IS draws is vague and confusing about what is meant by tacit knowledge. Thus tacit knowledge is typically interpreted and contrasted with explicit knowledge (Alavi and Leidner, 2001), whereas it is simply its other side (Tsoukas, 2002).

The way explicit knowledge is used in practice will reveal the fact this type of knowledge is far from being as objective and explicit as it is often perceived. This form of knowledge is grounded on personal judgments, tacit commitments and necessarily contains a "personal coefficient" (Polanyi and Prosch, 1975). Furthermore Polanyi (1958) argues that a society which wants to preserve a fund of personal knowledge must submit to tradition.

Drawing on several studies such as (Athanasios & Nigh, 2000; Cantwell & Santangelo, 2000; Donaldson, 2001), Busch (2008) argues that the studies on tacit knowledge, especially within the domain of knowledge management tends to only focus at the macro-organisational level. Also although there is a general agreement that tacit knowledge is hard to be acquired and transferred, according to Busch (2008) the majority of research on tacit knowledge is focused on attempts on converting it into explicit knowledge. Around 70% of research articles in the area of KM in Information Systems have a strict IT approach (Scarborough *et al*, 1999 as cited in Hildreth and Kimble, 2004; Stenmark, 2001) on how these technological tools can be exploited in order to capture and store knowledge, or create repositories of structured knowledge (Davenport & Prusak, 1998). Similarly Barth (2001) and Göranzon (2005) argue that there is an affinity of overlooking the nature of tacit knowledge and the tendency towards its articulation (Barth, 2001; Göranzon, 2005).

This dominant view has often been criticized, for instance Schultze and Leidner (2002) who argue that there is a taken for granted assumption that all knowledge can be made explicit and captured in a formal way. This perspective according to them lacks considering more complex issues such as tacit dimensions, relationships, degree of involvement within community. Thus the nature of tacit knowledge and its relation to individual skills and social contexts has been inadequately understood. Barth (2001) claims that ways of sharing craft/ practical knowledge which have a large tacit dimension lack rigorous and systematic investigation. Also Göranzon (2005) argues that there is a tendency to overemphasize theoretical knowledge at the expense of practical knowledge. According to him there is an underlying assumption that people who lack theoretical knowledge also lack any knowledge whatsoever.

1.3 Purpose and Research Questions

The purpose of this study is to empirically examine the potential conditions necessary for an environment that involves working with tacit knowledge. To achieve this, the study is conducted in

a natural setting that depicts the master/apprentice learning tradition, as the most suitable context defined for the purpose of this study.

Thus, considering the purpose of the study, the research question this study addresses is:

- What are the factors that enable effective working with tacit knowledge?

1.4 Contribution of the study

I consider that this study will contribute to both the Information Systems scientific community and practice. This study takes a different perspective from the majority of IS research on tacit knowledge. It does not take for granted and does not presuppose that tacit knowledge in order to be effective can and should be made explicit. On the contrary it tries to provide understanding of the tacit knowledge as such, and empirically examine the necessary factors that should be possessed by environment in working with tacit knowledge. The study aims to come up with an empirically investigated list of factors that enable working with tacit knowledge. Another contribution is perceived due to a limited empirical evidence of such study in a specific context that follows the master/novice tradition.

A difference and the novelty that this study will bring is the empirical research in the glass blowing field. Mainly all empirical studies reviewed for this study have been conducted in the field of nursing. Also Glafo Glass Research Institute located in Vaxjo expressed its interest in the research, since in the past they had initiated this type of research, however for some reasons it was not completed.

Given that the aim of this research is to examine the suitable environment for working with tacit knowledge, I consider that also “knowledge-driven” organizations that recognize the importance of tacit knowledge and put a lot of emphasis and efforts on tacit knowledge and its role in organizational learning and competitive advantage would also benefit from the results of this research.

1.5 Scope and limitations

This study focuses on examining the potential conditions necessary for an environment in working with tacit knowledge. As mentioned previously tacit knowledge is very context specific and could only be learnt through apprenticeship. By taking this into account, the empirical investigations are focused in the glass making tradition in Sweden, specifically in two settings. The glass blowing field in Sweden has preserved the master/apprentice tradition, thus being a suitable setting for conducting the empirical investigations.

However, this study can be further developed in at least two ways by considering limitations in terms of the application of methodological approach and the application of adapted theoretical bodies. Language barrier has presented a methodological limitation given that the verbal communication between the participants in the research setting was done in Swedish. To some extent in order to fill this gap, some translations were provided during the observations, by the participants. Also a help from a proficient Swedish speaking was required when analyzing the video recordings. Thus it is considered that to some extent any part might have been overlooked due to the language barrier.

In terms of the theoretical concepts employed to the study, Polanyi's notion of tacit knowledge is the prevailing concept. However it is important to note that the study will also consider communication/capture of tacit knowledge in a larger scale, by assuming that apprentices learn not only from the master but other apprentices as well.

1.6 Disposition of the thesis

This thesis is organized and structured into the following chapters:

- **Introduction-** Presents the background of the problem area, the purpose of the study along with the research question around which the whole study revolves. It also sets up the scope and the limitations of the study.
- **Literature review-** Provides the background of the main theories and most commonly used concepts related to the topic of the study. A theoretical framework compiled from the review of the literature is also presented.
- **Methodology**—This chapter presents the scientific method used to carry out this study. Philosophical tradition that has guided this study, research approach as well as data collection methods have been discussed in details. Moreover the research setting, participants and procedures are thoroughly explained. Criteria for trustworthiness and ethical issues are also presented and elaborated.
- **Analysis and results** – This chapter provides the analysis of the empirical data using hermeneutics as a data analysis approach. Also a model which is a result of analysis is presented and discussed.
- **Discussions** – The results of the study are discussed. Implications of the study to the Information Systems area and wider are discussed.
- **Conclusions** – This chapter provides conclusions of the study. Moreover suggestions for future research are presented along with own reflections on conducting this study.

2. Literature review

This chapter provides a background of theories and concepts related to the study. Initially this chapter provides an overview on the concept of knowledge followed by knowledge management and knowledge typologies. Furthermore it focuses on the notion of tacit knowledge as provided by Polanyi and others. Knowledge creation and sharing model is also presented. Since the study is conducted in the glass blowing tradition, master apprentice relation as the best environment of working with tacit knowledge is described, followed by the communities of practice. Through a thorough review of related studies a theoretical framework is developed that will serve as a foundation for data collection and analysis.

2.1 What is knowledge?

There have been many attempts in defining knowledge, traditionally in philosophy and later by different researchers; yet the definitional domain of knowledge remains highly debatable. One who tries to provide a general definition of knowledge would get trapped in a circle of various previous perspectives, by even tackling the entire field of epistemology. Attempts on defining knowledge date back to Greeks, with Plato who according to Kalman (1999) is perceived as the originator of epistemology. Plato defines knowledge as a “justified true belief” (Kalman, 1999; Nonaka, 1984).

This objective detached view is a generally accepted assumption in organizational theory developed by Nonaka & Takeuchi (1995), and many other positivist studies.

Polanyi and Prosch (1975) disagree that there is an “objective” knowledge, self-contained, detached, and independent of human action. All knowing is personal knowing that involves skillful action or participation through indwelling. This view is also shared by Berger and Lukman (1966) who consider that human knowledge is developed and transmitted in social situations. The sociology of knowledge provided by them, understands human reality as socially constructed.

The most common paradigm in the Knowledge Management literature is the data, information, knowledge, wisdom (DIKW) pyramid or hierarchy (Davenport and Prusak, 1998) which is illustrated in the Figure 2.1 below. The hierarchy is used to contextualize data, information, knowledge, and wisdom, and relations to one another. It also describes the processes of the transformation of an entity at a lower level in the hierarchy to an entity at a higher level in the hierarchy (e.g. transformation of data into information). The assumption is that data can be used to create information; information can be used to create knowledge, and knowledge can be used to create wisdom (Rowley, 2007).

Figure 2.1 The DIKW hierarchy (Rowley, 2007)

Ackoff (1989) whom this pyramid is attributed to, argues that although there is a tendency to use these concepts interchangeably, not only they are different but they also form a hierarchy of increasing value. The distinction between data/information and knowledge according to Nissen (2006) is specifically obvious where tacit knowledge is involved.

In this context the DIKW concepts are defined as following:

- Data are symbols (Ackoff, 1989; 1996), that represent elementary description of things, activities that can be recorded, stored but are not organized to convey a specific meaning (Turban *et al.*2008).
- Information is processed data (Ackoff, 1989; 1996) endowed with meaning, relevance and purpose (Jashapara, 2004). Information answers to who, what, when and how many questions.
- Knowledge is know-how, and application of data and information to answer how questions. Knowledge can be obtained either by transmission from another who has it, by instruction, or by extracting it from experience (Ackoff, 1989). In this context Davenport and Prusak (1998) view knowledge as a mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information.
- Wisdom is the ability to increase effectiveness (Ackoff, 1989).

Same Busch (2008) provides a knowledge hierarchy, although not in a pyramid form, that illustrates that data is the minimum we are able to communicate, information elaborates but knowledge truly represents what we know both articulately and tacitly.

Figure 2.2 The knowledge hierarchy (Busch, 2008)

2.2 Knowledge Management

Knowledge Management (KM) is quite a recent discipline that has emerged in 1990s, when the focus on the importance of knowledge highly increased. Same as knowledge also the KM is multifaceted and multilayered concept.

As an interdisciplinary field, KM has been influenced by numerous fields varying from philosophy, cognitive science, social science, management science, information science, knowledge engineering, artificial intelligence, and economics (Jashapara, 2004). Taking this into account a numerous definitions of KM exist, nevertheless there is no universal definition. According to Jashapara (2004), there are two dominant strands on the reliance of KM literature. One is IT oriented and other draws more attention on people's dimension of knowledge creation and sharing. The major part of literature has a more technological oriented approach by considering KM as a process of codifying knowledge and storing it in different Knowledge management Systems (KMS) (Hansen, 1995; Rowley, 2003). This perspective considers that facilitation of communication between members of an organization is achieved through tools like email, intranets, groupware etc. (Rowley, 2003).

Alavi and Leinder (2001) define knowledge management systems (KMS) as a class of information systems applied to managing organizational knowledge. They are IT-based systems developed in order to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer, and application. Alavi and Leinder (2001) claim that while not all KM initiatives involve IT implementation, many of them rely on IT as an important enabler.

Some others have a different perspective, arguing that KM is putting too much emphasize on technology. Swan *et al.* (1999) argues that KM is focusing on technology thus neglecting people related issues. According to them, KM is in danger of becoming just a re-label of information management consequently a new fad that forgot people. The same view is shared by Wilson (2002) who claims that although KM is supposed to be an innovative solution to many problems, it simply deals with structured data and involves a capture, codify and store approach. McDermott (1999) taking a similar stand argues that this information management approach disregards the fact that information is different from knowledge, and knowledge involves thinking with information. According to him different concepts and tools are needed not just to increase the circulation of information are needed because after all it is humans who realize it. If all we do is increase the circulation of information, we have only addressed one of the components of knowledge.

Figure 2.3 as provided by Schwartz (2006) presents a holistic representative view of knowledge management and its foundations. He elaborates that the core of the layers presents philosophical perspectives of several philosophers whose theories of knowledge, economics and business form the core and are fundamental to KM. These philosophies inform the choice of practical knowledge-management processes (the first layer). These processes that ideally must derive from the core theories present different stages, activities and cycles that KM is made of. These processes must be implemented and adapted to address managerial, social and organizational needs (the second layer). The enclosing layer presents the technologies that enable meeting organizational needs. However Schwartz (2006) argues that this layer often seems to drive KM rather than facilitating it.

Figure 2.3 Layers of Knowledge Management (Schwartz, 2006)

2.3 Knowledge typologies

Literature on knowledge provides a variety of terms of knowledge types and classifications. Classification of knowledge is not a modern trend. It could be traced back to the old Greeks that according to Hirschheim (1985) have classified it into *doxa* and *episteme*. *Doxa* refers to that which was believed to be true (Hirschheim, 1985) or that which is fallible as it basically involves opinion, assumption, view or belief that derives from experience through senses (Kalman, 1999). *Episteme* is the infallible knowledge of reason (Kalman, 1999) which was known to be true (Hirschheim, 1985). Greeks believed that science comprises the process of inquiry which transformed *doxa* into *episteme* (Hirschheim, 1985).

Aristotle divides knowledge into: *episteme*, *techne* and *phronesis* (Halverson, 2004; Schwartz, 2006). *Episteme* is defined as the scientific theoretical knowledge (Schwartz, 2006) expressed in a form of propositions true across particulars contexts. This form of knowledge can be represented apart from the knower, codified into systems (Halverson, 2006). *Téchné* refers to the technical and action-oriented knowledge, expressed through routines and procedures. This form of knowledge is not context bounded or as Halverson (2004) explains, it provides predictable results despite variations in context. *Phrónésis* on the other hand is the practical wisdom based on experience, skill based technical and action-oriented knowledge. This type of knowledge is not based and does not develop rules and techniques true for all circumstances. It is embodied and developed through habit, and expressed through particular actions (Halverson, 2004)

Ryle (1949) as cited in Jashapara (2004) makes a distinction between “knowing how” and “knowing what”. Knowing how refers to the intelligence, which can be meaningful and present itself only in activity and represents the ability to perform tasks. On the other hand knowing what refers to certain bits of knowledge in one’s mind.

As the vast majority of Knowledge Management literature considers knowledge as being of two types explicit and tacit, this study will provide a background of these two concepts. Basically most of the Knowledge Management literature has a specific focus on the interaction between these two.

Explicit knowledge is the type of knowledge which can be expressed in words and numbers and shared in the form of data, scientific formulae, specifications, manuals, reports, white papers, databases etc. This kind of knowledge can be easily transmitted and shared across individuals formally and systematically (Nonaka and Nishuguchi, 2001; Herrgard, 2000). Often explicit knowledge is viewed as being the same as information (Busch, 2008).

Tacit knowledge on the other hand is defined as being the opposite of explicit knowledge, the knowledge that cannot be articulated and codified (Nonaka and Takeuchi, 1995).

