Learning Through Formalized Communities of Practice Within a Large IT Organization

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Lärande genom formaliserade nätverk inom en större IT-organisation

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EXAMENSARBETE INOM TEKNIK OCH LÄRANDE PÅ PROGRAMMET CIVILINGENJÖR OCH LÄRARE

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Abstract

In a fast-paced and knowledge driven IT industry companies are increasingly becoming interested in making use of acquired knowledge and becoming “learning organizations”. To achieve that, some managers have taken an interest in incorporating communities of practice in their knowledge management strategy. However, these are often much more formal and structured than what the original concept entailed. This study looks at enabling factors for learning through formalized communities of practice, as well as prominent perspectives on knowledge and learning in a large IT organization. A qualitative case study using mixed methods was conducted at Scania IT. Three enabling factors for learning through formalized communities of practice were discovered. These were; having a clear and common objective, obtaining resources to achieve that objective, and being inclusive. Furthermore, some tensions that affect how a formalized community of practice can position their scope were discovered. Many perspectives on knowledge and learning could also be found in the studied organization. However, when it came to the knowledge a skilled developer should have, pragmatism became very prominent.

Keywords: communities of practice, knowledge management, organizational learning, the learning organization, perspectives on learning.
Sammanfattning

I en snabb och kunskapsdriven IT-industri blir företag mer och mer intresserade av att återanvända förvärvad kunskap och bli "lärande organisationer". För att uppnå detta har en del chefer blivit intresserade av att inkorporera "communities of practice" (sv. nätverk) i företages kunskapsstyrningsstrategi. Dessa grupper blir dock ofta mycket mer formella och strukturerade än vad som avsågs i originalkonceptet. Denna studie tittar på främjande faktorer för formaliserade nätverk samt framträdande perspektiv för kunskap och lärande i en större IT-organisation. En kvalitativ fallstudie genomfördes genom blandade metoder på Scania IT. Tre främjande faktorer hittades för lärande genom formaliserade nätverk. Dessa var att ha ett tydligt och gemensamt mål, att få resurser för att kunna uppnå det målet och att vara inkluderande. Vidare hittades ett antal spänningsförhållanden som påverkar hur det formaliserade nätverket kan positionera sitt syfte. Många perspektiv på kunskap och lärande hittades också i den studerade organisationen, men när det gällde den kunskap en skicklig utvecklare förväntades ha blev pragmatismen mycket framträdande.

Nyckelord: nätverk, kunskapsstyrning, organizatoriskt lärande, den lärande organisationen, perspektiv på lärande.
Preface

First and foremost, I would like to thank Scania for letting me choose a topic of my own interest to study and wholeheartedly supporting me in my research. I especially thank all who gave of their time and took part in the study, either through answering the survey or by participating in interviews. Without their participation, this study would not have been possible. And many thanks to the xMG groups for allowing me to observe and study their work.

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Finally, I thank Shmuli Bloom for removing Swinglish from the report, my father for his contributions as zealous scrutineer and Mats Skoglund for helping me reach my zone of proximal development.

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1 Introduction

In a small IT company, each developer can have a personal connection to all other developers in the organization. However, as a company grows such a direct connection is no longer possible. In Figure 1; how can developer A know if developer B has the solution to the problem A is working on? For companies with several hundreds of developers this can be very problematic. Time gets wasted searching for solutions that already exist within the organization. And the same problem gets solved many times, but in slightly different ways, making unity and a modular approach difficult. This of course is not without merit, since a diversity of solutions can give new insights into the problem and encourage creativity. However, in a fast-paced and knowledge driven industry companies are becoming more and more interested in making use of acquired knowledge and becoming “learning organizations”. This is not as straightforward as it may seem, entire research fields have emerged from trying to understand learning in an organizational context (Granberg & Ohlsson, 2009).

Figure 1. “The developer’s web”.

During the 1990’s communities of practice theory developed, initially as an approach for understanding situated learning, but it later became more of a tool for analyzing and facilitating knowledge transfer in different organizational contexts (Roberts, 2006). Communities of practice, as originally described, were informal and could not be implemented by management (Roberts, 2006). However, in recent years managers have been seeking to develop and support communities of practice as a part of their knowledge management strategy (Wenger, McDermott, and Snyder, 2002; Roberts, 2006). This report covers a case study that followed three cross-functional maintenance groups at Scania IT, a large Swedish IT company. These groups had many aspects of communities of practice, but they were also implemented by management and were rather formal. Therefore, this study investigates the “formalized community of practice”, focusing on what learning can occur through this social system.

1.1 Purpose and Objective
The purpose of this study was to understand the learning environment at a large IT organization, in particular to see how social systems can be used to facilitate learning. And the objective was to find enabling factors for learning through formalized communities of
practice, as well as to discover prominent perspectives on knowledge and learning within the studied organization.

1.2 Research Questions

The study addressed the following research questions:

i) What enabling factors exist for learning through formalized communities of practice within a large IT organization?

ii) What perspectives on knowledge and learning are prominent within a large IT organization?

Question (i) was initially the main research question. But whenever learning is discussed, different perspectives emerge within the discourse. Therefore question (ii) was added, in part to provide a deeper understanding of the results to question (i), but mainly because it is interesting in its own right. It is especially interesting, since a learning environment was studied and different perspectives on knowledge and learning may have very different consequences for such an environment.

1.3 Table of Abbreviations and Definitions

Throughout the thesis several abbreviations and concepts are used. Table 1 lists some of these along with their definitions.

*Table 1. Table of abbreviations and definitions.*

<table>
<thead>
<tr>
<th>Abbreviation/Concept</th>
<th>Definition/Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARMG</td>
<td>Another maintenance group at Scania IT, separate from xMG.</td>
</tr>
<tr>
<td>Community of practice</td>
<td>“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 on an ongoing basis” (Wenger, et. al., 2002, p. 4).</td>
</tr>
<tr>
<td>Cultivation</td>
<td>A management strategy for communities of practice suggested by Wenger et. al (2002), where management creates an environment where communities of practice can thrive.</td>
</tr>
<tr>
<td>Developer</td>
<td>An employee that creates and builds software.</td>
</tr>
<tr>
<td>Explicit knowledge</td>
<td>Knowledge which can be articulated and coded into artefacts.</td>
</tr>
<tr>
<td>Formalized community of practice</td>
<td>A community of practice with aspects of a formal workgroup.</td>
</tr>
<tr>
<td>HR</td>
<td>Human resources. A department that deals with questions regarding the employees of a company.</td>
</tr>
<tr>
<td>Junior developer</td>
<td>A developer with limited experience.</td>
</tr>
</tbody>
</table>
Organization

In this study “organization” refers to a company in its entirety.

Senior developer

A developer with a deep specialist knowledge within a specific field.

Social learning system

A social system where competence is historically and socially defined. It is a broad term that can refer to many groupings (e.g. a network, a community, an organization, an industry, or a consortium) (Wenger 1998; 2000).

Tacit knowledge

Knowledge which cannot be articulated or coded into artefacts.

The learning organization

“The organization which creates good conditions for learning among co-workers and which utilizes this in the organizations quest to impact and adapt to the surrounding world, with the purpose of achieving high efficiency.” (Granberg & Ohlsson, 2009, p. 51)

xMG

An umbrella term for three maintenance groups at Scania IT. Refers to group A, B, or C in this study (Figure 5).

ZPD

Zone of proximal development. The ZPD refers to what an individual can learn with assistance, which goes beyond what they can learn on their own (Vygotsky, 2001).

1.4 Outline of the Report

The report consists of six different sections, below is a summary of each chapter to serve as a guide for the reader.

Theoretical Background: Chapter 2 introduces the theoretical background of the study through a critical perspective. Expected contributions of the study are also discussed.

Background at Scania IT: Chapter 3 gives an overview of the contextual setting for the case study. An introduction to the company is followed by an account of their work with maintenance groups. Finally, the formality of the studied maintenance groups is discussed considering the theoretical background in chapter 2.

Method: Chapter 4 describes the method used in the study. Methodological approach as well as research design is explained. In addition, ethical considerations are discussed.

Results: Chapter 5 presents the results of the data gathering and initial analysis. Data is presented through the semantic themes and coding patterns that were discovered in the initial analytical process.
**Analysis:** In Chapter 6 the results from chapter 5 are further analyzed with help of the theoretical background presented in chapter 2. Latent themes and underlying processes are discussed and both research questions are answered.

**Discussion:** Chapter 7 summarizes the results of the study and discusses the trustworthiness of them and their possible implications for both IT organizations and education. Finally, further research is suggested.
2 Theoretical Background

In this chapter the theoretical background of the study is presented. Four main branches are explored through a critical perspective. And finally, the expected contributions of the study are discussed.

The theoretical background of the study consists of four main branches:

- Communities of practice
- Organizational learning
- Knowledge management
- Perspectives on learning

Perspectives on learning, organizational learning and knowledge management are related in the sense that organizational learning and knowledge management often reflect (intentionally or otherwise) different perspectives on learning. Communities of practice for example, is a theory that today lies mainly within the field of organizational learning, but which stems from the sociocultural perspective on learning (Wenger, 1998; Wenger 2000). Figure 2 shows an illustration of how the different theoretical branches of the study are connected.