Polanyi (1966) argues that there is no objective explicit knowledge independent of the individual’s tacit knowing: *“The ideal of a strictly explicit knowledge is indeed self-contradictory; deprived of their tacit coefficients, all spoken words, all formulae, all maps and graphs are strictly meaningless”* (p. 195). So according to Polanyi (1958) these two concepts are not separated rather exist in continuum.

Grant (2007) present the tacit/explicit dimension as derived from Polanyi (1956; 1969)

Figure 2.4 The tacit/explicit dimension (Grant, 2007)

2.3.1 Tacit knowledge - Polanyi’s view

The notion of tacit knowledge has been coined by Polanyi (1958, 1966) as a response to the scientific objectivism paradigm, which considers that all relevant knowledge is objective rather than personal. Polanyi (1966) considers human knowledge as *“we can know more than we can tell”*. Drawing on this definition some other authors such as Leonard and Sensiper (1998) have gone even further by claiming that *“we can often know more than we realise”*.

Based on an example provided by Dreyfus and Dreyfus (2005) it is obvious that the concept of that we can more than we can tell is not new, but it could be traced back to the beginning of western

culture. Drawing on one of the Plato's dialogue "The Euthyphro", Socrates walked around Athens looking for experts in order to get and test their rules. Socrates meets Euthyphro-a religious prophet and an expert on spiritual behavior, and asks him to tell how to recognize piety, its characteristics in order to use it as a standard to judge actions of people. But instead of telling how he recognizes piety, Euthyphro provides him examples from his experience, in this case mythical situations in the past in which men and gods have done things that everyone considers pious. Socrates demands that Euthyphro tell him his rules for recognizing these cases as examples of piety, but although Euthyphro claims he knows how to tell pious acts from impious ones, he cannot state the rules which generate his judgments. Socrates ran into the same problem with craftsmen, poets and even statesmen. They also could not articulate the principles underlying their expertise. Socrates therefore concluded that none of these experts knew anything and he didn't know anything either (Dreyfus and Dreyfus, 2005).

Polanyi himself does not make this epistemological distinction between tacit knowledge and explicit knowledge.

Polanyi (1966) supports his seminal statement by providing several examples. One of them is how we know a person's face and recognize it among thousand people, yet we cannot tell how we know that. Drawing his analysis of knowledge on Gestalt psychology, Polanyi (1966) argues that this has showed that we may recognize a physiognomy by integrating our awareness of its particulars without being able to identify these particulars.

Polanyi (1958) claims that in any activity two dimensions of awareness are involved: *subsidiary awareness* and *focal awareness*, which according to him are mutually exclusive. The example provided by Polanyi (1958) is the use of a hammer to drive a nail. When using a hammer to drive in a nail we are aware of as Polanyi puts it we attend to both nail and the hammer, but in a different way. We watch the effects of the strokes on the nail and we try to hit it in the most effective way. Driving the nail was the main object that we are aware of. However in a sense we are also aware of the feelings in our palm that hold the hammer. The difference is that hammer unlike nail wasn't object of our attention but instruments of it. "I have a subsidiary awareness of the feeling in the palm of my hand which is merged into my focal awareness of my driving in the nail".

According to Polanyi (1966) in an act of tacit knowing "we attend from something for attending to something else" Polanyi (1958) argues that if we switch our focal attention to particulars of which we had only subsidiary awareness before, their meaning is lost and the corresponding action becomes clumsy. Kalman (1999) referring to Polanyi claims that the act of knowing has a *from-to* structure, between what we attend from, and that which we attend to.

Polanyi illustrates this relationship between focal and subsidiary aspects by describing an electric shock experiment. In this experiment, a subject was shown a large number of nonsense syllables. After certain of these syllables were presented, an electric shock was administered to the subject. Within a short time, the person showed signs of anticipating the shock when the shock syllables were shown. However later when asked, the person who experienced the shock could not identify the syllables. He knew when to expect the shock, but could not tell how he knew it. The person was relying upon his/her tacit awareness of the shock syllables for attending to the approaching shock.

2.3.2 Tacit knowledge –perspective of other authors

Grant (2007) who conducted a qualitative examination of around 60 papers from three major knowledge management journals argues that Polanyi's work has been widely cited and also frequently misinterpreted by some authors. He goes even further by claiming that in some cases,

2.4 Knowledge creation and sharing

Nonaka and Takeuchi (1995) claim that knowledge is created through a spiral process of interactions between explicit and tacit knowledge. This dialectic interaction between tacit and explicit knowledge according to them yields new knowledge. Nonaka (1984); Nonaka and Takeuchi (1995) call this interaction between these two types of knowledge, knowledge conversion. Thus they proposed a model containing four different "modes" of knowledge conversion: (1) Socialization which involves the conversion from tacit knowledge to tacit knowledge, (2) Combination that involves the conversion of explicit knowledge to explicit knowledge, (3) Externalization where tacit knowledge is converted to explicit knowledge, and (4) Internalization that involves the conversion of explicit knowledge to tacit knowledge. This model is presented below in the figure 2.5.

Nonaka and Takeuchi (1995) claim that knowledge should be concentrated in a certain time and space in order to be exploited and created. Thus, they introduce the concept of "Ba" which means place, context or a platform where knowledge is created. According to Nonaka and Takeuchi (1995) through ba organizations are able to effectively manage the knowledge creating and sharing process. Information resides in media and networks, while knowledge resides in ba. There are four types of ba: originating, dialoguing, systematizing, and exercising ba, where each facilitates a particular mode of knowledge conversion between tacit and explicit knowledge, in the SECI model.

Figure 2.6 SECI Model (Nonaka and Takeuchi, 1995)

2.4.1 Socialization

According to Nonaka (1984); Nonaka and Nishiguchi (2001) socialization involves the conversion of tacit knowledge to tacit knowledge between individuals. The term socialization is adopted in order to highlight that shared experience or joint activities play a crucial role in this process. These joint activities include individuals spending time together, sharing the same environment, rather

than through written or verbal instructions. Nonaka and Takeuchi (1995) argue that self-transcendence is crucial in order to make this happen, because tacit knowledge can only be shared if the self becomes the larger self that includes the tacit knowledge of the other. This means that individuals empathize with their colleagues and customers rather than sympathizing with them. Another aspect of socialization is physical proximity that is largely supported through direct interaction. A typical example of socialization is the traditional apprenticeship. Apprentices learn their craft not through language or textbooks but by observing, imitating, and practicing the works of their masters.

According to Nonaka and Nishiguchi (2001) the place or platform where socialization mode takes place is originating ba. Since according to Nonaka (1984); Nonaka and Nishiguchi (2001) joint activities play a crucial role in tacit to tacit knowledge conversion, originating ba is the place where individuals share feelings, emotions, experiences, and mental models. This platform is considered to be the primary ba or the motor of knowledge creation process.

2.4.2 Externalization

Externalization mode of the SECI model involves conversion of tacit knowledge to explicit knowledge. Through externalization tacit knowledge is articulated into explicit knowledge. This articulation is expressed in forms of metaphors, concepts, hypothesis, diagrams, models or prototypes, which can be understood and shared between individuals. These expressions often appear to be insufficient, but this gap can help to promote reflection and interaction between individuals (Nonaka, 1984; Nonaka and Nishiguchi, 2001)

Dialoguing ba according to Nonaka and Nishiguchi (2001) is the platform where tacit knowledge is converted and becomes explicit. Dialogue, use of metaphors is considered crucial for this process. Through dialogue, individuals' mental models and skills are converted to common terms and concepts.

2.4.3 Combination

Combination involves the process of converting explicit knowledge into more systematic set of explicit knowledge. Explicit knowledge is collected and then combined, thus creating new explicit knowledge. This new knowledge is distributed to members through presentations or meetings, followed by editing or processing it in order to be more usable for the organization. Combination is enabled by different media such as documents, meetings, telephone conversations, computerized communication networks. The idea is that sorting, adding, combining and categorizing existing knowledge can yield new knowledge. It is assumed that large-scale databases can facilitate this mode of knowledge conversion (Nonaka, 1984); Nonaka and Nishiguchi, 2001).

Systematizing ba is a place of interaction where combination takes place. This is a virtual world instead of a sharing of space and time in reality. In this ba new explicit knowledge is combined with existing information and knowledge thus generating and systematizes explicit knowledge throughout the organization. The combination of explicit knowledge is efficiently supported in collaborative environments utilizing information technology (Nonaka, 1984); Nonaka and Nishiguchi, 2001).

2.4.4 Internalization

Internalization refers to the process of embodying explicit knowledge into tacit knowledge, and this is closely related to “learning by doing.” This knowledge is internalized in the form of shared mental models or technical knowhow. When this takes place it becomes a valuable asset. This tacit knowledge accumulated at the individual level is in turn shared with others through socialization, setting off a new spiral of knowledge creation.

In order to do this, first explicit knowledge has to be embodied in action and practice. For example, training programs help the trainees to understand the organization and themselves. Second, explicit knowledge can be embodied through simulations or experiments to trigger learning by doing. New concepts or methods can thus be learned in virtual situations.

Exercising ba is the platform that supports internalization where explicit knowledge is converted to tacit knowledge. The interaction that takes place in exercising ba is on-the-site, which means that it shares time and space. Learning by continuous self-refinement through on-the-job training or peripheral and active participation is stressed in such a ba (Nonaka, 1984); Nonaka and Nishiguchi, 2001).

2.4.5 Bread making machine

Nonaka and Takeuchi (1995) base their theory in the case known as the Matsushita Home Bakery. They describe the product development of the automated bread machine developed for home use which was introduced to the Japanese market in 1987. The idea was to produce breads with the same quality as the baker master famous for his breads. The first attempts ended up with the bread machine prototype which did not satisfy the expected results regarding the quality of bread it produced. They agreed that the only way to produce same bread quality as the famous baker, was for a software developer to serve as an apprentice with the baker. The idea was to learn how to knead bread properly and later convert this know-how into design of bread making machine.

The software developer could not come up mechanical specifications, but she was able to transfer her knowledge to the engineers by using the phrase “twisting stretch” to provide an idea of kneading, or by saying “make the propeller move stronger”, or “move it faster”. Then the engineers would adjust the machine specifications. After a year of trial and error and by having the team working together they managed to design product specifications that reproduced the baker’s technique and the quality of bread.

According to Nonaka and Takeuchi (1995), the software developer learned through socialization by observing and imitating the head baker. This knowledge was later externalized into explicit knowledge, by using concepts or metaphors such as “twisting stretch” or “more slowly” or “more strongly” for expressing the movements of the kneading propeller. Even this was harder for those who had no experience with kneading therefore engineers had to spend significant amount of time at the baker to experience the touch of the dough.

Combination occurred when the “twisting stretch” concept and the technological knowledge of the engineers merged in order to produce a prototype of Home Bakery.

2.4.6 Critique of the SECI model

Regardless being considered as one of the most cited models in the knowledge management field, SECI model has been highly criticized by different authors. The critiques are mainly directed towards the externalization mode of the model, that of conversion of tacit knowledge into explicit knowledge.

Tsoukas (2002) claimed that the notion of tacit knowledge used in this model has very little in common with that of Polanyi. He further states that the tacit knowledge could not be learned through conversion into explicit knowledge. According to him, although Nonaka and Takeuchi (1995) admit that software developer's apprenticeship was necessary because "the art of kneading" could not be conveyed in other forms such as through manuals, instructions etc. they consider apprenticeship as just another way of transferring knowledge. Knowledge gained through serving as an apprentice is not considered by Nonaka and Takeuchi (1995) to be qualitatively different from knowledge acquired through reading manuals, since in both cases the content of knowledge can be articulated and formulated in form of instructions (Tsoukas, 2002).

Also Ray (2009) states that by claiming that tacit knowledge could be converted into explicit knowledge expressed in a perfect language, Nonaka reinvented a problem that Polanyi was trying to avoid. Wilson (2002) goes even further, claiming that Nonaka and Takeuchi (1995) who used Polanyi's idea of tacit knowledge have either misunderstood Polanyi, or deliberately distorted it in order to construct the well-known SECI diagram. According to him, Nonaka and Takeuchi (1995) claim that they have expanded the Polanyi's philosophical context of tacit knowledge, into a more practical direction.

Similarly Walsham (2005) argues that this distinction between tacit/explicit knowledge as well as the view of the "knowledge as object" is diametrically opposed to Polanyi's ideas.

2.5 Master/apprentice model

The master-apprentice relationship has a long history in many areas of human education dating back from the old Greek Sophists in the West and various traditional schools in the East. According to Leonard (2002) apprenticeship learning was practiced among Egyptian scribes in 2000 B.C. and there were even rules how apprenticeships should be handled included in the Code of Hammurabi in Babylon around the same period of time.

Apprenticeship is the approach used to conveying specialized knowledge to a new generation of practitioners. Through this process the apprentices are transformed to experts. It is a means of learning things that cannot be easily communicated by conventional means. Apprenticeship is used in contexts that involve implicit knowledge to be acquired through long-term observation and experience (Coy, 1989). With this approach, teachers give students practice situations before having them do more challenging work tasks on their own (Leonard, 2002). According to him sometimes it can also be supplemented by classroom instruction on the concepts of the discipline. Apprenticeship involves at least two persons, the person who possesses the knowledge and skills and the person who wishes to acquire or develop that knowledge or skills. Depending how it is structured, often the apprenticeship can involve more than two people. Apprenticeship thus consists of a social relationship (Coy, 1989). This concept is used in many fields such as craftworks, business, music academies, arts etc. According to Leonard (2002) there are other alternative terms used for apprenticeship such as: on-the-job training and direct instruction.

Busch (2008) defines apprenticeship as both the knowledge transfer process (typically by an expert or senior person) and the concurrent acquisition of knowledge (typically by a novice or junior person) within a given domain.

According to Eneroth (2008) and Baracscai et al., (2005) the core of learning is not only to replicate master's actions. The master's intention is not to show them the right action, what apprentices should imitate. The master's intention is to develop the apprentice's inner eye and the ability to perceive the different events that constitute the practical activity.

Dreyfus and Dreyfus (2005) present a five stage phenomenological model of transformation from apprentice to expert. These development stages are presented as: novice, advanced beginner, competent, proficient and expert, each including different characteristics, in terms of how knowledge is treated, how context is assessed, relevance recognition and decision making. This model of transformation is presented in the figure below.

Level	Stage	Characteristics	How know- ledge etc is treated	Recognition of relevance	How context is assessed	Decision- making
1	Novice	Rigid adherence to taught rules or plans Little situational perception No discretionary judgement	Without reference to context	None	Analytically	Rational
2	Advanced beginner	Guidelines for action based on attributes or aspects (aspects are global characteristics of situations recognisable only after some prior experience) Situational perception still limited All attributes and aspects are treated separately and given equal importance	In context			
3	Competent	Coping with crowdedness Now sees actions at least partially in terms of longer-term goals Conscious, deliberate planning Standardised and routinised procedures				
4	Proficient	Sees situations holistically rather than in terms of aspects Sees what is most important in a situation Perceives deviations from the normal pattern Decision-making less laboured Uses maxims for guidance, whose meanings vary according to the situation				
5	Expert	No longer relies on rules, guidelines or maxims Intuitive grasp of situations based on deep tacit understanding Analytic approaches used only in novel situations or when problems occur Vision of what is possible		Present	Holistically	Intuitive

Figure 2.7 Phenomenological model of transformation from apprentice to expert

According to Farnham-Diggory (1994) apprenticeship is about membership in a culture. In the master/apprentice model, masters and apprentices differ profoundly in terms of professionalism and experience. Apprentice becomes a master through the mechanism of acculturation into the world of the expert. According to him actual participation is critical for two reasons:

- majority of the knowledge that the master transmits to the apprentice is tacit, and
- the knowledge often varies with context.

Same as it can vary on structure, apprenticeship can also vary in terms of degree of formality. Coy (1989) mentions that in Japan this practice is exercised with an assumption that severe discipline reinforced by the master is the necessary basis for successful learning. In terms of discipline and power, same, Baracscai et al. (2005) claims that idea of personal freedom and asymmetrical power of masters is having an impact on the disappearance of this type of relationship in the modern world.

In the master/apprentice relations, the master is the one that possess the authority/power and the knowledge. Foucault (1980) examined the relation between power and knowledge, thus breaking the tradition of humanism that regarded these two concepts as unrelated. The latter assumed that once someone gains power he/she ceases to know, or vice-verse, that knowledge can exist only where the power relations are suspended. On the contrary Foucault (1980) claimed that there is a continuous articulation of one into another, and they imply each other. Foucault (1980) claims that power is exercised rather than possessed what Marxists argued for.

The exercise of power repeatedly creates knowledge and equally, knowledge constantly induces effects of power. It is not possible for power to be exercised without knowledge, as well as it is impossible for knowledge not to produce power. Foucault (1980) claims that university hierarchy is the most visible and the least dangerous form of this phenomenon.

Nielsen (2006) claims that apprenticeship introduces another perspective on learning, which emphasizes the learner's participation in a community of practice, moving away from a perspective in which learning is more or less inseparably connected to teaching. Similarly, Lave and Wenger (1991) drawing on Heidegger argue that our being is never alone but always with other being, and the 'being-in' of the apprentice is, not confined to an immersion in the natural environment but extends to their involvement in communities of practice.

2.6 Communities of practice

Communities of practice is not a new concept, but they have been around since ancient times. They are considered to be the first knowledge based social structures, starting back when people living in caves managed prey strategies around the fire (Wenger, 2000). Still communities of practice are everywhere and we as human beings all belong to at least one community of practice, such as family, school, work etc. Although communities of practice have a long history, the term has been coined by Lave and Wenger (1991) who describe them as groups where learning takes place through a process of Legitimate Peripheral Participation, arguing that learning must be related to practice. However according to Frade (2000), Polanyi was one of the forerunners of the concept of communities of practice, by introducing it in terms of tradition, a system of values that describes how knowledge is transferred within a social context.

Communities of practice are defined as: *"A group of people who share a concern, a set of problems or a passion about a topic and who deepen their knowledge and expertise in this area by interacting in on-going basis"* (Wegner and Snyder, 2000).

A community of practice is characterized typically has the following characteristic:

- It is a joint initiative as understood by its members that comprise it
- It represents a body of knowledge/practice
- Its function is based on the mutual agreement that binds members together
- Members are involved in particular common activities that reflect the expertise of that specific community.
- It has a sense of shared identity
- The capabilities it produces are the shared repertoire of communal resources (routines, sensibilities, artefacts, vocabulary and styles) that the members develop over time
- It cannot be managed or controlled, but cultivated (Wenger, 2000, Wenger & Snyder, 2000)

Drawing on theories of Communities of Practice, Martin *et al.* in Hildreth and Kimble (2004) claims that Communities of practice represent an interdependent process of participation and reification of knowledge, where these two concepts are inseparable, as presented in the figure below. Participation means living in the world in terms of being actively involved in social communities, whereas reification means giving concrete form to something that is abstract and this comes from manifesting the experience of the participants. Reification can take the form of tools, procedures, stories or language.

Figure 2.8 The duality of participation and reification (Wenger, 1998 as cited in Hildreth and Kimble, 2004).

There is an overall assumption that Communities of Practice facilitate the level and flow of knowledge within an organization (Wegner and Snyder, 2000, Wenger, 2000) and organizations are increasingly supporting communities of practice as part of their KM initiatives (Martin *et al.* in Hildreth and Kimble, 2004, Jashapara, 2004)

2.7 Theoretical framework

So far general concepts related to the topic of the study have been presented. This part provides a background on the previous studies that have addressed a similar problem. Specifically it aims to identify and highlight similarities, contradictions and inconsistencies in these studies, in terms of importance of the factors in tacit knowledge. This set of conditions/ factors will provide further guidance for data collection process. Assumptions for each of these factors will also be presented.

2.7.1 Trust

This part elaborates the notion of trust and its role in working with tacit knowledge. There is an extensive literature on trust that has taken different approaches on defining trust. Thus, trust is a multifaceted notion that is defined by Lucas (2005) as the willingness of one party to be vulnerable to the actions of another party. Literature focuses on different kinds of trust types such as interpersonal trust, institutional trust, system trust (references). However, this study will delimit its scope by taking into account only interpersonal trust that according to Bachmann (2003) is the concept that comes closest to the ordinary language connotations of trust.

From a more general perspective Luhmann (1979) argues that trust is a basic prerequisite of social life and presence of trust provides more possibilities for experience and action and is an effective form of complexity reduction. To him familiarity is a precondition for trust, in a sense that trust is possible only in a familiar world; it needs history as a reliable background. Trust presupposes prediction based on former knowledge and is only possible with a reliable background (Luhmann, 1979).

From an organizational perspective in terms of trust development, Bachmann (2003) claims that trust is developed through frequent face-to-face contacts between individual actors. In an organizational sense, proximity of individuals is a prerequisite for developing trust, and is hard establishing it in contexts that lack personal contacts or where they are rare. The same view is only partially shared by Mayer et al. (1995) and Shapiro (1987) as cited in Lucas (2005), who consider trust as a function of access to information through direct or indirect interactions.

While many studies have focused on the role of trust in organizational contexts in general, only few studies have been identified that have investigated its role and relations to tacit knowledge. Moving from a general perspective to the role of trust in dealing with tacit knowledge, specifically in a master apprentice relationship, Polanyi (1966) argues that trust as an important factor in dealing with tacit knowledge. *“You follow your master because you trust his manner of doing things even when you cannot analyse and account in detail for its effectiveness”* (Polanyi, 1962). The apprentices surrender to the authority of the master and by watching him/her the apprentice captures the rules, even those that are not known to the master himself. The transmission of intellectual artefacts is carried out through a process of communication, which can be successful only in the presence of exceptional degree of confidence, the apprentice in the master, the student in the teacher, and popular audiences in distinguished speakers or famous writers (Polanyi, 1958).

Haldin-Herrgard (2000) also remarks that trust is important in tacit knowledge sharing. However he expands more by claiming that value and trust are indivisible. He argues that if you trust someone to be knowledgeable, you value their expertise and opinion, thus it is easier to capture the knowledge. Fernie *et al* (2003) through the concept of “strong ties” (socialized), which include high-trust, lengthy time frame (above mentioned factor) and close relationships, argues that are ideal for sharing tacit knowledge. However, they also claim that the knowledge created and shared by strong ties groups is unlikely to be innovative. Lucas (2005) in his empirical study investigated the role of trust and concluded that the presence of trust enhances the likelihood of knowledge, specifically by stating that trusting a knowledge source increases the prospect of knowledge transfer.

Stephenson (2004) perceives trust as a catalyst for the creation of tacit knowledge. *“Trust is the glue that makes knowledge whole by holding human networks together”* (Stephenson, 2004). Referring specifically to the master apprenticeship relations or mentoring as she names it, trust is the factor that makes this relationship tangible.

Overall literature reviewed acknowledges that trust is an important factor in environments that involve a great deal of working with tacit knowledge. Considering that the majority of the above mentioned studies are not empirically based, at least not in the role of trust in dealing with tacit knowledge, it is important and at the same time interesting to be investigated in organizations that work with tacit knowledge. Based on the above, some assumptions derive that will be further investigated by analyzing the empirical data.

- Trusting the master will have a positive impact on having an effective working environment with tacit knowledge.

2.7.2 Time

Acquiring tacit knowledge is a long-term process. In the case of master/apprentice tradition it requires apprentices spending a prolonged time with their masters. Polanyi (1958) by taking the example of connoisseurship, skills, medical diagnostician argues that in order to acquire this kind of knowledge one should go through a long course of experience under the guidance of a master. Similarly, Olsson and Gullberg (1988) share the same perspective when investigating the nursing education and role modeling for nursing which according to them is mostly transmitted through tacit knowledge. They claim that tacit knowledge is typically acquired through a long tradition and experience. This view is also shared by Sveiby (1997) as cited in Buch (2008), who moreover adds that the concept of time varies from one situation to another.

Wagner and Sternberg (1985) as cited in Busch (2008) have a slightly different viewpoint, by claiming that tacit knowledge is not automatically acquired with years of experience, but it is really what one learnt from experience that separates from people who are less capable of making use of their tacit resources of knowledge.

Yang and Farn (2009) also confirms the role of time, by claiming that internalization of this form of knowledge requires a long time both for individual and organizational forms of knowledge. To him not only experience is a long process but also reflecting upon these experiences is time consuming but a necessary aspect to develop tacitness in one's work.

This factor is considered to be a drawback by Haldin-Herrgard (2000). This is due to the turbulent business world and the need for fast responses, which in turn puts more pressures on employees. Also only few organizations provide enough time for its employees to learn tacit knowledge.

Based on the above literature I will add assumption that could also be considered as prejudices that will be shaped or changed during the data analysis.

- Spending more time with a master will have a positive impact on having an effective working environment with tacit knowledge

2.7.3 Verbal communication

The literature reviewed provides different perspectives on the role of the language and its importance in sharing tacit knowledge. These viewpoints vary between some who did not make explicit their use of term language, in contrast to others who focus on a specific aspect of language such as: common language, metaphors, stories, analogies. Thus, this part will divide literature by considering the use of everyday language, common/joint language and metaphors as facilitators in tacit knowledge sharing.

- **Everyday language**

The most cited definition of tacit knowledge is that of Polanyi (1966) “*we can know more than we could tell*”, encapsulating the non-verbal aspect of tacit knowledge. By taking the example of language itself as an art, Polanyi (1966) argues that language is carried on by tacit judgments and the practice of unspecifiable skills. Children learn to speak by imitating and observing their parents or guardians. The tacit coefficients of speech are transmitted by inarticulate communications,

passing from an authoritative person to a trusting pupil. According to Polanyi (1962) with spoken communication, no knowledge is transmitted, just information. “*Spoken communication is the successful application by two persons of the linguistic knowledge and skill acquired by such apprenticeship, one person wishing to transmit, the other to receive, information*”. According to him a real communication will take place only if assumptions of authority and trust are justified.

Nonaka (1984) emphasizes the importance of face to face interactions for tacit knowledge sharing, however states that tacit knowledge can be acquired without language as a mediator.

Gherardi (2006) argues that language plays a central role that enable apprentices to make sense of situations and contexts. She makes a distinction between “*conversation in practice*” and “*conversation on practice*”, which constitute different discursive practices. The latter is considered by Gherardi (2006) to be a key factor in knowledge circulation and includes talk in interaction, such as instructions given to the apprentice that are useful to code and transform events into “memorable events”. Conversation on practice on the other hand is when the practice is the object of talk. This is usually associated with stories, and is more “purposeless” conversation for the sake of socialization. This form of conversation according to Gherardi (2006) enriches the knowledge sharing within the group or community of practice. Generally Gherardi (2006) argues that both types of conversations help apprentices to discover the tacit map of the distribution of power/knowledge and to realize who knows what, and who can be asked what in which circumstance. “*Not only does the novice acquire knowledge of what is said, s/he also comes to know through what is silenced, and what is silenced by whom and why*” (Gherardi, 2006).

From the above an assumption will be that

- Language is not an important factor in environment that work with tacit knowledge
- **Storytelling**

According to Sole and Wilson (2002) storytelling is an old means of passing on wisdom and culture. More specifically Snowden (2005) considers storytelling as a natural skill that has kept societies together for centuries. The way people understand and explain their experiences, the social world they are part of is not as concepts, but as stories organized in narrative form (Nielsen and Madsen, 2006).

From an organizational perspective, Swap *et al.* (2001) define organizational story as a “*detailed narrative of past management actions, employee interactions, or other intra- or extra-organizational events that are communicated informally within the organization*”. They argue that stories usually originate from within the organization and will therefore reflect organizational norms, values, and culture. Nonetheless they are not only related to the organization itself but also derived from outside organizations, such as experts’ past experiences, norms and values that are common to many organizations.

Whether individually or collectively shared, stories enable people to make sense of the past and understand possible futures. Recently organizations have put an increased attention to the role and value of the storytelling. This is mainly due to the increased recognition of the value of knowledge and the fact that knowledge cannot be fully articulated. (Sole and Wilson, 2002).