![Figure 2. The relationship between the theoretical branches of the study.](image)

2.1 Communities of Practice

Communities of practice were originally introduced by Lave and Wenger (1991) in a study about apprenticeships as a new approach for understanding situated learning (Cox, 2005; Roberts, 2006). Brown and Duguid (1991) then further developed the concept, mainly focusing on the community of practice as a tool for solving new problems and acquiring new knowledge within an organizational setting (Cox 2005). Wenger (1998) went on to focus on identity, trajectories of participation and the dynamic operations of communities of practice (Cox, 2005; Roberts, 2006). Finally, Wenger et. al. (2002) marked a significant change in the discourse of communities of practice theory (Cox, 2005). Here the community of practice
shifted from being a somewhat general approach for understanding situated learning to becoming a managerial tool within an organizational context.

Neither Lave and Wenger, nor Brown and Duguid provide a definition of the community of practice (Cox, 2005). However, Wenger (1998, p. 126) defines the community of practice through three dimensions; “a community of mutual engagement, a negotiated enterprise and a repertoire of negotiable resources accumulated over time”. He also lists key characteristics of a community of practice, which indicate that one has formed (Table 2).

Table 2. Key characteristics of a community of practice (Wenger, 1998, p. 125-6, reproduced)

<table>
<thead>
<tr>
<th>Characteristic</th>
</tr>
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<tbody>
<tr>
<td>Sustained mutual relationships – harmonious or conflictual</td>
</tr>
<tr>
<td>Shared ways of engaging in doing things together</td>
</tr>
<tr>
<td>The rapid flow of information and propagation of innovation</td>
</tr>
<tr>
<td>Absence of introductory preambles, as if conversation and interactions were</td>
</tr>
<tr>
<td>merely the continuation of an ongoing process</td>
</tr>
<tr>
<td>Very quick setup of a problem to be discussed</td>
</tr>
<tr>
<td>Substantial overlap in participants’ descriptions of who belongs</td>
</tr>
<tr>
<td>Knowing what others know, what they can do, and how they can contribute to</td>
</tr>
<tr>
<td>an enterprise</td>
</tr>
<tr>
<td>Mutually defining identities</td>
</tr>
<tr>
<td>The ability to assess the appropriateness of actions and products</td>
</tr>
<tr>
<td>Specific tools, representations, and other artefacts</td>
</tr>
<tr>
<td>Local lore, shared stories, inside jokes, knowing laughter</td>
</tr>
<tr>
<td>Jargon and shortcuts to communication as well as the ease of producing new</td>
</tr>
<tr>
<td>ones</td>
</tr>
<tr>
<td>Certain styles recognized as displaying membership</td>
</tr>
<tr>
<td>A shared discourse reflecting a certain perspective on the world</td>
</tr>
</tbody>
</table>

Wenger et al. (2002, p. 4) instead define communities of practice as “…groups 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 on an ongoing basis.” They continue to say that communities of practice are a natural part of organizational life. That communities of practice will develop on their own, with some thriving regardless of whether they are recognized by the organization or not. Their communities of practice are characterized by three aspects: domain, community and practice. The domain is the area of interest that members of the community of practice have in common. The community consists of the interpersonal bonds which form through the collective learning the members of the community of practice engage in over time. Finally, the practice is what the members of the community of practice do together or separately because of the recourses produced through interactions in the community of practice. Wenger et. al. also say that communities of practice sometimes codify knowledge through artefacts (e.g. documentations, tools, procedures) and can do so successfully because they understand the needs of the practitioner.

2.1.1 Communities of Practice, Belonging and Identity

Wenger (1998; 2000) uses the term social learning system as a social system where competence is historically and socially defined. It is a broad term that can refer to many groupings (e.g. a network, a community, an organization, an industry, or a consortium). Furthermore he argues that; “communities of practice are the basic building blocks of a social learning system because they are the social ‘containers’ of competence that make up such a system” (Wenger, 2000, p. 229). He also addresses three modes of belonging to social
learning systems: engagement, imagination and alignment. Engagement means doing things together such as talking, helping each other, producing or using artefacts. The aspect of imagination concerns how we construct images of ourselves and the world. Finally, alignment means making sure local activities and proceedings are in alignment with the larger systems they interact with. Another important aspect of communities of practice, according to Wenger, is the role they play when forming identity. He says that “by participating in these communities, we define with each other what constitutes competence in a given context” (Wenger, 2000, p. 229)

2.1.2 Managing Communities of Practice

Wenger et al. (2002) argue that managers have been missing an understanding regarding the possibilities of social systems when it comes to fostering learning, developing competencies and managing knowledge. They say managers instead have discovered social systems for other purposes. One example is the team, which is an ideal structure for managers to assign project responsibility. Even though teams are excellent for producing short term business outcome, learning tends to be local and knowledge is easily lost when the team splits up or moves on to new projects. They also identify some differences between communities of practice and other social systems within an organization, Table 3 lists a few.

Table 3. Communities of practice in comparison to other social systems (Wenger et al., 2000, A snapshot Comparison, p. 142, reproduced).

<table>
<thead>
<tr>
<th></th>
<th>What is the purpose?</th>
<th>Who belongs?</th>
<th>What holds them together?</th>
<th>How long do they last?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communities of Practice</td>
<td>To create, expand and exchange knowledge, and to develop individual capabilities</td>
<td>Self-selection based on expertise or passion for a topic</td>
<td>Passion, commitment and identification with the group and its expertise</td>
<td>Evolve and end organically (lasts as long as there is relevance to the topic and value and interest in learning together)</td>
</tr>
<tr>
<td>Formal Work Groups</td>
<td>To deliver a product or a service</td>
<td>Everyone who reports to the groups manager</td>
<td>Job requirements and goals</td>
<td>Intended to be permanent (but lasts until the next reorganization)</td>
</tr>
<tr>
<td>Project Teams</td>
<td>To accomplish a specific task</td>
<td>People who have a direct role in accomplishing the task</td>
<td>The project’s goals and milestones</td>
<td>Predetermined ending (when the project has been completed)</td>
</tr>
<tr>
<td>Informal Networks</td>
<td>To receive and pass on information, to know who is who</td>
<td>Friends and business acquaintances, friends of friends</td>
<td>Mutual need and relationships</td>
<td>Never really start or end (exists as long as people keep in touch or remember each other)</td>
</tr>
</tbody>
</table>

One inherent difficulty surrounding communities of practice is the contradiction of trying to manage a social system that is organic and unstructured by nature. Wenger et al. (2002, p. 13) believes that communities of practice can be managed through cultivation. Meaning
management can create an environment where communities of practice thrive. This is achieved by “valuing the learning they do, making time and resources available for their work, encouraging participation, and removing barriers.” However, communities of practice as originally described by Lave and Wenger cannot be established by management (Roberts, 2006).

![Diagram](image)

**Figure 3.** Tension between formal and informal communities of practice.

Granberg and Ohlsson (2009) also question whether communities of practice can be organized and managed, they even argue that the learning organization (2.2, Organizational Learning and Knowledge Management) sometimes stands on a tension between freely formed communities of practice and communities of practice that management have requested (Figure 3).

### 2.1.3 Limitations, Risks and Critique of Communities of Practice

Wenger et. al. (2002) address some limitations and risks of the community of practice, even arguing that the characteristics which make a community an ideal place for learning also can limit its development and ultimately even prevent learning. They continue to discuss external and organizational limitations and risks. However, their conclusions have been critiqued for lacking in empirical evidence (Cox, 2005).

Some research into enablers and barriers for participation in communities of practice have been conducted. In 2009, Guldberg and Mackness studied an online workshop designed to align with Wenger’s perspective on communities of practice. They found five dimensions that either enabled or constrained participation. These were emotion, technology, connectivity, understanding norms and learning tensions. In particular, they found that learners can become unable to establish a connection and find themselves isolated from the community of practice if they do not understand culture, norms and learning tensions, do not have the necessary technical skills, or experience negative emotion. A similar study was conducted on “virtual knowledge-sharing communities of practice” at three different organizations (Ardichvili, Page & Wentling, 2003). Here employees often preferred to interact with their local and informal personal networks, rather than with the community of practice.

The concept of communities of practice has been criticized due to its vague nature, with critics saying it could be interpreted as almost any social system (Granberg & Ohlsson, 2009; Cox, 2005). Granberg and Ohlsson also critique the normative nature of the research, where the community of practice is seen as more or less functional in relation to the objectives of the organization. Roberts (2006) argues that the concept of communities of practice has changed a lot since it was introduced by Lave and Wenger and needs more research in order for its complexity to be understood. She calls for research of different sociocultural and organizational contexts and a return to Lave and Wenger’s original conceptualization.
2.2 Organizational Learning and Knowledge Management

Ackerman, Pipek, and Wulf (2003, preface) describe knowledge management as a field which “…examines how organizations can effectively manage, store, retrieve and augment their intellectual properties.” According to Huysman and de Witt (2003, p. 29) “…knowledge management is perceived as structural management initiatives within and by the organization, whereas organizational learning is seen as the process through which an organization (re)constructs knowledge.” In recent years, the field of knowledge management become very similar to the field of organisational learning but is more prominent within leadership and management research (Granberg & Ohlsson, 2009).

A prominent concept within organizational learning theory is the learning organization, which Granberg and Ohlsson (2009, p. 51) defines as “the organization which creates good conditions for learning among co-workers and which utilizes this in the organizations quest to impact and adapt to the surrounding world, with the purpose of achieving high efficiency”.

Easterby-Smith, Snell, and Gherardi (1998) offer some general criticism of the field of organizational learning. Due to a lot of researchers from different fields and with different approaches working in organizational learning, they claim the field is somewhat confusing with a lot of different terminology and divergences. Furthermore, they argue that previous research has had a tendency towards over-simplification and attribute this to researchers borrowing concepts of learning and organizations without carefully considering the implied prerequisites of those concepts.