Stories can be a very powerful way to present and convey complex, multi-dimensional ideas. If stories are well-designed and told properly they can convey both explicit and tacit knowledge, both the core and the context (Snowden, 2000).

According to Snowden (2005) the strength of a storytelling relies on its unpublished nature, since it allows to self-propagate as each storyteller brings his/her own unique way. An effective story will

spread rapidly throughout organization, and still keep its core meaning. Storytelling is an effective and powerful technique of knowledge disclosure. Similarly, Nielsen and Madsen (2006) argue that storytelling is a common experience, but the reception is individual and each listener creates his or hers individual story.

Storytelling is used in many fields such as therapeutic interventions, nursing, business, education, psychology etc to communicate embedded knowledge, resolve conflicts, and simulate problem solving (Sole and Wilson, 2002).

Besides, the role of storytelling has been investigated also in the field of Knowledge Management, and is considered it as one of its tools utilized to transfer tacit knowledge. For example in this context Snowden (2004) considers storytelling as an old skill in a new context. Lelic (2001) claims that storytelling can serve as a powerful tool to the Knowledge Management practitioner to capture knowledge. However his stand is that by sharing and discussing stories is a powerful way of converting tacit knowledge to explicit knowledge, and an effective method for quickly assimilating new learning. Nissen (2006) on the other hand claims that flows associated with storytelling are not completely tacit but neither are they completely explicit.

Although all the above scholars claim the importance of storytelling in dealing with tacit knowledge, there were no obvious indications on how and whether tacit knowledge can be conveyed through storytelling. From the above the assumption would be that:

- Storytelling is an important factor in environment that work with tacit knowledge

- **Metaphors**

Johnson and Lackoff (1980) argue that the main function of metaphor is understanding and experiencing one kind of thing in terms of another. The first step in the analysis of metaphoric language is identifying when a word or phrase is being used metaphorically, which means if (a) it can be understood beyond the literal meaning in the context; (b) the literal meaning stems from a source domain of sensory or cultural experience; and (c) this literal meaning is transferred to the abstract target area (Schmitt 2005).

Johnson and Lackoff (1980) argue that metaphors are used and possible because human thought processes are largely metaphorical.

In terms of relations between metaphors and tacit knowledge, Martin (1982) as cited in Ambrosini and Bowman (2001) argues that metaphors can serve as a means to transmit and capture tacit knowledge. Metaphors are useful in sharing tacit knowledge because metaphorical language is argued '*to be employed to give to tacit knowledge voice*' (Munby, 1986). The role of metaphor and analogy is reinforced when no explicit language is available (Ambrosini and Bowman, 2001) or language often is not powerful enough to capture the knowledge that one wishes to transmit (Guzman & Wilson, 2005 as cited in Busch 2002).

Åberg (2010) explaining how music conservatory teachers convey their knowledge, which is based in a master/apprentice relations, argues that teachers have a very refined way of using metaphors to convey the way something feels instead of describing in concrete terms the way it is performed. He claims that a successful metaphor can convey a whole in a way that is difficult to achieve by other means. However in order to convey a meaning, metaphors can reach their aim only if persons share similar field of concept-related associations. Åberg (2010) further argues that it is always a risk that if a metaphor fails to succeed, it will become an obstacle to further communication.

Also Busch (2008) states that in case when words themselves are not adequate to transfer the knowledge, the use of metaphors and analogies can overcome this problem.

Nonaka (1984); Nonaka and Takeuchi (1995) acknowledge the importance of metaphors, however their viewpoint is that metaphors are used to convert tacit knowledge into explicit knowledge. They perceive metaphors as a way of intuitively understanding one thing by imagining another thing symbolically or as non-analytical methods for creating radical concepts. It is neither analysis nor synthesis of common attributes of associated things. Donellon, Gray and Bougon (1986) argue that metaphors create original interpretation of experience by asking the listener to see one thing in terms of something else and create new ways of experiencing reality.

In relations to the metaphors the assumption is that:

- Metaphors are an important factor in in environment that work with tacit knowledge

2.7.4 Emotions

Gieser (2008) in his phenomenological study elaborates *emotions* as another factor that affect the learning process. Based on Heidegger's view that people always have some mood, which is not a psychic, inner state, but it has a context of involvements, Gieser (2008) claims that emotions are integral to the learning process in the context of novice-teacher relationships. These emotions vary between novices and masters. Apprentices often have feelings of shame, insecurity, and nervousness, fear of failure, or pride and happiness. On the other hand masters are often known for their displayed feelings of displeasure, sometimes even hostility, anger, or pride and happiness. Thus the apprentice learns to 'read' the bodily changes induced by an emotion of his or her teacher and learns to link this emotional response to a particular environmental stimulus by repeated practice.

Gherardi (2006) from a learning perspective acknowledges the role of emotions, and their presence in all form of interactions. She claims that when learning takes through participation in practice the body and the mind, feelings and emotions, understanding and knowing are interrelated. Also Fineman (2003) as cited in Gherardi (2006) considers emotions at the heart of the building trust and competencies. Also from a similar perspective, Salzberger-Wittenberg et al.(1983) agrees that since any form of learning involves uncertain results and goals, as a result all learning invariably involves emotions. Based on this derives the following assumption:

- Emotions are an integral factor in environment that work with tacit knowledge

2.7.5 Cultural homogeneity of the team

Nowadays it is has become a trend to say that we are all living in a "global village", however as Hofstede *et al.*(2002) puts it our global village has many disparate quarters. Culture is a wide notion and there is no universally accepted notion. Hofstede (1991) in whom the majority of cultural studies draws upon, defines culture as '*the collective programming of the mind that distinguishes the members of one category of people from those of another*'. Moreover this pattern of thinking, feeling and acting that characterizes culture is learned throughout one's life. Hofstede (1991) argues that behavior of a person in a workplace is determined by: national culture, occupational culture, and organizational culture. Nonetheless this study will delimit itself by taking into account the national culture only.

National culture is the collective mindset that distinguishes people of one nation from another. This type of culture is based primarily on differences in values which are learned in early childhood from the family. These values are strong beliefs which are unlikely to change throughout the person's life (Hofstede, 1991). Culture only manifests itself through social action that always takes place in a changing context.

There is an extensive literature that has investigated the role of culture in organizational context. Nonaka and Takeuchi (1995) emphasizes the differences between western (usually meaning Anglo-American) and eastern (Japanese) experience, when discussing their model of knowledge conversion. Similarly a vast majority of KM literature acknowledges cultural differences with regard to the impact they have on Knowledge Management initiatives.

More specifically in relation to tacit knowledge, Busch (2008) claims that cultural composition of the team has an impact on the tacit knowledge transfer. Camelo-Ordaz et al (2005) as cited in Busch (2008) argue that diverse teams can have a negative impact in the transfer of tacit knowledge. Whereas Malik (2004) believes that heterogeneity in groups and occupational background can actually increase knowledge creation and transfer. Also Walsham (2001) from a more cultural perspective claims that cultural differences should be taken seriously, given that cross-cultural working involves the interaction of people whose tacit knowledge has been developed in different ways. As an example of the role of culture and relation to tacit knowledge, is one provided by Leonard and Sensiper (1998). According to them it is due to cultural differences why Japanese car designers detected that the shape and headlights were the reasons why car was not selling well, and not their US counterparts.

This framework compiled from the literature review is presented in the figure below. The factors on the left such as time and trust are unidirectional as literature suggested. For working in an environment with tacit knowledge apprentices should trust their masters and should spend significant amount of time with the master. The factors on the right side of the figure are bidirectional. Emotions of both masters and apprentices are related to working with tacit knowledge. Verbal communication that is comprised of metaphors, storytelling and everyday language should take part between both parties. Similar cultural background facilitates working with tacit knowledge.

Figure 2.9 Theoretical framework resulting from the literature review

3. Methodology

This section provides a detailed overview and rationale of the scientific method chosen based on ontological and epistemological beliefs. Initially the philosophical tradition that guided the research is discussed, followed by the actual strategy of inquiry chosen, that best reflects the philosophical tradition. Furthermore, the process of data collection and data analysis is presented and discussed.

3.1 Philosophical tradition of the research

Every research endeavor is guided by basic assumptions about the nature of reality (ontology), nature of knowledge and how such knowledge is acquired (epistemology), and the relationship between knowledge and the empirical world (methodology) that shape the nature and direction of the research (Orlikowski and Baroudi, 1991; Kecmanovic, 2005; Creswell, 2009).

This research is conducted in the hermeneutical tradition. Hermeneutics is defined as the art, theory or philosophy of the interpretation of meaning (Gadamer, 1976). In terms of ontology this study relates to Berger and Luckman (1991) who consider reality as socially constructed by individuals or groups holding the constructions. In terms of epistemology, this research holds that the researcher and the object of investigation are interactively linked and that the findings are created as the investigation proceeds (Guba and Lincoln, 1994).

The underlying principle on adopting hermeneutics in this research is that the aim is to interpret the meaning of participants' views, opinions and actions.

Hermeneutics is primarily concerned with the meaning of a text or text-analogue. Thus the field of application of hermeneutics is very broad, since a text-analogue is anything that can be treated as a text, such as any human artifact, action, organization or culture, conversations and even non-verbal communications such as gestures or facial expressions (Myers, 2004). Hermeneutics was initially applied to the biblical and other sacred scriptures, and was later expanded by social philosophers to be applied not only to written texts, but also to the interpretation of speech actions and even culture (Myers, 2004). Hermeneutics can be treated as both an underlying philosophy and a specific mode of analysis (Bleicher, 1980 as cited in Myers, 2004). As a philosophical approach to human understanding, it provides the philosophical grounding for interpretivism (Klein and Myers, 1999; Myers, 2004).

There are different schools of thoughts of hermeneutics varying between those who place the meaning within the text and others who consider meaning as grounded in the process of understanding (Winograd and Flores, 1986). The "pure" hermeneutics (Myers, 2004), conservative (Butler, 1998) or objectivist school considers that the meaning of the text exist independently of the act of interpretation, and the interpreter should disclose the meaning of the text as intended by the authors of the text, by freeing him/herself from all prejudices (Winograd and Flores, 1986; Butler, 1998). On the contrary, the pragmatic/constructivist or subjective school believes that the dialogue between the text, not the author of the text and the interpreter is crucial for understanding and creation of new knowledge. Critical hermeneutics considers that the interpretive act is one that can never be closed as there is always a possible alternative interpretation (Winograd and Flores, 1986; Myers, 2004)

This research will predominantly be based on the hermeneutic philosophy of Gadamer. According to Gadamer (1976) hermeneutics applies to those situations in which the meaning is difficult to grasp therefore it requires interpretive efforts. There are a few interrelated concepts crucial to

Gadamer's hermeneutic, that will be briefly described here, as well as applied in this study. These concepts include: prejudice, fusion of horizons, circularity or hermeneutic circle.

Prejudice (prior-conception, pre-judgment) is the core concept of hermeneutics that is widely based on Heidegger's concept of fore-meaning. In order to understand a meaning of the text some prior knowledge is required of what the text is about. This establishes the starting point of understanding. One cannot enter in the act of interpretation objectively, thus according to Gadamer (1976) there are no prejudiceless or presuppositionless interpretation. Prejudice has been highly criticized by Habermas, who from a critical standpoint compares them to misunderstandings that need to be overcome, because they hinder the emancipation of the individual from social misunderstandings (Palmer, 2007).

Another concept used and developed by Gadamer (1976) is the fusion of horizons. In a process of interpretation, interpreter exists and thinks consciously within a certain horizon or familiar world shaped by past experience, frame of reference. When encountered with meaning to understand or the alien with Gadamer's word, the interpreter should try to bridge his/her horizon and the other horizon of the text to be interpreted, by thus merging them. Hermeneutic serves as a bridge connecting the present and the past, or as Gadamer (1976) puts it "*bringing of something out of one world and into another, out of the world of the gods and into that of humans*". This fusion of horizons is called effective history by Gadamer (1976). So in other words our prejudices merge with the horizon provided by the text, and this merger creates new knowledge and understanding.

Hermeneutic circle is a fundamental principle of hermeneutics. The idea of the hermeneutic circle suggests that we come to understand a complex whole from preconceptions about the meanings of its parts and their interrelationships (Klein and Myers, 1999). In other words, when engaged in the process of interpreting a meaning, the interpreter once encountered with parts projects the whole text that contains these parts. The movement of understanding is constantly from the whole to the part and back to the whole. According to Debesay et al (2007) the interrelationship between wholes and parts in a hermeneutic circle does not represent a vicious circle; on the contrary, one never remains in the same place but constantly acquires new knowledge.

3.2 Type of research

There are generally three types of research approaches: quantitative, qualitative and mixed methods (Yin, 2007; Creswell, 2009). Considering the intention of this study, conducting a qualitative approach seemed the most appropriate approach for this study. Qualitative research is a naturalistic interpretive approach concerned with understanding the meaning that people or groups attribute to a social or human problem (Creswell, 2009; Denzin and Lincoln, 2000). The argument on adopting qualitative approach is first due to the nature of the research problem itself. The aim of this study is to identify the factors that facilitate effective working in an environment that involves a large deal of tacit knowledge. This best can be done by observing participants in their natural setting, and by understanding the participants' opinions regarding the problem. Since a qualitative research is a situated activity (Denzin and Lincoln, 2000) it enables the researcher to explore participants behaviours in the natural social setting.

3.3 Research setting

This study has been conducted in the glass blowing field, given that this kind of industry has preserved the traditional master/apprentice relation. The data has been collected from two glass blowing facilities: Pukeberg and Transjö Hytta. Both sites are located in the so called Glasriket or Kingdom of Crystal, where hand-blown glass has been made since 1742. This region which is

comprised of four municipalities: Emmaboda, Lessebo, Nybro and Uppvidinge famous for its authentic glass blowing tradition. This region provided an optimal area to exercise this activity due to its large wood areas, lakes and rivers, which provided woods for furnaces, sand for glass and water. The demand for glass products initially included high jars of different sizes for pharmacies, milk bottles, and window glass.

However many glassblowing techniques have been developed through experimentation in the Småland blowing rooms (Glasriket, 2010; 2011)

3.3.1 Transjö Hytta

Transjö Hytta is a small glass making workshop located in Transjö – a small village in the forests of the "Glass Kingdom". It was established in 1982 by two master glassmakers from the famous Kosta Boda factory, who back then worked and collaborated with well-known designers in so called "Mid-Century Modernism". Transjö Hytta is particularly well known for making complex and unusual artifacts. The work of the two masters has been exhibited internationally in many museum and galleries, and combines their extensive technical knowledge with their equally strong connection to the Scandinavian aesthetic.

For around 20 years, the workshop accepts students from all around the world to serve as apprentices. This provides students with opportunities to capture the knowledge and techniques of the masters (Transjö Hytta, 2006).

Facilities of Transjö Hytta include the glass blowing room where masters and apprentices do their works, and the gallery where they exhibit and sell their products. Transjö Hytta is comprised of four people in total, two masters and two apprentices. Both apprentices have been there for almost 4 years. They have some established rather informal routines, where four days a week masters blow glass and apprentices observe and help them, and one day they switch places, apprentices do the work with the close supervision of masters. One apprentice is always with one of the masters, however they switch every day. The reason is that the masters want apprentices to observe both of them and capture the knowledge and techniques of both. The team blows glass regularly throughout the year, except summer where they focus on the gallery to sell their products and one of the masters in teaching especially USA and Japan.

3.3.2 Pukeberg

Pukeberg Glassworks is one of the Sweden's oldest glass-works that has been established in 1871 by a master glass blower and two associates, who have had previous experience in Kosta, Transjö and Boda. At this period of time it was pretty common for glass blowers to open their workshops. Afterwards they started hiring people, who had assigned role in making glass products. The master had the highest rank and was the most authoritative person. At this period apprentices who were man started at the very early age, 8 or 9. The workshop was particularly famous for the production of oil lamps. However the production of lamps ended in 1977. Pukeberg was the only glassworks in Sweden that had semiautomatic manufacturing of products such as globe lamps. Pukeberg is considered to be one of the most well-preserved glassworks, which enables people to experience how glassworks facilities looked in the beginning of previous century. The blowing room at Pukeberg is directly connected to the shop and is open to visitors. Currently the glass blowing room is not functional on daily basis. In order to keep up with the tradition, Linnaeus University's design programme is located at Pukeberg, and several artists have their studios in the area (Glasriket, 2010)

Several workshops take place every year in the glass blowing room in Pukeberg, especially dedicated to students of the Linnaeus University design programme. This year the workshop was held during February, where basically observations for the study took place.

3.4 Participants of the research

All persons involved in the two research settings were subject of observations. However informal interviews were not conducted with all of them. Below are presented only the participants with whom I was engaged in discussions and informal interviews.

JE – Is a glass blowing master who has 55 years of experience in the field of glass blowing. He is considered to be the youngest person who became a Master of the Art Glass team. Since the early 70s, JE is involved in teaching, training and consulting abroad. He was the first European glass master to demonstrate glassblowing in the United States.

SC- A glass blowing master who began his career in glass in 1972 at the Kosta Boda factory. In 1976 along with JE created the first independent glass workshop. He has also been involved in providing glassblowing courses internationally, from Japan to the United States.

DX – Is a Danish apprentice at Transjö Hytta who has been there for almost four years. He also had a five years previous experience in glass blowing, two years in school and three years in factory.

LY- Doing his apprenticeship for four years at Transjö Hytta. He started his apprenticeship after finishing the two year school in Kosta.

JG – A Japanese glass blowing apprentice, who recently came to Sweden to get some training and experience the Swedish way of glass blowing. JG was for a day in Transjö Hytta observing the masters' way of glass blowing.

GB – Is a master that belongs to a third generation of glass blowing. He began glass blowing at the age of fourteen. His works include different pieces such as colorful bowls, vases and drinking glasses to the detailed figures and animals.

3.5 Data collection methods

To conduct the study, data has been collected from multiple sources such as: literature studies, documents, observations and interviews.

3.5.1 Literature studies

Initially a thorough literature review was conducted in order to gain deeper insights on the subject of the research. This part played a crucial role on shaping the focus of the study. Furthermore, literature study provided a frame of reference that influenced the empirical stage thus serving as a foundation for observations and interviews. It is important to note that this part has been revisited numerous times during several stages of the study, especially during the data collection process.

3.5.2 Documents

Besides, several documents were investigated during the process. The documents included two books and a DVD provided by the Glafo Research Institute. Also during observations in Pukeberg, an instruction manual that was distributed to the students was analyzed. Documents provided basic information regarding the glass making field, introduction to different terms, tools, setting and methods that they use, which were initially unfamiliar to me. Also the instruction guide helped to shed light on how much knowledge is basically codified and used by students who had the role of apprentices.

3.5.3 Participant observations

Participant observations were conducted in two glass making sites. Participant observation as a method of data collection enables the researcher to take part in everyday activities of the social context under study in order to study an aspect of that life through the observation of events in their natural contexts (Given, 2008). The purpose of participant observation is to gain a deep understanding of a particular topic or situation through the meanings ascribed to it by the individuals who live and experience it.

In total five days of observations took place within a time span of 3 months. This time frame proved to be very useful, because it allowed time for reflection, and conduct analysis simultaneously, and revisit theories. First day of observation took place in Pukeberg on February 10, 2011, from 9:00-14:00. The participants during that day were eight students of the Linnæus University School of Design, and one glass blowing master. The students were in an eight day workshop, organized by their school. The purpose of the workshop was to enable students with a real time glass blowing and get “hands on glass” and get a real feeling of the tradition.

Observations in Pukeberg were captured by making extensive notes during the observations. These notes included the number of participants, their previous experience, the communication between master and apprentices, non-verbal aspects of communication, the physical layout of the setting.

Participant observations continued in another setting, Transjö Hytta. In total three days observations took place. First observations were conducted on April, 06, 2011 from 10:00 – 15:00. During this day only one master and one apprentice were blowing glass, thus making them the focus of the observations for that day.

Second observations took place on April, 28, 2011 from 8:00-16:00. Four participants were present, two masters working along two apprentices. These observations differed from first ones in terms of number of participants thus providing insights on how they work as a bigger team.

Third observations took place on May, 05, 2011 from 10:00-15:00. Also this day there were four of participants present. Nonetheless in the afternoon they switched places, apprentices were blowing glass and masters were observing and assisting them.

All three participant observations that took place on Transjö Hytta were taped using a video recorder. Besides the recording, notes were also taken on issues that came up during the observations, that I felt needs to be addressed. Video camera was used in order to provide more contextual data, on the way how participants interacted, the way they were engaged in their activities, as well as capture the non-verbal aspects, which might very easily be omitted during the real time observations. As an advantageous and rather time consuming approach, video recordings provided the possibility to revisit them frequently when needed, and even discover few things that had been omitted on the setting or in previous viewings. Due to the constant movement of the

participants and in order to avoid intrusion I did not use a tripod for the camera. As a result recordings were stopped when I took notes and restarted again. Since a small handy camera was used, it allowed only 90 minutes of recordings. After that I had to copy the videos into computer and start new recordings. First day of observations was easier to handle because that day only one master and one apprentice blew glass. The next two other days were somewhat more complicated because with the camera I could capture only one team (two people) working. In this situation I was focusing the camera on one team while watching the others, and shifting the camera and the focus in order to be able to capture four participants. Due to these reasons I had a numerous and often small video clips. However this was not problematic and in a way was useful when dealing with transcriptions. My initial intention was to focus entirely on the video recordings, but later chose to have a minimal interaction with the camera, and focus instead on observing the participants, since this provided more real time information.

When transcribing videos I checked some video analysis software such as Transana, Atlas Ti, but none of them was free, therefore they were not used. The conversations done in English and some non-verbal aspects were transcribed by using Word after each observation. The transcription of the interactions between the participants that were in Swedish language were done at a later stage by a Swedish speaking person into English.

The observations covered some aspects such as:

- Number of participants on each session
- Usual routines of organization
- The way participants work
- What they use for performing their tasks
- Behavior of the participants
- Level of communication, how often they interact with each other
- Ways of interaction, how they interact
- Are interactions more work related or for socialization sake
- Do they interact more with their peers or their masters
- What form of verbal communication is more present
- Emotions where possible
- How emotional aspect specifically mood (happiness, anger) had an impact on the others and the working environment in general

3.5.4 Informal interviews

Since participants opinions, feelings and beliefs could not be captured by just video recording them in the natural setting, informal and semi-structured interviews were also conducted. They proved to be an important and fruitful data collection method, in getting insights on participants' opinions and experience. Interviews were unstructured, and conducted in a form of informal conversations and discussions, during the time spent with participants.

Informal interviews in form of discussion and conversations were an important and fruitful data collection method, in getting insights on participants' opinions and experience. They were conducted at the same time as observations during the time spent with participants.

These types of informal interviews were conducted in both research settings with both masters and apprentices. The majority of informal interviews were recorded, few in a video camera and some in audio recorder. The interviews were conducted in a group as well as individually. During the

interviews camera was not focused on participants, because my intention was to have a natural and relaxed environment for conversations. I believed that focusing on the camera rather than participants, would ruin the conversation flow, distract the participants and make them uncomfortable. Audio recorder was also used during the last two meetings in TransjoHyttä. The reason for using audio recorder is that it was more suitable and handier than camera to capture the audio conversations since it could be placed next to participants. The need for audio recording emerged after viewing video recordings of the first observations where I experienced that it was a lot of noise caused by the glass furnaces and sometimes it required a lot of efforts to listen to some parts of conversations.

In the first day of observations in both settings, the discussions had a rather general nature. They would revolve around the experience of participants, their backgrounds, the setting, the structure, their way of working and other general issues. In later stages, informal interviews were more focused on the factors provided in the theoretical framework. Participants provided their own perspectives on each of the factor and also provided new insights on what they considered as important during their learning process. In total from both settings, informal interviews were conducted with six people, three of them masters and three apprentices.

3.5.5 Semi-structured interview

Because observations in Pukeberg took place in February, while the theoretical framework was still in progress, I believed that some issues might have not been addressed during informal conversations. For this reason a semi-structured e-mail interview was conducted with a master in Pukeberg, as well as an apprentice, who participated in the workshop. From the two emails sent, I did get a feedback from the master only. The interview questions derived from the theoretical framework (see Appendix B). It is important to mention that although questions were formulated in the simplest form e-mail interview is not the best choice. The e-mail interview included nr. open ended questions.

3.6 Data analysis

As mentioned previously, hermeneutics is used as the philosophical underpinning that guided this research. Nevertheless, this research will adopt hermeneutics as a mode of analysis, as well. For analytic purposes, hermeneutics provides means to understand textual data, by attempting to disclose the meaning of the text (Butler, 1998; Myers & Avison, 2002; Cole & Avison, 2007). Data analysis process was informed by the use of hermeneutic circle. Initially all data such as field notes, videos, interviews has been organized by transcribing them in a form of text. The data was read and examined several times in order to have an initial understanding. No coding of data was used, but the factors identified from the literature review served as codes for data analysis.

In the figure below I have presented how hermeneutics was applied in this study.

Figure 3-1 Application of hermeneutics (inspired by Butler, 1998)

3.7 Ethical considerations

To address some potential ethical issues that might arise, this research has employed several measures in order to protect the participants and the research setting.

Initially the purpose of the research and data collection procedures has been explained to the participants. Participants have given their consent and agreed upon participation before engaging in the research. Also they were informed that they could withdraw from participation at any time. Considering that direct observations took place, participants were ensured that no disruption of the physical setting and intrusion of the participants' activities will take place.

Participants were also assured that all data collected will be used for academic purpose only. Participants in Transjö Hytta were asked in advance for permission to use the video camera, and they were reassured that videos will be used for the thesis purpose only. Furthermore the confidentiality of participants was guaranteed. They were offered the possibility to check the transcripts of data collection as well as a report including the results and outcomes of the research.

3.8 Trustworthiness of the study

According to Lincoln and Guba (1985) traditionally the trustworthiness criteria for a research have been internal validity, external validity, reliability and objectivity. In interpretive research the concepts of validity and reliability cannot be addressed same as in positivist studies (Shenton, 2004; Given, 2008). Regardless from the critiques from the positivist schools, qualitative researchers have come up with measures that address the issues of validity and reliability, by using alternative terminology to distance themselves from the positivist paradigm. Trustworthiness refers to the degree how the researcher can convince the audience that the findings are worthy (Lincoln and Guba, 1985).

These alternative terms include: *transferability*, *credibility*, *dependability*, and *confirmability*. They are presented below in a tabular form. Basically according to Given (2008) the trustworthiness can be thought of as the ways in which qualitative researchers ensure that transferability, credibility, dependability, and confirmability are evident in their research.

Naturalist	Positivist
<i>Credibility</i> Refers to the level of harmony between the participants' expressions and the researcher's interpretations of them.	<i>Internal validity</i> A study possesses internal validity if the researchers have successfully measured what they sought to measure.
<i>Transferability</i> Refers to the degree to which the results of the research can be transferred to other contexts or settings	<i>External validity/generalisability</i> Concerns that the results of a study can be applied across all environments related to the context being studied.
<i>Dependability</i> The researcher lays out his/ her procedure and research instruments in such a way that others can attempt to collect data in similar conditions, and a similar explanation for the phenomenon should be found	<i>Reliability</i> The extent to which multiple researchers arrive at similar results when they engage in the same study using identical procedures.
<i>Confirmability</i> Refers to the need to ensure that the interpretations and findings match the data and no claims are made that cannot be supported by the data	<i>Objectivity</i> Refers to the extent to which a research is distorted by the biases of researchers.

Table 3.1 Positivist versus naturalistic trustworthiness criteria

In order to ensure the trustworthiness of the study, several safeguards have been taken into account. There are several strategies suggested by Lincoln and Guba (1985); Given (2008) and Shenton (2004) that this study has compiled and employed in order to assure credibility, such as:

- **Triangulation** of data sources and sites. The data has been collected from various sources such as observations, interviews and documents. Also a site triangulation was conducted having observations in two settings, as well as interviews with participants in both locations.