2.2.1 Views of Knowledge

Granberg and Ohlsson (2009) and Edenius (2005) note a shift in knowledge management theory from a realistic view of knowledge to a social one. A realistic view of knowledge sees knowledge as a recourse and presumes that knowledge exists as an entity that can be transferred to and from different containers (e.g. the individual, documents and the intranet), without any major loss of meaning or value (Edenius, 2005). A social view of knowledge however, views learning as a social process. Individual learning is not deemed important unless it is coordinated in a meaningful way with others. The size and amount of knowledge in an organization is also not important. It is the ways in which knowledge is coordinated given social rules, procedures and technologies that matter (Edenius, 2003).

Wenger et. al. (2002) defines knowledge as being both explicit and tacit. Explicit knowledge is possible to “capture” through theoretical explanations. Tacit knowledge however is much more elusive. One example is riding a bicycle. If you can ride a bicycle you possess that knowledge, but teaching someone else to ride a bicycle without having them actually ride the bicycle is very difficult. The knowledge of riding a bicycle is tacit, it lies within the very process of riding the bicycle. Hansson (2013) also emphasizes the tacit aspects of knowledge, specifically of technological knowledge.

2.2.2 Can Knowledge be Managed?

Granberg and Ohlsson (2009) and Lustri, Muira, and Takahashi (2007) question whether knowledge can be managed at all. They find it paradoxical to try and control the creative and dynamic processes knowledge is made up of. Controlling this (e.g. by evaluation) might even stifle creativity and innovation. Instead they mean creativity and innovation should be encouraged through the environment, relations, structures, and policies throughout the organization. Wenger et. al. (2002) take a sociocultural perspective (2.3.3, The Sociocultural Perspective) when discussing the inherent difficulties of knowledge management:

“In short, what makes managing knowledge a challenge is that it is not an object that can be stored, owned, and moved around like a piece of equipment
or a document. It resides in the skills, understanding, and relationship of its members as well as in the tools, documents, and processes that embody aspects of this knowledge.” (Wenger et. al., 2002, p. 11)

2.3 Perspectives on Learning

Scientists are not in agreement about how the concept of learning should be interpreted and understood. It is a complex phenomenon that can be studied in many different aspects. Some researchers are interested in the neurochemical processes that occur in the brain when humans learn. Other researchers, such as psychologists and sociologists, are more interested in cognitive processes and behavior (Säljö, 2015). This section offers a short introduction of four prominent perspectives to understanding learning, together with some consequences and limitations of understanding learning through these perspectives.

2.3.1 Behaviorism

Behaviorism takes the stance that learning can be described in terms of changing behavior. By learning we adapt new behaviors and within behaviorism you only observe the visible; what the individual does. Behaviorists look at the response certain stimuli generate (Skinner, 2013; Illeris, 2006; Säljö 2015). How the individual feels, what their personal interests and ambitions are is deemed impossible to study in a scientific and objective way. However, critics of behaviorism say that it is far too limited to be applicable in real situations (Säljö, 2015).

2.3.2 Piagetian Constructivism

Constructivism is a philosophical branch concerning the epistemology of knowledge. Perhaps most prominent within educational science, is Jean Piaget (Säljö, 2015). Piagetian constructivism aims to explain the internal processes of the individual that behaviorism deems impossible do study. Within this constructivism the individual constructs an understanding of the surrounding world through learning. Furthermore, the individual adapts to the surrounding world, while at the same time seeking to adapt the surrounding world to serve her needs. This adaptation is achieved through cognitive processes that always aim to maintain a cognitive balance within the individual (Piaget, 2013; Illeris, 2006; Granberg & Ohlsson, 2009). Säljö (2015) explains that learning within Piagetian constructivism is an independent activity. The individual must discover the world for herself. Just listening to the constructions of others will not lead to learning in any deeper meaning. The individual must independently be engaged in activities which triggers the cognitive processes that enable true understanding.

2.3.3 The Sociocultural Perspective

As opposed to the Piagetian constructivism, where the individual must construct her knowledge independently, the sociocultural perspective claims that learning is done by appropriating knowledge through a communication with the surrounding world. Thus, your environment, both social and physical, have a great influence on your learning. Humans are said to be biological, social, cultural, and historical creatures. And to understand learning one needs to understand how these aspects affect the individual (Vygotsky, 2001; Säljö, 2015). Chiappetta and Koballa (2010, p. 72) emphasizes the social and cultural aspects of learning:

“Changing one’s mind is not simply a matter of rational decision making. It is a social process with social consequences. It is not simply about what is right and what is true in the narrow rationalist sense; it is always also about who we are, about what we like, about who treats us with respect, about how we feel about ourselves and others. In a community, individuals are not simply free to change their minds. The practical reality is that we are dependent on one another for our survival, and all cultures reflect this by making the viability of beliefs contingent on their consequences for the community.”
One of the most prominent concepts from the founder of the sociocultural perspective, Lev S. Vygotsky (2001) is the zone of proximal development (ZPD). The ZPD refers to what an individual can do with guidance, which goes beyond what they can do on their own (Figure 4).

Figure 4. The zone of proximal development (ZPD).

Another important aspect within the sociocultural perspective is the belief that we mediate the world around us through artefacts, such as language, tools, books, and computers (Vygotsky, 2001; Säljö, 2015).

2.3.4 Pragmatism

Pragmatism (within educational science) has a lot in common with the sociocultural perspective (Säljö, 2015). However, pragmatism takes a rather political (democratic) view of knowledge. The stance of pragmatism is that knowledge is neither constant, nor absolute. What is scientifically true changes and evolves over time and therefore learning is not just about memorizing facts and solutions; products of scientific research. Learning is also about understanding the processes which result in knowledge (Dewey 2004; Öhman, 2014; Säljö, 2015). Only by understanding how knowledge is produced can we make educated decisions in a world where information is unlimited. The concept of “learning by doing” is also significant within pragmatism (Dewey 2004; Öhman, 2014; Säljö, 2015).

2.3.5 Learning in Working Life

Most researchers interested in learning focus on children and the scope of their research often lies within the context of an educational environment, such as schools. However, some have taken an interest in the learning process of adults in working life. For instance, Illeris (2004) identifies six dimensions of learning in working life. One of them is concerned with having enough time and energy for learning:

"Finally, the learning possibilities also depend on the scope and nature of stresses and strains that the work involves. When the work makes high demands with respect to space and intensity, the learning possibilities are worsened because there is neither time nor energy for learning" (Illeris, 2004, p. 35).
2.4 Expected Contributions of the Study
Through this report, I hope to offer some conclusions, supported by empirical evidence, about enabling factors for learning through the formalized community of practice in an organizational setting. The objective is neither to evaluate, nor simplify, but rather to question and problematize. Hopefully the results contribute to clarify one section, albeit a small one, of the diverse and complex research area that is communities of practice.
3 Background at Scania IT

The following chapter is an overview of the contextual setting of the case study at Scania IT. An introduction to the company Scania IT is followed by an account of their work with maintenance groups. Finally, the formality of the xMG maintenance groups is discussed considering the theoretical background in chapter 2.

Scania IT is a wholly owned IT subsidiary of the international truck manufacturer Scania AB. Scania IT was established in 2012, however Scania AB has had an IT department/subsidiary since 1986. Scania IT has, as of now, 900 employees and 600 consultants. Business is mainly conducted in Sweden, France, the Netherlands, Belgium, India, and in Latin America. During the fall of 2015 Scania IT went through a reorganization and transformed from a technology oriented organization to a process oriented one. This meant that developers working with the same technology were sitting together before the reorganization. But after the reorganization, they were spread out in different teams across the entire organization.

3.1 Maintenance Groups

At Scania IT there are several cross-functional groups who are concerned with improvement and maintenance of certain technologies. These are commonly referred to as maintenance groups. Included in this study are three of these groups, collectively known as xMG. They are three separate groups (A, B, and C) that are focused on different technologies (java, .NET, and frontend), but they share the same structure, routines, and coordinator. The three xMG groups have about ten members each from different teams in the organization. Some teams have several representatives in xMG and since there are about a hundred teams in the organization there are also many teams which do not have any representatives in xMG (Figure 5).

Figure 5. The structure of xMG.

Members of xMG are generally developers or systems architects, both senior and junior, employees and consultants. Members are usually handpicked by the coordinator. He uses his personal network and receives recommendations. Managers can also sometimes request to have one of their team members included in xMG. To involve more junior developers and boost attendance many former interns were also included in one group. Participations is voluntary and members can quit if they no longer want to be part of the group. Members can also be asked to leave, or take time off if they cannot contribute (often in terms of time or
effort) as much as they are expected to. This is decided together with the member and often happens when members have a high work load in their regular teams and feel torn between xMG work and their teams' work.

Each xMG group have biweekly meetings that last between four and five hours. The first part is used for a traditional meeting, where current topics regarding the group's technology and the organization are addressed. After each meeting the coordinator prepares meeting minutes which are distributed to members in the organization who are included on a mailing list. The meeting minutes are also posted on a social platform within the organization. The second part of the meetings is used for working together on the group’s projects. These projects range from writing wiki pages, creating reference architectures, composing best practices or preparing educational activities called focus days. On focus days, xMG invite developers from the organization to take part in interactive activities that are meant to educate and inform developers of xMG projects. Another objective of focus days is to create networks within the communities surrounding the different technologies.

xMG report to department managers and the coordinator, who also reports to the department managers as well as his group manager (Figure 6). For evaluation, statistics regarding attendance is mainly used. Sometimes the experiences of members and the coordinator are also used to evaluate xMG. 15-20 % of an employee’s time is meant to be used for meetings, administration and skill development. Members of xMG are expected to use that time for xMG meetings and projects.