This in turn could potentially reduce the risk of having the effect of particular local factors peculiar to one institution as mentioned by Shenton (2004).

- ***Tactics to help ensure honesty in informants*** when contributing data. This part is discussed below when ethical issues are presented. According to Shenton (2004) it concerns involving participants who were willing to participate in the research.
- ***Frequent debriefing sessions*** – Since the beginning of the study, regular meetings between the researcher and the supervisor took place. Also there were several peer briefing sessions both formal during seminars and informal during several stages of this study.
- ***Member checking-*** Transcripts were not sent to participants for checking, however my understandings that emerged during observations and interviews as well as after transcribing were brought up again with participants, as a way of checking.
- ***Thick description of the phenomenon under study.*** This research attempted to provide as much as possible information about the situations and the context in order to enable readers to grasp the phenomenon.
- ***Examination of previous research findings*** refers to assessing the degree to which the study's results are congruent with those of past studies. Previous related studies have been thoroughly examined and presented in the literature review section of the study. These studies basically served to build the theoretical framework of the study.

Transferability of the study can be increased by focusing on was assured by using the following two approaches as suggested by Given (2008).

- ***Thick description.*** The study provides a detailed description of the research setting, as well as participants of the study, thus enabling the reader to grasp the full picture. Moreover the research design is explained so one can make their own determinations about transferability.
- ***Selection of participant.*** Participants of this study present relevant members that are closely related to the research setting.

To assure **confirmability** the following measures are undertaken:

- ***Transparent research process*** which explains in detail the data collection methods
- ***Audit trail*** has not been applied; however the interpretations of the researcher will potentially be double checked with participants.

Dependability of the study is assured by:

- Checking transcripts any potential mistake
- The study provides a detailed description of the research design, the process of data collection as well as its implementation

4. Analysis and results

This section provides the analysis of the empirical data collected from the two research settings. Hermeneutics is used as a data analysis method. This chapter concludes with the presentation of the results derived from the analysis.

4.1 Trust

Polanyi (1958, 1966), Haldin-Herrgard (2000), Stephenson (2004) acknowledge the importance of trust as a part of environment working with tacit knowledge. This according to Polanyi (1966) and Stephenson (2004) becomes important especially in situations that involve master/apprentice model of learning. However the focus of the literature was mainly on unidirectional trust, that of apprentices in their masters. For example Polanyi (1966) argues that transmission of intellectual artifacts can be successful only in the presence of exceptional degree of confidence, the apprentice in the master, the student in the teacher, and popular audiences in well-known speakers or famous writers.

The literature on the role of trust also shaped my initial pre-conceptions about the role of trust. By relating my experience to Polanyi's argument, specifically in the student/teacher relations, my initial assumption was that of unidirectional trust, as literature suggested. Before starting with data collection I took for granted that trusting your master/teacher is one of the factors in order to have/create an effective environment that mainly involves tacit knowledge.

The process of data collection was an initial indicator that began to shift that perspective. Observations and informal interviews indicated that trust should be mutual in order to have an effective environment working with tacit knowledge. This was confirmed by all masters that are subject of this research as well as apprentices. Nevertheless although trust was recognized to be an important factor, the evolvment of trust building varied between masters and apprentices.

Apprentices in Transjö Hytta had a pre-built trust on their masters, even before starting working with them. One reason that derived during the conversation was that one of the masters is a famous glassblower and they heard about him when they were in school already. The role that master's reputation played in trust building was brought up by DX – an apprentice in Transjö Hytta when asked whether they get any certificate in the end of their apprenticeship. He stated that *“To say that I have stayed in this place for so many years is a very big plus, because this guy is known all over the world. So that is a certificate itself.”*

This could also be expanded by considering the fact that apprentices were so eager to work with this master that they waited for six years to get the apprenticeship in Transjö Hytta.

Based on discussions with apprentices, the reputation and professionalism of the master was the initial building block of the trust. Nevertheless the trust was further expanded beyond professionalism and reputation. Apprentices considered that after a while, when they got to know the masters by working with them, socializing and interacting, trust was further reinforced, and professionalism was just one the trust blocks.

For masters on the other hand trust evolved overtime. Masters LE and SC in Transjö Hytta have twenty years of experience with student/apprentices. The trust according to them was not primarily related to the skills or talent apprentices have, but how quickly they adapt themselves into the

community of practice. The issue of trust evolvement from masters's side might be further supported by the following argument. Masters and apprentices in Transjö Hytta had an agreement about the apprenticeship period of apprentices that was extended in yearly basis. However only after four years apprentices were offered the chance to stay indefinitely in the workshop. To apprentices this was an indication of trust communication, since masters demonstrated a degree of confidence in apprentices' ability to blow glass. To apprentices this was considered as a reward and further stimuli.

Generally Transjö Hytta is a good example of a trust based working environment, where team spirit is very present. This does not include only trust between masters and apprentices but also towards customers. As mentioned in previous chapter, the gallery of TransjöHytta is separate from glass blowing room. In many instances they give keys to the potential customers to go and visit the gallery themselves, by thus demonstrating a high degree of trust.

4.2 Metaphors

Metaphors are considered to be an important means to convey a meaning where no explicit language is available (Ambrosini and Bowman, 2001) or to give a voice to tacit knowledge (Munby, 1986). Also Nonaka and Takeuchi (1995) discuss the role of metaphors by arguing that metaphors are used as a means to make tacit knowledge explicit.

Due to the language barriers, this factor could not be investigated by relying in observations only. Therefore the issue of metaphors and their use it was intentionally brought up with participants in both settings. They claimed that they used metaphors sometimes, although they are not so common or constant. According to the participants, the metaphors were mainly related to the amount of glass to be taken from the furnace. According to the master JE and the apprentice LY in Transjö Hytta, a metaphor that they use quite often is "Lagom". JE explained that *"When apprentices ask me how much glass should I put in the pin, the answer is lagom which means the right amount"*. According to the apprentice LY one may know what word lagom means, however it is highly unlikely to know how much is the right amount of glass. Only people involved who have spent a significant amount of time in glass blowing can know what lagom or the right amount is. This is in line with Aberg (2010) who argues that metaphors can convey a meaning only if persons share similar field of concept-related associations.

Nonetheless, the use of metaphors in this context and the statement of the master, contradicts the claim of Nonaka (1984); Nonaka and Takeuchi (1995) who in the externalization mode of SECI argue that metaphors are used to express the articulation of tacit knowledge and its conversion into explicit knowledge. In this case the tacit knowledge is not converted into explicit knowledge. On the contrary in order to understand what legom means and apply its meaning in practice requires heavy reliance on a tacit coefficient. The word legom itself deprived from the tacit coefficient to understand it is meaningless. This is similar to Polanyi (1966) view that *"all knowledge is either tacit or rooted in tacit knowledge"*.

The other apprentice in Transjö Hytta DX claimed that they used metaphors. These metaphors according to him were related to the amount and shape of glass. He mentioned few metaphors such as "apple" "thumb finger". However my impression was that he himself created metaphorical concepts of the shape and amount of glass to be taken, and internalized them for guidance.

GB the master in Pukeberg claimed that he rarely uses metaphors, although they may be useful in the beginning of the glass blowing career.

4.3 Time

There is an overall agreement from the literature such as Polanyi (1966), Olsson and Gullberg (1988) that learning tacit knowledge is a long process that involves spending a significant amount of time along the master in a working environment that involves mainly tacit knowledge. Masters of both settings spent a lot of time serving as apprentices before they were able to become masters themselves. According to all participants time required usually varies between ten to fifteen years. DX the apprentice in Transjö Hytta claimed that: *“Usually they say it is about 10 to 15 years when you are in the industry to work yourself up. Some get there faster some never get there, but usually it takes 10-15 years. It takes a long time to learn to use the glass”*.

Apprentices in Transjö Hytta were there for almost four years, plus two years in the glass school in Kosta. However they both felt that they need few more years in order to learn from their masters and to be able to open their own studios to put the knowledge acquired into practice.

JE the master in Transjö Hytta claimed that the time factor has changed from before. This shift in time according to him is due to many factors. Years before one had to start apprenticeship in a very young age, basically as a child, a case not present and neither allowed today. There was an unwritten rule that a master cannot be one who is young.

Another reason provided by the GB the master in Pukeberg is that nowadays there are glass making schools which facilitate this process. Overall the general opinion from participants was that reaching a proficiency level in the glass blowing requires a significant amount of time.

4.4 Team composition/Cultural differences

The reviewed literature varied in terms of whether diverse cultural composition of the teams is positive or negative for working with and learning tacit knowledge. Despite this variance there was a common agreement that cultural differences have an impact in tacit knowledge after all.

The participants in the both research settings came from more or less similar cultural backgrounds. It was difficult to investigate this factor during observations because all participants in Pukeberg were Swedish while the Transjö Hytta team was comprised of two Swedes and two Danish persons.

However taking into account my language barrier, my initial assumption was that cultural differences especially the language element of culture plays a crucial role and should be taken into consideration.

Based on their experience, masters and apprentices of both settings, especially the masters claimed that cultural differences do not play a role. For example Transjö Hytta for over 20 years had apprentices from all over the world, and also masters themselves worked abroad, and did not perceive it as a problem. Moreover they claimed that diverse teams do neither hinder nor foster working with tacit knowledge.

On the second day of observations, in Transjö Hytta, a Japanese glass blower apprentice JG was present and conducted observations for the whole day. Since she came from a different background I raised this issue with her. She also claimed that from her personal experience of working with different and in different cultures, the cultural differences do not play a role. She said *“What is*

different in glass blowing field across cultures is the way the glass blowing is done, not how people learn". This in a way is in contradiction to Walsham (2001) statement that cross-cultural teams are comprised of people whose tacit knowledge has been developed in different ways.

Given that the masters claimed that adaptation to the community of practice and village as a community itself is crucial for learning to take place, I consider that after all culture has a role. This can be overcome by high motivation of the apprentice, who is eager to learn and master the glass blowing.

4.5 Language

The level of communication between masters and apprentices varied between the two settings that were subject of this study. This was mainly due to the differences between the two settings, such as team size and the level of expertise of the apprentices.

In Pukeberg where students were beginners in the glass blowing field, more interactions were present between master and them. This verbal communication was basically an extended and repeated verbal edition of the instruction manual that was initially provided to the students. The instruction manual included some basic information about different angles to be used while taking glass from the furnace (for more details see Appendix A). The language used was only related to the work, and only few socializing interactions took place. More interactions were present between apprentices themselves, since they already knew each other from school and were school friends. They would in many cases help each other and give advices or even ask for advices. They were more free to ask each other rather than the master. This was less present when the master was in question.

Transjö Hytta represented a different picture. Since observations here took place in three days, the level of communication varied significantly from day to day. Nevertheless generally masters and apprentices did not communicate a lot. The language used did not serve to articulate any knowledge; rather in this context it had more instructions and order giving nature. For example while working in a piece of glass, the master SC told the apprentice DX *"take two and put them in the oven"*. And later *"little more fire on the piece"*.

According to Gherardi (2006) discursive distinction, this falls into the *conversation on practice* category. Conversation on practice includes talk in interaction, such as instructions given to the apprentice that are useful to code events. Another example of this discursive category is the communication between the master JE and apprentice LY, as shown below.

LY: *"Do you want green or white?"*

JE: *"No, I am cutting like this, so we shall have white"*

Compared to Pukeberg, in Transjö Hytta the communication in form of instructions was less present. Apprentices knew in advance what they should do, without masters telling them. They would just go and heat the pin, clean the place etc. By observing the masters for four years, they assist them by knowing exactly what to do when and where. They both claimed that in the beginning of their apprenticeship, they needed more instructions or orders on what to do. DX said: *"In the beginning you ask, for example is it now, do you want it now"* complemented by LY who said *"or do you want it hotter, colder etc. So you have to find out what is the way of your master and then you adapt"*. With time, their experience evolved and they captured the unwritten rules on doing the right think at the right time.

In Transjö Hytta contrasted to Pukberg was also present the other category “conversation in practice”. According to Gherardi (2006) in this category the practice is the object of talk. It involves stories and more “purposeless” conversation for the sake of socialization. . For example:

JE: ” *In Nättraby, someone I know who has donated glasses* ”

LY: ” *Where is Nättraby?* ”

JE: ” *It is located before the Karlskrona* ”.

LY: *Is it not at Sölversborg?*

JE: ” *No Nättraby, it is near Karlskrona* ”

During observations in Transjö Hytta I could notice that the level or amount of verbal communication was highly affected by the mood of the participants, masters mainly. Usually masters were the ones who started talking first.

Based on the analysis of the verbal communication from observations and from discussing with participants, verbal communication does not play an important role in terms of tacit knowledge. Verbal communication was more oriented towards instruction giving and socialization.

4.6 Story telling

In terms of the relation between storytelling and tacit knowledge, Sole and Wilson (2002) claimed that storytelling is an old means of passing on wisdom and culture. Snowden (2000) claims that well designed and told stories can convey both explicit and tacit knowledge, both the core and the context. Also Lelic (2001) claims that storytelling can serve as a powerful tool to capture knowledge. However his stand is that by sharing and discussing stories is a powerful way of converting tacit knowledge to explicit knowledge, and an effective method for quickly assimilating new learning.

The presence of this factor varied between the both settings. In Pukeberg storytelling was not present between the master and apprentices.

Participants in Transjö Hytta claimed that storytelling is very present in their day to day activities. Apprentices in Transjö Hytta claimed that mainly masters, especially one of them, are the ones who often use storytelling during their working hours.

JE a master in Transjö Hytta claimed that he uses storytelling, not as a way of purposefully conveying any message or meaning to the others, but just in specific contexts when he thought it was appropriate.

Storytelling seems to be closely related to the mood. As the apprentice LY said: “*In good days once he gets started he will not stop*” referring to one of the masters. In line with Swap et al (2005) who stated that stories usually originate from within the organization and experts’ past experiences, the storytelling in Transjö Hytta seemed to be much related to the past experience of the masters.

According to participants, stories told revolve around many different aspects. Masters often tell stories of their past experiences as apprentices and the harsh treatment from their masters, or their experiences with other previous apprentices and their teaching experiences outside Sweden.

Below it is presented a story told during observations in Transjö Hytta, told by the master JE.

“*At Kosta we had what they called rörmokslag (type of worker) out in the yard, for things that needed to be polished. There was a guy named X, a teacher who was about to retire. He had special*

working hours and he found no pleasure in working at the glass factory anymore. He had his own assistant named G. There was a large warehouse at the time, and G needed to stay there where they kept the glass. G always slept there. Anyway, one day he asked G, what are you doing? He answered: Nothing, I'm helping X. Oooh good, and what is X doing? G answered: Nothing! . (Everyone laughed)

Apprentices in Transjö Hytta DX and LY felt that storytelling is an interesting and amusing part of interactions, because through these stories the masters unconsciously revive the past and in a way enable apprentices to relate the stories to their experiences.

However their opinion was that besides being interesting, storytelling do not convey any knowledge related to their work. While asked specifically about their opinion or their experience if storytelling is an important factor, apprentice DX replied: *"Just to get happy that you won't get hit if you make a mistake, so to make you happy even when you are not"*, referring to the often told stories from their masters about the harsh treatment from their masters. DX also stated that *"Some of the stories remind me of the first factory I worked that was a bit of a hell, and it seems like I kind of knew"*. This is in agreement with Sole and Wilson (2002) who claim that stories enable people to make sense of the past and understand possible futures.

Other apprentice LY said *"I don't think we specifically learn from the storytelling. Yeah, we learn history, the way glass blowing was before but they do not really convey any practical knowledge"*. Nevertheless, during conversations they would go back to the stories of the masters, when trying to explain something to me.

Based on the participants feedback I assume that storytelling was important and in a way helped apprentices in this case to shape their horizons or if I can use Gadamer's word fusion of horizons, that provided them with an understanding. They could relate their experience with their masters' experiences and reflect upon it.

It is hard to really reflect upon the story that has been told, unless you can relate that to your past experiences or if you are faced with a situation that resembles the story that has been told. Based on this I could conclude that storytelling is an important aspect or factor of any working environment not only those that mainly involve tacit learning. However in itself does not convey any knowledge, but it is a necessary factor in order to build, shapen socialization and trust.

4.7 Emotions

Gherardi (2006) acknowledges the role of emotions, and their presence in all form of interactions. Participation in practice intertwines the body and the mind, feelings and emotions, understanding and knowing. Also Gieser (2008) claims that emotions are integral to the learning process in the context of novice-teacher relationships.

From the observations emotions as a factor were present in both settings. Since observations in Transjö Hytta were conducted for three days they enabled a deeper understanding on the role of emotions, as well as a clearer picture then in Pukeberg. Pukeberg apprentices were more nervous and unsecure. This according to the master GB in Pukeberg was because they were beginners in the glass blowing.

The second day of observations in Transjö Hytta provided more insights in terms of emotions and their role in an environment of working with tacit knowledge. The masters/apprentices did not blow glass for two weeks, one week due to the lack of raw material and the week after due to Easter

holidays. I noticed a high enthusiasm resulting in a very productive day followed with good team spirit and good mood.

From the observations the mood of masters played a significant role in the entire room. While one of the masters SC was working on a final part of the glass work, the glass work was cracked in the middle. The master got a bit nervous and started to redo that part. That was also reflected to the apprentice DX, who was taking a look at master's face every 10 seconds. Also the behavior of the apprentice was affected and he seemed more stressed. This caused a long pause in the workshop, and affected everyone including me.

When later the other master JE was whistling and even signing, the apprentices seemed more relaxed. Both apprentices LY and DX also confirmed this perception. They both claimed that the emotions are very present during the days where they have to blow glass in front of their masters. DX said *"Ohhh it is worse than if the king is watching you. If the king comes and watches me blow glass no problem, if he (JE) watches me I get all nervous"*. The other apprentice LY said *"emotions are so hard that even if you get burn by the glass you will not say a word. You just keep going and do your work"*.

The above is very much in agreement with Gieser (2008) who argued that apprentices often have feelings of shame, insecurity, and nervousness, fear of failure, happiness. Whereas masters often display feelings of displeasure, sometimes even hostility, anger, or pride and happiness.

4.8 Results

This section provides the results that derived from the analysis of the data collected. Given that during analysis these factors varied in terms of their relevance, they will be classified into primary and secondary factors. Moreover some sub-factors that emerged during analysis will also be included. Results are presented in an illustrative form also. It is important to note that most of the factors appeared to be intertwined with each other, with one or more factors contributing to the others.

From the literature review and empirical findings, time is considered to be an important factor in working with tacit knowledge. Each of the participant interviewed confirmed that it takes a significant amount of time to learn the tacit knowledge. This requires spending prolonged time with the experts who possess or accumulated such knowledge during years. However as a variable, time varied from one person into another and perhaps also varies from one context into another and it is up to future research to investigate it.

Analysis indicated that trust was also proven to play an important role in working with tacit knowledge. Nonetheless trust varied between masters and apprentices. Reputation and professional knowledge or competence of the master served as a building block of trust. Trust is closely related to time, since it develops over time.

Verbal communication specifically language was not considered important by the participants. This was due to the nature of tradition itself, since learning to blow glass does not require verbal learning or teaching.

Metaphors did not appear to be an important factor that facilitates working with tacit knowledge. They were not a constant part of that working environment, and were used very rarely. From discussion with participants only one apprentice claimed to have used metaphors with one of the

masters. The use of metaphors was mainly related to the amount of glass to be taken from the furnace. Beginners are more tempted into using metaphors or at least creating metaphorical concepts.

Storytelling as an aspect of verbal communication was an inseparable part of the working environment. Storytelling in participants' view was present almost every working day. Nevertheless based on participants it is not considered as an important factor from which they derive any knowledge. However they considered it as an important and amusing part of their work. For this reason I believe that since storytelling was considered to be as a socialization aspect and a part of interactions can play an important role in working with tacit knowledge.

During data collection process some other factors emerged while discussing with participants. These factors were not identified during the literature review; however their importance emerged during observations and later was addressed with the participants.

As mentioned earlier the number of participants in both settings differed. In Pukeberg there were 8 students/apprentices with one master whereas in Transjö Hytta it was one master with one apprentice. Students in Pukeberg had a limited time with the master and it wasn't easy to observe the master performing glass blow, because all eight gathered around him. While in Transjö Hytta it was a different situation. Apprentice was with the master all the time. The issue of team size emerged during observations, because my impression was that the size of the team was important. All masters and apprentices in Transjö Hytta have experience in working with small and larger teams. Also my initial prejudice about the team size was supported by bringing it up with masters and apprentices, who also believed that team size plays a role. The master JE further elaborated that *"Smaller teams are more appropriate to work, because in teams that are comprised of many people, jobs are divided and too specific and you get to focus on only one part of the whole thing. While in this type that we have, you get to do and learn everything"*.

While discussing the time factor with the masters and apprentices in Transjö Hytta, they mentioned that it takes time to reach proficiency in the field of glass blowing, but this is relative and varies from one person to another. Thus some questions emerged on what is it about people that some learn faster and some slower. Masters claimed that first of all it is fitting to the community, followed by talent and motivations. They claimed that usually they notice in the very beginning if one will make it or not. They gave an example of one apprentice who they doubted that will learn, however in the end he opened his own studio.

All masters and apprentices that were subject to this study argued that "fitting in" into the tradition, the way of working as well as village is crucial. They put a lot of emphasis into this concept. Adaptation to the community of practice appeared to be a crucial factor as provided by participants. According to them, especially masters who have quite a long experience with apprentices, if one adapts to the community of practice it is very unlikely that any problems will appear.

Figure 4-1 List of factors derived from the analysis

The concept map shown in the figure 4.1 represents the factors and the connections between them. These factors have been identified from the analysis. These factors are categorized into primary (more important) and secondary (less important) factors while working in tacit knowledge environments. The primary factors are represented in a light blue color while the secondary factors are illustrated in the green color.

5. Discussions

This section discusses the results of the study as well as implications to Information Systems

This study has examined the factors that enable effective working with tacit knowledge. The results of the study have classified these factors into primary and secondary factors, based on their importance. The motivation to investigate the phenomenon of working with tacit knowledge arose from the importance of tacit knowledge as one of the most critical resource of organizations' competitive advantage. Despite this fact, tacit knowledge has been often misunderstood and the majority of efforts especially in the field of KM appeared to be towards its explication and ways of storing it into different KM systems. Thus knowledge has been treated as an object that can be easily detached from humans/knowers that can be accessed, transferred and shared. This has mainly been the case in the field of Knowledge Management studies. This study has taken a different approach and has moved away from the assumptions that tacit knowledge can be extracted and passed from one person to the other. Instead the study has taken a human centered approach by acknowledging that tacit knowledge resides within humans and cannot be transferred and shared as such. Nonetheless as practice indicates in which this study is based, tacit knowledge can be displayed and developed by indwelling and observing an expert who possesses it. This is in line with Tsoukas (2002) who argues that new knowledge comes about not when the tacit becomes explicit, but when our skilled performance is punctuated in new ways through social interaction.

In order to achieve this, a suitable environment is necessary along with some informal social factors that are considered to facilitate this process which is basically human and takes place in a social context.

Results of the study showed that tacit knowledge is a process, rooted in action and cannot be divorced from the context. All the empirically investigated factors presented in the results chapter of the study are developed and evolve in the context of which tacit knowledge is a part of.

The research settings where the study was conducted varied profoundly in terms of the team size, structure, proficiency level of the apprentices. Although this is not intended to be a comparative study, some implications related to the investigated factors are worth discussing. The data analysis indicated that the factors are interrelated and differ between different stages of apprenticeship. In the beginning some factors appear to be more present and important than the others, and later their importance reduces and other factors appear.

The results are considered to have some important implications in terms of working with tacit knowledge both in theory and practice. Drawing on Busch (2008) who claims that IS has expanded from being only information processing into becoming knowledge oriented; the results of this study could provide some implications to Information Systems. Implications could be further developed by considering the claim of Willcoks and Whitley (2009) that topic of knowledge especially tacit knowledge is studied in IS by focusing particularly into and technologies to codify and manage knowledge in organizations.

5.1 Implications to Information Systems

As a discipline IS is considered to be fairly new, that began in 1950s with the widespread use of computers to process data. Literature provides a variety of definitions on IS. Similar as the field of

KM, diversity of definitions of IS seemed to be related to the role of IT, and whether IT plays a crucial or instrumental part in IS is subject to many disputes and arguments among IS scholars.

Often IS is not distinguished from IT and both concepts often are used interchangeably. Some have a IT oriented approach thus neglecting the social side of IS, whereas others focus more on the social side by considering IT as having incidental role. For instance Avison and Fitzgerald (1995) define IS as the effective design, delivery, use and impact of information technology in organizations and society. Lee (2001) tries to connect these two views by claiming that research in the information systems field examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact.

McDonalds (2005) reduces the role of the technology as an instrumental component of the IS approach to human activity systems; one that offers opportunities and limitations (McDonalds, 2005).

Interestingly Carvalho (2000) relates the first perspective to be more associated to American tradition whereas the second to European tradition.

In terms of IS/IT relations, Avison and Elliot (2006) argue that Information Systems existed even before the introduction of computers. Although today in practice most IS are computerized, there can still be IS without computers. Nonetheless Avison and Elliot (2006) argue that organizational context is key and that people will be involved as much as computers, and that not all parts of the information system will be automated.

Alter (2008) defines IS as a special case of work system, a definition that covers totally manual, partially automated and totally automated ISs. Through this he differentiates IS from IT.

This study has taken a more human-centered approach, thus the issue of Information Technology (IT) was not a primary focus. Nonetheless this study by no means denies the technical aspect of the IS and discussed its implications on the overall process of environment of working with tacit knowledge. The exclusion of IT as a primary focus was due to the nature of the research settings itself, since they did not use any information technology means to support their daily working activities. The glass blowing tradition has not gone through any major transformations and it basically preserved the structure as it used to be centuries ago, where technology was not in sight. Furthermore, the analysis of the literature did not provide any indication that computer systems could facilitate the process of working with tacit knowledge.

Despite the theoretical perspectives, the issue of technology and its possible facilitator role has been discussed during informal discussions with the participants specifically those in TransjoHytta. These informal discussions provided some indications about the possible use of IT that are considered worth discussing. The first important aspect was the differences in the technology utilization between the masters and apprentices in their everyday activities. Masters claimed to use technology neither personally nor work related. The latter was quite obvious also from the observations. In contrast to the masters, apprentices on the other hand claimed to use IT frequently, especially social media in their personal life. The possible factors that affected different levels of IT utilization could be due to: IT literacy and the level of glass blowing proficiency (apprentices where eager to learn new stuff thus more open to alternative ways for getting new ideas and thoughts).

In order to discuss these factors and their implications in more detail in the following sections the IT utilization is discussed from the perspective and as affects it could have to tacit learning and to business in general. This section ends with some suggestions regarding the role of technology in the settings.

5.2 IT Implications to tacit learning

Results of the study indicated that factors that facilitate environment that involve working with tacit knowledge are context dependent they develop and evolve in the social context, through socializing and by spending time together. Participants frequently referred to the adaptation to the CoP as being key to this process. ICT had a great impact in the changes that are taking place by enabling new modes of work, communication/interaction and organization across time and space (Walsham, 2002). However the question is how ICT could facilitate this adaptation process that is crucial and which requires physical presence? Literature concerned with relations IT-tacit knowledge discussed it terms of diffusion of tacit knowledge as such. The difficulty of diffusion of tacit knowledge through modern IT has been addressed and recognized by different authors (Haldin-Herrgard, 2000, Nonaka and Takeuchi, 1995). For instance Yang (2009) argues that modern IT can provide many possibilities to diffuse explicit knowledge but tacitness is hard to diffuse technologically. IS and KM approaches suggest that in order for tacit knowledge to be transferred it needs to be codified first. This study indicated that first of all no codification of tacit knowledge took place, nonetheless the tacit dimension embodied in glass blowing skills was interiorized not as transfer of master knowledge to apprentice but emerged as new knowledge developed through practice. This was made possible by the factors that this study has examined.