Figure 6. The management structure of Scania IT.

3.2 xMG: A Formalized Community of Practice

xMG displays many of Wenger’s (1998) characteristics. For example, they have sustained mutual relationships and shared ways of engaging. They also have specific tools, representation and artefacts. Using Wenger's et. al. (2002) descriptions of social systems (Table 3), xMG could be defined as communities of practice with aspects of formal work groups. For instance, they do not evolve organically, but are held together somewhat by passion and commitment. They also report to management, but their objective includes to create, expand, and exchange knowledge. This puts them somewhere between a formal work group and an informal community of practice (Figure 7). One could say that they are
“formalized”, in the sense that management have tried to implement what is usually seen as an informal structure. A “pure” community of practice, as envisioned by Lave and Wenger is informal, totally driven by the members, and cannot be implemented by management. However, as seen in Wenger's later works, communities of practice have come to refer to a social structure management can use for knowledge management, which xMG is an example of. Therefore, xMG will continuously be referred to as a “formalized community of practice” in this report.

Figure 7. The formality of xMG.
4 Method

This chapter describes the method used in the study. Methodological approach and research design is explained and ethical considerations are discussed.

4.1 Methodological Approach

The methodological approach was centered around understanding the study’s research questions:

i) What enabling factors exist for learning through formalized communities of practice within a large IT organization?

ii) What perspectives on knowledge and learning are prominent within a large IT organization?

Research was conducted as a qualitative case study through mixed methods using a survey and interviews, as well as some additional data gathering. This approach was chosen to obtain a holistic understanding of the research questions (Denscombe, 2009). The interviews resulted mainly in qualitative data and the survey generated both qualitative and quantitative data. The research questions are of a general nature. However, the research was conducted as a case study at a specific organization. Therefore, the transferability of the results will be further discussed in section 7.1 (Trustworthiness).

4.1.1 Analytical Approach

The quantitative data collected was both on a nominal and an ordinal scale level. Meaning, answers could either be identified as belonging to specific categories or be positioned on a scale (Denscombe, 2009). Analysis consisted of descriptive statistics, where frequency calculations were done of pre-defined categories in the data sets. Categories were pre-defined since they were “built in” as nominal or ordinal answer options in the survey. The survey elicited a lot of interesting quantitative data, of which only some could be used to answer the research questions. For instance, one could have used analytical statistics to examine whether consultants more often felt part of a developer’s network outside of the organization than employees. However, such questions were deemed to lie outside the scope of this study.

Qualitative data was analyzed through inductive thematic analysis. Meaning themes were not given initially, but rather constructed from the data through the analytical process (Braun & Clark, 2008). To begin with, all qualitative data (interview transcripts, text answers from the survey, observational protocols, and xMG documentation) was carefully read several times and initial codes were generated. Then semantic themes, which are explicit themes that do not extrapolate beyond what the participant has answered (Boyatzis, 1998; Braun and Clark, 2008), were identified and reviewed. Finally latent themes, that imply more than what is explicit in the data (Boyatzis, 1998; Braun and Clark, 2008), and underlying processes emerged that could be interpreted and discussed through the theoretical background. Here, results from the quantitative analysis were used to support conclusions and achieve a holistic understanding of the research questions.

The analytical process, as described above, appears linear. However, the analysis was conducted as an iterative process where I cycled between the data sets, coded extracts and written analysis, in accordance with how thematic analysis is described and recommended by Braun and Clark (2008).
4.2 Research Design

To understand enabling factors for learning through formalized communities of practice within a large IT organization, xMG was studied from three different aspects. The developers at Scania IT, the members of xMG and management connected to xMG (Figure 8).

![Figure 8. Three aspects of the study.](image)

A survey was used to gain an understanding of the developers’ current social learning systems in the organization. The survey was also used to gain an understanding of the developers’ awareness of, engagement with, and opinion of xMG. Semi-structured interviews were conducted with members of xMG and managers to understand their experience of working with formalized communities of practice. All participants in the study were also asked the question: “What, in your opinion, makes a good developer?” Either in an interview or through the survey. The answers to this question, along with other answers and proceedings for knowledge sharing, were used to find prominent perspectives on knowledge and learning within the studied organization. When using a mixed methods approach, Denscombe (2009, p. 157) emphasizes two important questions the researcher must consider:

- In what order should the alternative methods be used?
- Should some of the alternative methods used be more important than others?

For this study, observation was the first method to be used. Initially, the study was meant to mainly focus on the internal communication within the xMG groups. However, for various reasons the scope shifted to include the organizational context xMG operates in. At this point, observation was no longer adequate to gain a holistic understanding. Here the survey and interviews were introduced. The survey was open while interviews were conducted, meaning they ran simultaneously. However, they operated on slightly different levels. The survey was designed to capture information on a macro level by reaching many developers across the entire organization, whereas interviews garnered data very close to the xMG (i.e. on a micro level). This design was chosen to acquire a thorough account from many perspectives (Denscombe, 2009). The survey and interviews have equal importance in the study. However, since this was a qualitative study the qualitative data was the main focus for the analysis. The quantitative data was used to support and further understand the results from the qualitative analysis.

4.2.1 Survey

An online survey was constructed using Google Forms, an online tool. The choice to use an online survey was made in order to make it easier to distribute (Denscombe, 2009) and thus, reaching more developers. Qualitative questions, such as “What, in your opinion, makes a
“Are you a good developer?” and “What is your opinion of xMG?” were mixed with quantitative questions (e.g. “Are you an employee or a consultant?”, “How often do you read meeting minutes from xMG?”). Questions in the survey were both general, regarding social learning systems within the organization and specific towards xMG. Since group C (Figure 5) only had existed for a couple of weeks when the survey took place, it did not include questions about group C. A full list of the questions included in the survey can be found in Appendix A.

When participants started the survey, they received an introduction to the purpose of the study and additional information about their anonymity. They did not receive any further instructions other than what was implicitly contained in the questions themselves. Part 1 (Figure 9) consisted of questions regarding social learning systems in the organization. Part 2 concerned general information, where the final question was: “Which type of developer do you mainly identify yourself as?”. If participants answered that they mainly worked with technology A, they would only answer questions regarding group A in part 3. If they instead answered that they mainly worked with technology B, they would only answer questions about group B in part 3. Finally, if they answered that they worked a technology other than A or B, they would answer questions about both groups. The questions for group A and B were exactly the same, apart from the group name, which is noted as “xMG” in Appendix A.

![Diagram of survey construction]

Figure 9. Construction of the survey.

The survey consisted of 16 – 23 questions, depending on which path the participant took in part 3. If a participant didn’t know anything about xMG they were encouraged to leave part 3 blank. All questions were optional to answer and the survey took between 3-5 minutes to complete. The somewhat complicated construction of the survey, with different paths in part 3, was chosen to make the survey short and easy to complete since that can increase the response rate (Denscombe, 2009).

The survey was developed iteratively with five different versions having been tested before the final version was distributed. Initially it was sent to all group managers in the organization and they were asked to distribute the survey to developers in their teams. The same managers
also received a reminder one week later. In addition, a “channel message” (an organizational e-mail) with the survey was sent from human resources (HR). The survey was also distributed through e-mail lists used for sending out xMG meeting minutes. And finally, it was posted on the organization’s social platform. When the survey had been open for three weeks it was noted that few developers, who defined themselves as mainly working with technology A, had responded. Therefore, members in group A were asked to distribute the survey to people they knew in the community. This meant that the sampling for the survey was non-statistical and a mix between subjective and snowball sampling (Denscombe, 2009). This is not the norm of traditional research within the Social Sciences. However, one reason for using non-statistical sampling for small qualitative studies is the idea that the research process is a process of discovery, rather than a testing of hypotheses (Denscombe 2009).

In total the survey received 156 responses and of these 148 were deemed valid. A response was deemed invalid if it was blank or from a manager. It was somewhat difficult to assess the response rate since the term “developer” was rather unclear within the organization. HR had 132 employees listed as developers, but the actual number could differ since some employees with the title developer may do more administrative work and not define themselves as developers. Systems architects may also see themselves as developers, although they do not have that word in their title. In total 80 employees who defined themselves as developers took part in the survey. Consultants were not listed at HR, therefore it was very difficult to know how many consultants were working as developers at the time. In total 68 consultants took part in the survey.

4.2.2 Interviews
Semi-structured interviews were conducted one-on-one with members of xMG and management. This approach was chosen in order to give interviewees the opportunity to think, reason, and elaborate about the questions (Denscombe, 2009). All interview questions can be found in Appendix B. These were used as a guide, but the strategy of using semi-structured interviews meant that topics and questions could vary (Denscombe, 2009).

Only members from group A and B (Figure 5) were interviewed for the same reason as to why direct questions about group C were not included in the survey. Managers sometimes answered questions about xMG as a whole and sometimes about specific groups. Most interviews were conducted in Swedish and some in English. Quotes in the report from the Swedish interviews have been translated and are followed by the notation “author’s translation”. xMG members were interviewed after one of their meetings and all members who were present that day were asked to participate. Managers were selected from each level in the management structure (Figure 6) on the criteria that they had, or used to have, a direct connection to one or more xMG groups. In total 9 xMG members and 5 managers were interviewed (Table 4). In addition, the coordinator of xMG and a coordinator for another formalized community of practice in the organization were also interviewed (Table 5). Interviews were sound-recorded with permission from the interviewees and orthographic transcripts (Braun and Clark, 2008) were made for the analysis.
### Table 4. Main interviewees.