Addressing the question above, there have been studies that have investigated this issue for instance Wood et al (2009) conducted an action research project on how interactive digital media could be used to capture and pass on the skilled knowledge of master craftsmen. Through a process of video recording by after summarizing events using drawings and flow charts, the designer/researcher assisted with articulation of the knowledge and developed interpretation suitable for transmitting the knowledge. The materials facilitated the reciprocal reflection between the master and apprentice. Nonetheless throughout their study they explicitly stated that this did not imply that the tacit knowledge of the expert was made explicit and that multimedia materials would always be a complement to traditional forms of instruction.

Although not having an explicit focus on IT, there were no indications during data collection process and analysis that *IT* is a factor in working environments where tacit knowledge is the primary knowledge form. This was also suggested by Nonaka and Takeuchi (1995) in the case of bread making machine. They did not refer to any IT system when discussing the conversion. From the case it was obvious that after all humans are the key factors of knowledge creation.

In line with the work of Woods et al (2009) and based on observation, for the tacit learning environments one possible use of technology could be for recordings of the particular working activities that could be revisited numerous times. This could potentially help apprentice to review particular working activities and reflection upon the particular glass blowing session.

While Wood et al (2009) suggested using different flowcharts and graphs that is exactly what apprentices in Pukeberg were using. There was no knowledge on those graphs, rather they provided information or instructions that can be useful in early stages of the apprentice.

To conclude this part, participants' view was that no tool can replace or even complement the physical presence or using their words the "*smell of glass and its feeling in your spine*".

5.3 Implications to business

The IT technology utilization could have a wider impact in the way the current business activities are done at Transjö Hytta. The suggestions and discussions in this part will be mainly focus on Transjö Hytta because as described in the empirical study chapter Pukeberg does not function on regular basis and participants were only temporarily located there. Both of these research settings have their own websites as a forum for communication with the interested people. In the current constellation, the Pukeberg website is hosted within Glassriket portal (Kingdom of Crystals official visitors guide for online booking & tourist information), while Transjö Hytta has its own website. The important fact to mention was that Transjö Hytta staff is not very familiar with the content of the website; they just know that there is a website. A possible improvement in this direction is to make the web presence more active, but regularly posting news and newly designed artifacts pictures in this portal. The popularity of the Transjö Hytta would help that this site could become rapidly popular and increase the communication and interaction with the people all over the world. The possible drawback of this approach could be that it will require a dedicated person to maintain this web presence. At the current stage, none the masters and apprentices are not be able to perform this task. The potentials for using Internet technologies were pointed out by apprentices during our informal discussions. One of them actually managed to sell few pieces of the glass via Facebook. The actual financial transaction was not completed through Facebook but there the apprentice was able to exhibit some of his work that attracted the attention of the possible buyers. This is an important aspect because the parts of the apprentices' studies are actually financed by the artifacts that they are able to sell. For this reason, it could be said that for the overall sustainability of learning practice at Transjö Hytta it is important to improve the overall web presence, especially with a well-established and maintained presence in social media services. Since one of the main features of the social media services is to keep and maintain connection between peoples in different locations, they might be helpful for creating contacts between the apprentices and the possible admirers of their glasswork. This could have a double positive effect for the apprentices: 1) to advertise and make more popular their glasswork and 2) create the opportunities for possible buyers of their work. Even that these effects are not necessary directly related with the learning practices, they might improve the way the business is done at Transjö Hytta.

Another line of improvements that could be done with the help of IT is the real time communication with the distance people interested in the glasswork. The use of IT technologies has already been practiced by one of the apprentices in Transjö Hytta. Due to his personal circumstances he used Skype real time videoconference in order to enable his mother in Japan to watch him communicate with his mother blow glass. In this manner it could be said that today Transjö Hytta might benefit from different streaming technologies in real time to enable their admirers to watch their work over the Internet. The streaming media could be integrated with the overall web portal thus giving a more comprehensive experience for the distance users and visitors of the Transjö Hytta. Both apprentices mentioned the importance of streaming media was where they claimed that they used to check different blogs of glass blowers, as well as youtube videos. This was mainly used to get some new ideas and inspirations for their work

The streaming media potential could be beneficial for the masters as well. One of the masters is involved in providing teaching and training abroad specifically in Japan and USA. An idea would be to allow their students in the remote locations that prior the actual training on site, to get a flavor of that following real time video stream. This could enable that besides the periods where the master teaches there, they could provide distance training or teaching to different locations in parallel.

6. Conclusions and future work

This study aimed to examine the potential factors necessary for an effective environment in working with tacit knowledge. To satisfy the aim, the study sought to answer the following question:

- What are the factors that enable working with tacit knowledge?

In order to address and answer the research question, this study has first developed a theoretical framework from the literature review. This framework served as guidance for the data collection, given that most of the related studies that have been reviewed lacked an empirical base. In order to further explore this framework an empirical study was conducted. Empirical study was conducted in a glass blowing tradition in two locations, Transjo Hytta and Pukeberg. The rationale on basing the study in glass blowing tradition relies on the fact that this tradition is master apprentice based.

The outcome based on the analysis of the data collected throughout this thesis suggested that the framework that was derived from the literature review needs to be complemented with other factors as well. These factors were identified mainly from the empirical study conducted in this thesis. Based on the data collected the factors have been classified as primary and secondary factors.

It is important to note that most of the factors appeared to be intertwined with each other, with one or more factors contributing to the others. Furthermore these factors play a role even in our daily lives and our relations to others. The concept map and the relations between the identified factors is shown in the figure 4.1. When it comes to the implication for IT this study has taken a more human-centered approach, thus the issue of Information Technology (IT) was not a primary focus. Nonetheless this study by no means denies the technical aspect of the IS and discussed its implications on the overall process of environment of working with tacit knowledge.

The IT implications were mainly for the support of distance learning and communication for streaming sessions while working with glass. Furthermore, IT could support in terms of new market opportunities for selling the different art pieces through social networking sites or web portals. Nevertheless, it could be said that IT could be used as a supplementary technology while working with tacit knowledge.

6.1 Suggestions for future work

The analysis and the results section provide some suggestions for future research. This section provides some potential ideas on how this study could be further expanded and improved. It is considered that this study could serve as a foundation on which further studies could be developed. A suggestion for further work would be to use ethnography as a research approach. By spending prolonged time in the field, as a requirement in order to conduct ethnography, would provide deeper insights on the already investigated factors, and potentially new emerging factors that might have been overlooked by this study. The extended time span would enable researchers to follow several stages of apprenticeship and define or categorize the factors in these stages. Also another suggestion would be to investigate the identified factors that have emerged from the data collection that were not covered by the literature.

Since the role of IT was not the primary focus of this study, it would be interesting to explore the role of technology as a factor in this specific context. It would be useful to investigate how the participants' actual usage habits could be utilized in order to identify possible technological support for their work.

6.2 Reflections

Conducting this study has been an interesting and likewise challenging endeavor. Tacit knowledge, although appears to be a new notion, it is an indivisible part of our daily lives and activities. Reflecting upon all activities performed one would realize that all of them are tacit or tacitly rooted. Studying tacit knowledge proved to be quite a challenging experience, explicitly to due to its non-articulate nature. First of all the literature on tacit knowledge appeared to be quite diverse and providing different perspectives. The work of Polanyi and especially his examples was very useful in understanding the tacit dimension of knowing and relating it to my experience. The list of factors that has been presented in the literature review has been compiled by different studies. This required an extensive literature review since apparently previous studies lacked it. Moreover Polanyi itself despite his focus on tacit knowledge, only implicitly mentions some of these factors. Creating a theoretical framework for this study was quite challenging, since the literature on each factor was very extensive and I was forced to put boundaries thus limiting the study. For few factors and their role and relation to tacit knowledge, I could conclude that conducting it thoroughly it requires a specific separate research on each.

In terms of methodology, initially it was planned to conduct semi-structured interviews, however later this appeared to be almost impossible due to the nature of the study itself. All factors that have been investigated are in a way tacit, thus making difficult getting explicit answers from the participants. During the informal interviews or conversations the non-articulate nature of tacit knowledge or we can know more than we can tell became obvious. When asked specific questions to the participants they had to reflect upon it and not being quite able to answer, thus reflecting the focal and subsidiary awareness of knowing.

Conducting the data collection in the glass blowing tradition was an amazing experience, and I consider that it provided a suitable environment to conduct this kind of study.

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Appendix A – Instruction manual

GS. KF.	HYTTARBETE.	NR:1
HT.	ANFÅNG PÅ SPIK.	SID.3

KONTAKT MED GLASET.

ANFÅNG.

- FÖR SPIKEN NED MOT GLASETS YTA.
- IAKTTAG SKUGGAN PÅ YTAN.
- FÖR SPIKEN NEDÅT TILLS SPIKEN OCH SKUGGAN MÖTS.
- NÄR SPIKEN OCH SKUGGAN MÖTS, ① BÖRJA VRID SPIKEN RUNT MEDURS (MOT HÖGER.)
- ÖKA HASTIGHETEN PÅ VRIDNINGEN, OCH FÖR SPIKEN I EN BÅGE FRAMÅT, UPPÅT.
- NÄR DEN ANFÅNGADE BITEN HAR KONTAKT MED GLASET GENOM EN TRÅD, MINSKA VRIDNINGEN OCH LÄGG TRÅDEN TILL VÄNSTER I RINGEN.

TAG INTE I SPIKEN FÖR LÅNGT NED MOT DEN VARMA DELEN.

LITT

GS. KF.	HYTTARBETE. ANFÅNG PÅ SPIK.	NR:1
HT.		SID.4

SAMLAR BITEN.

- NÄR TRÅDEN HAR SLÄPPT YTAN OCH LAGTS TILL VÄNSTER, DRAG SPIKEN MOT DEJ.
- SÄNK DEN DEL AV SPIKEN DU HÅLLER I OCH SAMLAR BITEN INNANFÖR DEGELKANTEN.

GÅ UR UGN.

- NÄR DU SAMLAT BITEN BYT GREPP.
- HÖGER HAND LÄNGST BAK PÅ SPIKEN MED ÖVERHANDSFATTNING.
- VÄNSTER HAND SÅ LÅNGT NED PÅ SPIKEN SOM MÖJLIGT MED UNDERHANDSFATTNING.
- GÅ UT UR UGNEN MED BITEN, UPP ÅT VÄNSTER.

FÅNGA AN SNABBT SÅ ATT DU INTE BRÄNNER VÄNSTER HAND. GÅ UT UR UGNEN ÅT VÄNSTER.	LITT
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24°

COMPLETING YOUR VERY FIRST TUMBLER THE WELL ENDOWED VERSION

UNLESS YOU WANT A TUMBLER THE SIZE AND THICKNESS OF A SHOT GLASS, YOU WILL NEED TO GATHER MORE GLASS IN ORDER TO INCREASE THE SIZE AND VOLUME YOU WANT. DESIRE. NEED, DREAM ABOUT....

Gathering More Glass

GATHERING YOUR SECOND, THIRD, FOURTH, AD INFINITUM LAYERS OF GLASS GOES JUST LIKE THE FIRST. WITH EACH SUCCESSIVE GATHER YOU SHOULD PLUNGE THE PIPE DEEP ENOUGH IN THE GLASS SO AS TO COVER THE PRE-EXISTING GATHER. MAKE AT LEAST TWO FULL ROTATIONS IN THE GLASS TO INSURE EVENNESS.

YOU CAN DRAMATICALLY EFFECT THE AMOUNT OF GLASS YOU GATHER BY JUST CHANGING THE METHOD or STYLE BY WHICH YOU GATHER.

THE COAT METHOD ↗

WITH THE COAT-STYLE OF GATHERING, YOU END UP WITH THE LEAST AMOUNT OF GLASS PER GATHER. BUT BY ALLOWING THE GLASS AN OPPORTUNITY TO TRAIL OFF IN THE FURNACE - YOUR GATHER GETS A NICE EVEN SHAPE.

WITH THE COLLECTIVE-STYLE OF GATHERING (DRAWN BELOW) - YOU GAIN THE LARGEST AMOUNT OF GLASS PER GATHER. THEY DON'T NECESSARILY COME OUT AS CLEAN AS YOU LIKE, BUT THAT'S WHY BLOCKS WERE INVENTED.

THE COLLECTIVE METHOD ↗

FOR PRACTICE: JUST TAKE GATHERS. PRACTICE TURNING AT VARIOUS SPEEDS, SEE WHAT IT DOES FOR YOU. [TAKE NOTES]. TRY CHANGING YOUR ENTRY ANGLE. SEE WHAT THAT DOES. THEN TRY CHANGING THE ANGLE AT WHICH YOU EXIT THE FURNACE. IF YOU GET THE HANG OF GATHERING - DIFFERENTLY - BUT WITH PREDICTABLE RESULTS → YOU'LL GO FAR! OF COURSE, THE TEMPERATURE OF THE GLASS IN THE FURNACE PLAYS AN IMPORTANT ROLE. IF IT'S REALLY HOT - YOU'LL ONLY BE ABLE TO GATHER A LITTLE AT A TIME. IF THE GLASS IS "COLD" - YOU'RE LIKELY TO GATHER LARGER AND HEAVIER.

Appendix B - Interview questions

Time

1. How long have you been involved in glass blowing?
2. How long it took for you to become a master?
3. Generally how long does it take to master the craft of glass blowing?

Trust

4. As an apprentice do you have to trust your master?
5. How does trust evolve?
6. Do you gain trust in your master/apprentice overtime or in the beginning?

Language

7. How much is verbal communication present during working with glass?
8. What do you usually talk about during the working hours, is it more work related or general conversation?
9. Do you think that verbal communication is important in your workplace?

Storytelling

10. Are stories present during your usual working hours in the workplace?
11. In your opinion, how storytelling is important in relations to glass blowing knowledge?
12. What kinds of stories are usually told?

Metaphors

13. Do you use metaphors when you work with glass?
14. If yes, can you name a few, and what they stand for?
15. Do you think they help you to communicate a meaning or something?

Emotions

16. Are emotions present in your workplace?
17. Do you think they are an important factor?
18. Besides the above mentioned factors, what do you think is important for having an effective working environment with tacit knowledge?

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