<table>
<thead>
<tr>
<th>Main Interviewees</th>
<th>Number of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>xMG Members</td>
<td>9</td>
</tr>
<tr>
<td>Group Managers</td>
<td>1</td>
</tr>
<tr>
<td>Section Managers</td>
<td>1</td>
</tr>
<tr>
<td>Department Managers</td>
<td>2</td>
</tr>
<tr>
<td>CEO</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 5. Other interviewees.

<table>
<thead>
<tr>
<th>Other Interviewees</th>
<th>Number of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>xMG Coordinator</td>
<td>1</td>
</tr>
<tr>
<td>ARMG Coordinator</td>
<td>1</td>
</tr>
</tbody>
</table>

### 4.2.3 Additional Data Gathering

In addition to the survey and interviews, some xMG material was gathered and four xMG meetings and one focus day was observed. The xMG material that was gathered included an original framework and goals that were formulated by xMG. Observations were open and systematic, where the observant had a discrete placement and quietly took notes in order to minimize the Hawthorne effect (Denscombe, 2009). This additional data gathering had a smaller role than the other methods used, but helped to achieve a holistic perspective of the case study. Data gathered was mainly qualitative and analyzed as described in 4.1.1. (Analytical approach) In particular, the xMG material was used to understand the objective of xMG and to identify semantic themes in the initial thematic analysis. The observations were then used to identify perspectives of knowledge and learning in xMG proceedings as latent themes further on in the thematic analysis.

### 4.3 Ethical Considerations

Research conducted in this study followed the Swedish Research Council’s principles for ethical research (Vetenskapsrådet, n.d.). All participants were informed that their participation was optional, anonymous, only to be used for this study, and could be withdrawn at any time. For reasons of anonymity, the survey did not log any answers. Also, in order to preserve anonymity all managers are referred to as “manager” in this report, regardless of their position in the organization (group manager, CEO etc.). The survey and interviews contained specific questions about group A and B. To preserve anonymity, all group names have been replaced by “xMG”, in this report. And the technologies Group A and B worked with are referred to as “technology A” and “technology B”
5 Results

Chapter 5 presents the results of the data gathering and initial analysis. Data is presented through the semantic themes and coding patterns that were discovered in the initial analytical process.

5.1 Developers
Developers answered a survey with questions regarding their social learning systems and xMG. Their answers are presented below in terms of social learning systems, relationship to xMG, and professional identity and ideals.

5.1.1 Social Learning Systems
Participants were asked (a) if they felt there existed a developers’ network/community in the organization. And if so, (b) did they feel part of that network/community? 147 participants answered question (a) with 67% reporting that there exists a developers’ network. Among those, 54% also said they felt part of that network/community (Figure 10).

Figure 10. Developers network/community within the organization.

Participants were also asked if they felt part of a developers’ network/community outside of the organization. 149 participants answered that question and 35% said that they did feel part of a developers’ network/community outside of the organization (Figure 11).

Figure 11. Developers’ network/community outside of the organization.
When asked what participants did when they needed help with programming/coding/development, the most common answer contained “google”, “internet”, “forum”, “net”, “stackoverflow”, or “search”. 55 answers contained “colleague(s)” or “co-worker(s)” and 20 answers also included “close”, “closest”, “near”, “nearest”, or “team”. 8 answers did not fall under either category A, B, or C (Table 6).

<table>
<thead>
<tr>
<th>Total</th>
<th>Answers containing google, internet, forum, net, stackoverflow, or search</th>
<th>Answers containing colleague(s) or co-worker(s)</th>
<th>Answers containing close, closest, near, nearest, or team</th>
<th>Answers which do not fall under either category A, B, or C</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>88</td>
<td>55</td>
<td>20</td>
<td>8</td>
</tr>
</tbody>
</table>

5.1.2 Relationship to xMG
To assess the relationship participants had to xMG, their awareness, engagement and opinion was evaluated.

5.1.2.1 Awareness
Participants who described themselves as developers mainly working with technology A or technology B, were asked to describe their awareness of group A and B respectively. They were asked to position themselves on a scale where 1 meant that you had never heard of the group and 5 meant that you were a member of the group. 74 participants answered the question and among those, 73 % rated their awareness as 3 or 4 and 27 % rated their awareness as 1 or 2. Some members (13) also answered the question (Figure 12).

![Awareness within the Community](Image)

*Figure 12. Awareness within the community.*
Figure 13 shows answers to the same question. However here the participants identified themselves as mainly working with a different technology other than A or B. 62 participants answered the question, both for group A and group B, giving 124 answers in total. In 75% of the answers participants rated their awareness as 1 or 2 and in 23% of the answers participants rated their awareness as 3 or 4. In 3 of the answers participants defined themselves as members.

5.1.2.2 Engagement

Another aspect of the relationship between the developers and xMG is how much developers were engaged in the practice of xMG. Here only participants who mainly identified themselves as working with technology A or B were considered. Figure 14 shows how often participants perceived that they read meeting minutes from their respective xMG group. 67 participants answered the question. 18% said they never read meeting minutes, 43% said they read them sometimes, 13% said they read them often and 25% said they read meeting minutes whenever they were published.
Participants were also asked if they had used xMG material, such as reference architectures, instructions, and wiki-pages. 66 participants answered the question. 23 % said they had used xMG material, 65 % said they had not and 12 % said they did not know if they had used xMG material (Figure 15).

![Graph showing meeting minutes engagement](image)

**Figure 14.** Engaging through meeting minutes.

5.1.2.3 Opinion

75 participants also gave their opinion of the xMG groups. These were coded into three different categories; positive, negative, and neutral (Table 7).

![Pie chart showing xMG material usage](image)

**Figure 15.** Engaging through other artefacts.

Table 7. Opinions of xMG.

<table>
<thead>
<tr>
<th></th>
<th>Positive</th>
<th>Negative</th>
<th>Neutral</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>36</td>
<td>18</td>
<td>21</td>
<td>75</td>
</tr>
</tbody>
</table>
Most developers who gave their opinion on xMG had a positive or neutral opinion of the groups. Among the perceived benefits, knowledge sharing and unity, were common themes:

“I believe they are doing a great work.”

“Good to have somewhere to gather central technology questions.”

“Great opportunity to share knowledge.”

“It’s a great initiative and will probably help with knowledge spread.”

Among the more negative opinions a central theme was the belief that xMG mainly benefited the members and that their work did not get implemented in the organization:

“Mainly skill building for the members. Not sure how much their work are actually put to use in ‘real’ projects or system maintenance.”

“It’s a nice initiative but it’s open to a limited audience.”

“They should lower their ambition. They are very oftenly up in the ‘clouds’.”

“It’s like a secret club where some developers and architects discuss technology, come up with ideas and maybe even future plans and then it stays there.”

Some participants also expressed a wish to be more included in xMG:

“I never get a chance to participate in the xMG.”

“Every team should have one member in xMG. xMG should listen to all the teams.”

“I would like to be involved. I wish I knew how to get involved.”

5.1.3 Professional Identity and Ideals

Answers to the question “What, in your opinion, makes a good developer?” were coded in terms of content (knowledge a good developer should know) and skills of a good developer. Finally, central characteristics of the ideal developer were derived.

Table 8. Content. Knowledge a good developer should have.

<table>
<thead>
<tr>
<th>Content</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>“sound technical skills”</td>
</tr>
<tr>
<td></td>
<td>“technical experience”</td>
</tr>
<tr>
<td></td>
<td>“…have good technical knowledge.”</td>
</tr>
<tr>
<td>Dependencies</td>
<td>“…an understanding of impact and dependencies to the surrounding sources.”</td>
</tr>
<tr>
<td></td>
<td>“Considers the surrounding environment for which he/she is developing for.”</td>
</tr>
<tr>
<td></td>
<td>“In order to develop a robust system, developers has to be equally aware of the DOMAIN and technology.”</td>
</tr>
</tbody>
</table>
Having knowledge about technology, dependencies and business were important to many developers (Table 8).

**Table 9. Skills of a good developer.**

<table>
<thead>
<tr>
<th>Skills</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-solving</td>
<td>“solution to every problem”</td>
</tr>
<tr>
<td></td>
<td>“Good at solving problems…”</td>
</tr>
<tr>
<td></td>
<td>“Driven by a ‘solution’ rather than ‘technology’.”</td>
</tr>
<tr>
<td>Seeing the bigger picture</td>
<td>“To be able to see the bigger picture (business side, service consumers, end users).”</td>
</tr>
<tr>
<td></td>
<td>“Only technology skills never made the best systems.”</td>
</tr>
<tr>
<td></td>
<td>“…broad level of thinking while working on any solution.”</td>
</tr>
<tr>
<td>Social skills</td>
<td>“Someone who can make appropriate decisions but also be able to accept that other developers do not always think like you.”</td>
</tr>
<tr>
<td></td>
<td>“Good relationship with people is also essential, since the main role of a developer is to understand the need and make it real.”</td>
</tr>
<tr>
<td></td>
<td>“…helpful to other developers.”</td>
</tr>
</tbody>
</table>

When it came to skills of a good developer, problem-solving skills, seeing the bigger picture and social skills were emphasized (Table 9).

Without any competition, the most common answer had to do with being adaptable and constantly acquiring new information and knowledge. Below are some examples of answers that reflect this position.
“The will to learn new things.”

“Open minded and hungry for knowledge.”

“quick learner”

“...ability to learn and understand new things.”

“acute learning curve”

“Good capacity to explore and research new stuff.”

“Constantly learning new things and keeping oneself updated through forums.”

“accept and adapt to changes”

5.2 xMG

xMG members were asked in interviews about the objective of xMG, what drove them to continue to be a part of xMG, what their greatest challenges were and what makes a good developer. Below, their answers are presented in terms of objective, motivation, challenges, and professional identity and ideals.

5.2.1 Objective

The original framework document, which was composed by the responsible manager at the time when group A was formed, lists the following topics of responsibility:

- Maintain the technology A roadmap (which guidelines, patterns, support etc. we should work with)
- Specify requirements towards technology A Tool Maintenance
- Recommend courses and other activities for the technology A Development Network
- Bring information and questions to and from the technology A improvement groups and/or organizational groups.
- Support and drive improvement activities in the technology A area.”

Group B also uses this document. In addition, the members of group A defined their own objective and areas to work with by the following more general points:

- Effective development
- Ease of maintenance
- Attractive workplace
- Developer community

In interviews the members of group A and B were asked to describe what they felt the objective of their respective maintenance group was. Many initially referred to the areas and points listed above, but they also elaborated.

**Member:** “Yeah, but also that it should be an attractive workplace and stuff like that. And you do help with that by removing some problems and such. ‘No, you don’t have to redo this thing because we already did it this way.’ You only have to pull in these things and then you can solve the real problem. Put your energy where you need to instead of doing the groundwork.’ Then you also have to get people to do it, but that’s a different story” (author’s translation)

**Member:** “If you need to start with something new there should be a place that perhaps you can turn to. Either if it’s something we can help with or if we can point someone in the right direction. And then there are also questions and stuff from managers so they have somewhere to turn.” (author’s translation)
5.2.2 Motivation
When members were asked about their motivation to continue to attend xMG meetings, three themes emerged. These were; having the ability to impact and improve the organization, learning new things, and expanding one's personal network:

Member: “I think that everything one does, everything we do, doesn't have to stay in a corner with a team. I want it to have a greater momentum so it can reach more people. I think xMG is a way to spread things faster and not specifically work with the type of problems that only affect the team.” (author’s translation)

Member: “Because I learn a lot and there is an awful lot that I do not understand, so then I get a push to understand things that I feel I need to learn beyond what I learn at my department. Because that’s kind of specific, this is much broader…” (author’s translation)

Member: “I get to hear what’s new, what our best practices are and I also become a part of a network. I think that's very important when you're a developer. It's really easy to sit on your island somewhere and work, but when you start to talk to someone and share you become a better developer.” (author’s translation)

5.2.3 Challenges
Members also talked about the challenges they experience in xMG.

5.2.3.1 Getting Enough Time
When asked about the challenges xMG face, a lack of time was a common answer.

Member: “We know what we want in so many situations, but actually getting it done is a real challenge because we all have to sit in another project at the same time.”

Member: “Currently I believe it is to get everyone to attend xMG. It is hard to find time, today we're only three. And it is hard to get group managers to think it is important.” (author's translation)

Also, finding motivation to spend time on xMG meetings and projects was difficult, as one member put it:

Member: “The xMG deals with typically longer term solutions, whereas project work will give something within a week, or a day, or an hour. But the xMG thing... it’s all about visions. How do you convince someone ‘for us to achieve this vision in six months or a year, I need to put down one month’s work? Everybody’s going to say no, including myself.”

Another member attributed the difficulty of obtaining resources to challenges measuring the effect of xMG:

Member: “It’s difficult to measure and say that something gets better. Well, why was that? Was it because of xMG or was it because there was a reorganization or everyone’s salaries were raised? And before we can do that it is difficult to get... to give motivation to get resources.” (author's translation)

5.2.3.2 Support and Mandate
When members talked about the role and mandate xMG have in decision making, such as deciding which development tools should be used, opinions differed. Some said the group had a lot of governing power:
Member: “Well, we also decide which technology that should be used at Scania... So, that is governing in its own way. I didn’t know that until recently, that it was these maintenance groups that did that. But apparently it is.” (author’s translation)

Others said xMG can make suggestions and be a resource of information but has no actual governing power:

Member: “... Some say we do, but if we look at it in reality one can also, quite frankly, say that no one cares about it, what xMG says. The groups may have said to themselves internally that they govern and decide how things are to be done. I don’t want to say that. I would instead say that we can be a cohesive place where you know there is a lot of relevant information about how things should be done.” (author’s translation)

Often members wanted more support from the organization:

Member: “Now it feels like xMG is a regular organization within Scania. We can have a lot of opinions, but maybe half will get out there. The other half is because there is no recipient, no owner. It’s up to me and the members and you don’t have a lot of power alone. I would like there to be more support in the organization for xMG in general.” (author’s translation)

Interviewer: “What are your greatest challenges?”
Member: “Well, it is the organization that still has a limited understanding of how software development works.” (author’s translation)

5.2.3.3 Formality and Exclusivity
Some members talked about formality and exclusivity as barrier for the groups.

Member: “They’re a bit too formal. That in itself is not a problem. The problem starts if we say that we should only have these three and that this is the only way to do these things. What is done here now, getting cohesiveness, spreading good things, focus days and so on. It’s a shame you only can do that in a formal group called ‘xMG’.” (author’s translation)

Member: “…you get picked for the xMG because you’re seen as a good developer. But I do not think being a good developer is a necessity for the xMG. In fact, I think, personally, it should be... Well, it should cater for everybody. I think anybody is welcome to come to the xMG, I think it should be like that because everybody actually has something to contribute. I think if we were to open up for everybody, then maybe barriers would fall down. Maybe we would get more done.”

5.2.4 Professional Identity and Ideals
The ideal developer for xMG members reflects many of the same skills and characteristics as the ideal developer of the developers in the organization. However, many members also emphasized the importance of sharing your knowledge:

Member: “And a willingness to share your knowledge in all possible ways.” (author’s translation)

Member: “You do not have to write the most effective code, but you have to be very open to searching for solutions. That also means that you share and spread the knowledge that you have, that I share with my colleagues and that we can be open and test ideas and thoughts.” (author’s translation)
Member: “Someone who can share knowledge, ask questions, and contribute to the network.” (author’s translation)

5.3 Management
Managers were asked in interviews about the objective of xMG, what their greatest challenges were, how they felt about the non-traditional evaluation methods, how they felt about informal networks, and what makes a good developer. Below their answers are presented in terms of objective, challenges, informal networks, and professional identity and ideals.

5.3.1 Objective
Managers were asked about what objective they wanted xMG to have.

5.3.1.1 Driving the Vision
When asked about the objective of xMG managers mainly wanted them to “drive the vision”, create unity and help to make and implement technical decisions:

Manager: “Partly I think it is to look at our visions. Where are we going with the vision we have? And then they should also show good examples and best practices within these areas and try to get that out in the organization, so that people start to adapt their architecture and so on. And learning quite simply.” (author’s translation)

Manager: “We should not make up our own stuff, we need to pick up speed by getting things served, reusing things.” (author’s translation)

5.3.1.2 Somewhat Governing
Some wanted them to have a governing role while others mainly wanted them to provide information. One manager said they could be governing as long as the decisions they made did not have any implications for finance or infrastructure:

Manager: “No, but I would like them to bring forth ideas and suggestions about technical choices. It could be governing as long as there are no outside implications, or how you want to put it.”

Interviewer: “How do you mean?”
Manager: “That it doesn’t... that it sort of doesn’t... If it is the kind of decisions that don’t bring up cost for infra or that sort of doesn’t have any implications. I mean like, to bring in Open Source components that don’t have a maintenance cost or create any sort of challenge. Then they are welcome to take that decision themselves. But otherwise I would like recommendations regarding the other questions, which databases to use or something like that.” (author’s translation)

5.3.1.3 Filling a Void after the Reorganization
Finally, there was a hope that xMG could help fill a coordination and communication void created by the reorganization:

Manager: “With the organizational setup we have now with technology A and B spread out over all the departments, the importance of cross-functional groups like these, regardless of whether it is technology A, B, or C, or D, or E, become very, very important. To meet across boundaries and try to define the playing field for how we work within these areas and what we want to control and what we don’t want to control.” (author’s translation)

5.3.2 Challenges
Managers also talked about the main challenges xMG face.
5.3.2.1  Delivery over Improvement
The main challenge managers addressed was the pressure of delivery which made it hard to prioritize improvement work, like xMG:

Manager: “...there is a very high pressure of delivery and we have a culture where we always put delivery ahead of this kind of work. So, that’s a huge challenge I think all improvement groups deal with.” (author’s translation)

Manager: “There is a business that always wants features and we try to work with quality and we try to work long-term. But the business isn’t always that interested in the long-term perspective. There is a delivery right now!!!(author’s translation)

Manager: “It’s those culture things, that our follow-up is hourly based. Meaning that the financial model often entails that we get evaluated in terms of hours. There isn’t really... it’s hard to make time for these things. New functionality has a very high priority and many feel a great loyalty to the delivery. That’s our greatest challenges.” (author’s translation)

5.3.2.2  A Different Structure
Some managers thought the structure of xMG needed to be updated:

Manager: “A lot of these things are very good when you come up with them and they solve several problems that existed in that very moment when they were founded. And it was a quite modern setup in that very moment. But then it’s easy, particularly if you haven't built in some form of self-learning in the structure. Then it can easily stay like that for five years. Maybe it has now... four years. And there sort of needs to be a retro on the structure itself, that the structure develops continuously.” (author's translation)

5.3.2.3  Evaluation
One manager said he would like more traditional ways of evaluating xMG. However, in general managers were not particularly bothered with current methods of evaluation:

Manager: “As long as people are interested in participating. Meaning, as long as my co-workers seem to think it adds something. As long as they go there more or less voluntary, I don’t think you need any other evaluation really.” (author’s translation)

Manager: “I don’t think it is particularly troublesome not to have key points of evaluation. I can see that the developers... When you talk to them... It’s so good this exists! So, then it feels pretty obvious to continue working with this.” (author’s translation)

5.3.3 Informal Networks
Managers were also asked how they felt about informal networks in the organization and most were very positive:

Managers: “That’s one of the strengths within Scania I think, the informal networks. It is good that they exist if all else should fail.” (author’s translation)

One manager said informal networks are good, but run a risk of becoming too static:

Manager: “I think it’s good when people look for inspiration in many places. There’s a risk that only the same people come and then it can become very static. I mean, if you send twenty Christians to a church very few are going to come out as Muslims.” (author’s translation)
Another manager also said he was in favor of informal networks as long as they did not compete with the formal ones:

Manager: “In general it is a positive thing when people get together and discuss a subject matter and exchange experiences, that’s very positive. But it shouldn’t be done at the expense of this kind of work (xMG).” (author’s translation)

5.3.4 Professional Identity and Ideals
The managers’ ideal developer had a lot in common with the ideal developer of the developers in the organization and the members of xMG. Understanding business, having knowledge and experience, and being willing to constantly acquire new knowledge was deemed very important:

Manager: “It is a knowledge bank, it is experience. It is to have an overview and an understanding of what is needed... Understanding what’s... to make those choices all the way. To understand how it’s all connected, but still know what needs to be delivered. And to have a skill, a knowledge bank that’s so good you understand... Because technology moves so fast. They are very interested; they teach themselves in the evening and code themselves. Well, those people are on a different level.” (author’s translation)

They also emphasized versatility and being able to do many things in a team. The term “T-shaped” occurred more than once:

Manager: “I think a good developer also is prepared to do other things in a team than just development. They will do testing when that is required, they will create test automation when that is required, they will take care of requirement specifications when that is required and so on. So, you are a bit more, you are T-shaped kind of.” (author’s translation)

Manager: “It’s someone who’s T-shaped, that has a depth in something and is good at some aspect of development. Like frontend, backend, or test for example. But who also really can be able to have a width and do the tasks that are needed at the moment. That’s really important.” (author’s translation)
6 Analysis

In this chapter the results from chapter 5 is further analyzed with help of the theoretical background presented in chapter 2. Latent themes and underlying processes are discussed and both research questions are answered.

6.1 Social Learning Systems
Developers in the studied organization were involved in many different social learning systems. However, as noted by Wenger et al. (2002) and Ardichvili et al. (2003), these tended to be local since developers chose to mainly engage with close co-workers or within the team. By searching the internet, developers also engaged with large external and virtual communities (e.g. stackoverflow).

![Figure 16. xMG and informal networks.](image)

As Granberg and Ohlsson (2009) discussed, there seems to be some tension between informal and formal networks. Managers had an overwhelmingly positive opinion of informal networks, although there was some concern that they might be too static or claim the domain of xMG. Developers mainly had a positive or neutral opinion of xMG, however only 23% of developers in the community had engaged with xMG by using their artefacts. That could be because one of the groups had not yet created that many artefacts. But it could also be because developers felt a stronger sense of belonging with their local social learning systems, than with xMG. For instance, among the more negative opinions of xMG was a feeling of not being included:

“Every team should have one member in xMG. xMG should listen to all the teams.”

6.2 Objective
When it came to the objective of xMG, managers leaned more towards a governing objective. They saw xMG as an organ that could provide information, “drive the vision”, and help to implement governing decisions. Members also wanted to use xMG for governing, but in a much more subtle way. They were focused on creating unity for the purpose of helping other developers and creating “a more attractive workplace”. Building a network within the community surrounding their technology, was also a high priority for them.

6.2.1 Who Should Learn?
As Wenger (1998; 2000) argued, a lot of learning can occur through communities of practice, but who should learn through the formalized community of practice? Managers, members, or developers? The members will learn regardless of the objective. During meetings members gained new perspectives and learned things they would not have discovered on their own or within their teams. Thus, participating in xMG helped them reach their ZPD (Vygotsky, 2001). Managers need information in order to make informed decisions in their daily work and a
formalized community of practice could help them do that. When asked who should be in xMG, one manager said:

“I don’t really think I should decide who should sit there, but it really has to be those people who are in the forefront, who are informal leaders.” (author’s translation)

If you have a governing objective, that might be precisely who should be in the formalized community of practice. However, if the formalized community of practice becomes too exclusive developers might be reluctant to engage with it. As seen in Guldberg’s and Mackness’ (2009) study, not understanding the culture and norms of the community of practice and experiencing negative emotions, can have a profound effect on an individual’s identity and ability to connect to the community of practice. The members themselves even discussed this aspect:

“...I think anybody is welcome to come to the xMG, I think it should be like that because everybody actually has something to contribute. I think if we were to open up for everybody, then maybe barriers would fall down. Maybe we would get more done.”

There could also be a didactic reason for including junior developers in the formalized community of practice. When a former intern was asked about his role in the group, he said:

“Often It’s difficult for me to understand everything, how it works and such. But at the same time, I can make it as easy as possible for others to understand because I know what I find difficult to learn. There’s so much information and I’m sure there are me than me that find it difficult to understand. And then you have to make it as easy as possible for those who use the stuff we make here.” (author’s translation)

In other words, he could use his inexperience in order to communicate effectively with the community. And thus, making xMG more inclusive and their artefacts easier to engage with. Regardless of whether a formalized community of practice has a governing or an educational objective, there is a need to reach out to the developers in the community and create a sense of belonging to the formalized community of practice. This is necessary in order spread knowledge or implement decisions through the community’s interactions with the formalized community of practice and its artefacts.

6.2.2 Wanting it All
The one challenge almost all interviewees mentioned was the pressure of delivery, which made improvement work, such as xMG, difficult to prioritize. There seemed to be tension between improvement and delivery. Three other related tensions were also discovered; learning versus governing, individual learning versus organizational learning and long term versus short term (Figure 17).

![Figure 17. Tensions.](image)

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The tension between learning and governing is somewhat addressed in the previous section. If you focus on governing, learning might take a back seat and vice versa. However, the two are not mutually exclusive. On the contrary, the two depend upon one another. Learning is necessary to get the information needed to make good governing decisions. And governing is necessary to facilitate learning. The same goes for the other tensions. Delivery is needed if we are to have a future to improve, organizational learning needs individual learning and so on. Both ends of the spectrum need attention, but you cannot have it all at once. There is a need to position the scope of the formalized community of practice regarding these tensions. Perhaps a formalized community of practice decides to have a largely governing objective, focus slightly more on organizational learning than individual, and look to the long term through improvement (Figure 18). That community of practice will need completely different resources in order to achieve their objective than a community of practice that has positioned their scope otherwise.

<table>
<thead>
<tr>
<th>Learning</th>
<th>→</th>
<th>Governing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual learning</td>
<td>→</td>
<td>Organizational learning</td>
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<tr>
<td>Improvement</td>
<td>←</td>
<td>Delivery</td>
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<tr>
<td>Long term</td>
<td>←</td>
<td>Short term</td>
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*Figure 18. Positioning the scope.*

### 6.3 Getting Resources

Another formalized community of practice in the organization could show that they had saved the company a substantial amount of money by coming up with a technical solution that brought down server costs. This was a highly measurable improvement that helped them get resources. However, most of the work a formalized community of practice does is not measurable through traditional methods (Wenger et. al., 2000). Even though managers were quite comfortable using non-traditional methods for evaluation, members expressed concern about not getting resources and having difficulty providing motivation to management in order to obtain resources. Perhaps having a clear and common objective could make it easier for management to understand the needs of the formalized community of practice and help them manage through cultivation.

### 6.4 Perspectives on Knowledge and Learning

One could say that since communities of practice reflect the sociocultural perspective on learning, this perspective should also be a prominent perspective on learning within the whole organization. However, just within the proceedings of xMG many different perspectives on knowledge and learning could be found. For instance, the desired process of xMG (Figure 19) reflects a realistic and explicit perspective on knowledge and a behavioralistic perspective on learning. During xMG meetings, members met and discussed current issues and topics (1). These were then summarized through artefacts, such as meeting minutes and instructions (2), and distributed to the developers in the community (3). In the desired process, the developer then engaged with the artefact, learnt the necessary knowledge, and changed their behavior (4). Desired behavioral changes could be writing cleaner code, using standards and patterns, or using a specific tool for development. xMG also wanted feedback from the developers (5). However, they rarely experienced that.
This process reflects a realistic and explicit perspective on knowledge because it is assumed that the knowledge xMG produces can be captured and stored in artefacts, and then transferred to developers without any major loss of information. The process also reflects a behavioristic perspective on learning because there is an intention to change the behavior of the developer by introducing them to different stimuli (the artefacts).

xMG also interacted with their communities through focus days, where developers from the organization were invited to take part in educational activities and network. These activities included lectures, labs and open coding sessions.

Here a social and tacit perspective on knowledge could be seen. The developers were meant to obtain the knowledge, not only by listening to the lecture, but mainly by doing the labs. It was unclear whether the developers were meant to construct or appropriate knowledge through the labs, however “learning by doing” was an important aspect of the activities.
Therefore, the perspective on learning during the focus days could be either constructivism, the sociocultural perspective, or pragmatism.

6.4.1 Who Is the Ideal Developer?
Even though xMG members emphasized sharing knowledge as an important quality of the ideal developer and managers preferred versatile developers, the most mentioned quality overall had to do with being adaptable and always willing to learn new things. This reflects a pragmatic view of knowledge and learning. Knowledge is not seen as constant, but always changing, and to be a good developer you need to be familiar with the processes that help you acquire new knowledge.

6.5 Conclusions
Just within one structure (xMG), many perspectives on knowledge and learning could be found in the studied organization. However, when it came to the ideal developer, a pragmatic perspective on knowledge and learning became very prominent. And although informal learning systems are valuable for learning, the formalized community of practice seems to have the added benefit of being central and visible. It could serve to connect developers within the community and provide management with valuable information (Figure 21).

![Figure 21](image-url)

*Figure 21. The formalized community of practice as a central and visible point of connections.*

What makes a successful formalized community of practice is difficult to pinpoint and may vary depending on the context, however the following general enabling factors could be identified:

- Having a clear and common objective.
- Obtaining resources to achieve that objective.
- Being inclusive.

Part of defining a clear and common objective may include positioning the scope of the formalized community of practice regarding the tensions mentioned in 6.2.2 (Wanting it All). However, the objective does not need to be static over time. On the contrary, it should adapt to the needs of the community and the organization. But in order for the community of practice to ask for and to obtain necessary resources, it is important that everyone involved understands the current objective of the community of practice. Regardless of the objective, formalized communities of practice also seem to benefit from being inclusive.
7 Discussion

This chapter summarizes the results of the study and discusses the trustworthiness of them and their possible implications for both IT organizations and education. Finally, further research is suggested.

In this study, three enabling factors for formalized communities of practice were found and these were:

- Having a clear and common objective.
- Obtaining resources to achieve that objective.
- Being inclusive.

It is worth noticing that implicit within these results one can also find disabling factors, that disable learning through formalized communities of practice. These would be; lacking a clear and common objective, not having enough resources, and being exclusive. One could also say that objective, resources, and inclusivity are dimensions that affect learning through the formalized community of practice. Along with the factors listed above, many perspectives on knowledge and learning were found within the studied organization. When it came to the knowledge of a skilled developer, pragmatism became very prominent.

7.1 Trustworthiness

Since the distribution of the survey was not cohesive and the response rate difficult to assess, the credibility (Lincoln & Guba, 1985) of the results of the survey could be questioned. Perhaps only managers who were in favor of xMG distributed the survey to the developers in their teams? And perhaps the developers who received the survey from xMG members were unusually engaged with, and in favor of, the groups since they knew members? By distributing the survey in many different ways, the ambition was to reach as many developers as possible. And as Denscombe (2009) writes; a large number of responses can increase balance between proportions in the sampled population and the actual proportions of the studied population. Therefore, the large number of responses may have helped minimize the suspected bias discussed earlier in this paragraph. The online survey also accepted responses without any logging in order to give participants complete anonymity. This meant that in theory the same participant could submit several answers. However, the likelihood of that happening was deemed small due to the high time pressure developers were under at the studied organization.

Prior to the case study I had worked at the organization for some months. This “prolonged engagement” (Lincoln & Guba, 1985) helped me understand the culture of the organization, which then helped me detect distortions in data and make a more accurate analysis. I was also able to make connections and build trust with employees, which may have helped eliciting honest and detailed information in interviews. All of this contributed to establishing a stronger credibility (Lincoln & Guba, 1985). However, having been that involved in the organization, the confirmability (Lincoln & Guba, 1985) may come into question. My ambition was to always maintain a neutral stance, particularly in interviews and during the analytical process. Chapter 4 (Method) contains a detailed description analytical process, which hopefully can help the reader assess its confirmability.

Regarding dependability (Lincoln & Guba, 1985), it is unlikely that this study could be replicated with an exact precision. This is mainly because the nature of qualitative research makes it difficult to replicate. However, if similar methods were used, patterns and themes seen here are likely to re-emerge. For instance, the results from Guldberg and Mackness
(2009) and Ardichvili et. al. (2003) share similarities regarding barriers found for participation in a community of practice.

Given that research was conducted as a case study at a specific IT organization the transferability (Lincoln & Guba, 1985) of the results is not apparent. Chapter 3 (Background at Scania IT) was included, in part to provide an orientation of the contextual setting of the study, but also to serve as a “thick description” (Lincoln & Guba, 1985) which the reader can use to assess the transferability of the results.

7.2 Implications for IT Organizations
The most prominent perspective on knowledge and learning regarding the ideal developer was pragmatism. If companies want developers who are always willing to learn new things, they need to create a work environment where that is possible. As Illeris (2004) argues, one important dimension for learning in work life is having enough time and energy to do so. Many other perspectives on knowledge and learning could also be found at the studied organization. A natural question then arises; does it matter which perspective on knowledge and learning is prominent? It does certainly have consequences. If knowledge is seen as realistic and explicit, it will be distributed differently than if it is seen as social and tacit. Perhaps another reason as to why few developers engaged with xMG through their artefacts was because the knowledge coded there was not explicit in nature, but rather tacit, and more suited for other methods of distribution. This is not to suggest that knowledge never should be coded into artefacts, on the contrary, such coding can be very beneficial. However, to achieve a learning organization, one needs to consciously evaluate which perspective to apply in each context. Because it does not matter how knowledgeable our employees are or how many documents we have in our databases. If we cannot share and utilize knowledge in a meaningful way, there is no learning organization. Granberg and Ohlsson (2009), Lustri et. al. (2007) and Wenger et. al. (2002) all have discussed the difficult paradox in trying to manage and control the dynamic processes of learning. Here the formalized community of practice emerges as one way of approaching this issue. However, as seen in this study, the formalized community of practice is not uncomplicated. It is also not the only way to facilitate learning within an organization. In conclusion, IT organizations need to provide an environment where employees have the time and energy to engage in learning. They also need to appreciate the complexity inherent in learning processes and consciously evaluate which approach for facilitating learning to use in each context.

7.3 Implications for Education
In comments to the Technology program for Swedish upper secondary school, the CDIO-concept is said to highly influence the curriculum (Skolverket, 2013). CDIO emphasizes seeing the bigger picture and building the students communication, social, and team work skills (CDIO, 2017). This also reflects the skills of the ideal developer discovered in the studied organization. However, in a recent study about the programming discourse in Swedish programming classes, normative values and attitudes were discovered. The knowledge content was seen as given and students were not encouraged to discuss or question it. There were also problems relating the use of programming to different contexts (Engström & Björkholn, 2016). This suggests that even though the curriculum emphasizes a holistic perspective and encourages students to develop social skills, it has not yet been successfully implemented in the classroom. Something which becomes more important to achieve since this report also has shown a demand from the industry for developers with social skills that can apply a holistic perspective.

7.4 Further Research
The research area of communities of practice is still very complex and in need of further research. As Roberts (2006) suggested, looking into different organizational and cultural
contexts is important to fully understand the concept of the community of practice. Furthermore, the term “formalized community of practice”, coined in this report, is certainly not unambiguous. There could be many different levels of “formalization” which all impact possibilities for learning differently. Therefore additional research is needed, regarding how different levels of formality affects learning possibilities. Another interesting area for research is the prominence of pragmatism. It would be interesting to see of the same pattern occur in other organizations and industries.
References


Appendix A: Survey Questions

1. Learning Environment

1.1. What, in your opinion, makes a good developer? (text answer)

1.2. In your opinion, does there exist a developers’ network/community at Scania IT? (yes/no)

1.3. If you answered yes to the question above, do you feel part of that network/community? (yes/no)

1.4. Do you feel part of a developers’ network/community outside Scania IT? (yes/no)

1.5. What do you do when you need help with programming/coding/development? (text answer)

1.6. Where (at work, at home, at fika, at the pub, online etc.) and with whom (friends, family, colleagues etc.) do you talk about programming/coding/development? (text answer)

2. General Info

2.1. Are you an employee or a consultant? (employee/consultant/other)

2.2. For how long have you been working at Scania IT? (<1 year/1-2 years/2-5 years/>5 years)

2.3. Which type of developer do you mainly identify yourself as? (A-developer/B-developer/other)

3. xMG

3.1. Please describe your awareness of xMG (x Maintenance Group) by using the scale below. (1-5, 1= “I have never heard of xMG”, 5= “I am a member of xMG”)

3.2. Do you know a representative in xMG? (yes, my team has a representative in xMG/ yes, I know a representative in xMG but they are not a member of my team/ no, I do not know a representative in xMG)

3.3. How often do you read meeting minutes from xMG? (never/sometimes/often/whenever they are published)

3.4. How do you get meeting minutes from xMG? (If you never read meeting minutes from xMG you may skip this question.) (I get them through e-mail/I find them on Inline/I find them on Agora/other)

3.5. Have you used other material from xMG (e.g. instructions, reference architectures, Wiki)? (yes/no/I do not know)

3.6. What material from xMG have you used? (If you have not used material from xMG, or do not know if you have, you may skip this question.) (text answer)

3.7. What is your opinion of xMG? (text answer)
Appendix B: Interview Questions

Questions within parenthesis were only asked in some of the interviews.

**xMG**
1. How did you become a member of xMG?
2. What motivates you to keep coming?
3. What do you think the purpose of xMG is?
4. What are your greatest challenges? / What is your role in the group?
5. What is the purpose of the meeting minutes?)
6. What is the purpose of the focus days?)
7. What, in your opinion, makes a good developer?
8. Is there anything you would like to add?

**Management**
1. How did you become aware of xMG?
2. What is your role in relation to xMG?
3. What role does xMG have at Scania IT today?
4. What role would you like xMG to have at Scania IT?
5. What are their greatest challenges?
6. How is xMG evaluated?
7. How do you feel about the current evaluation?
8. What is the purpose of the meeting minutes?)
9. What is the purpose of the focus days?)
10. How do you feel about informal networks?
11. What in your opinion makes a good developer?
12. Is there anything you would like to add?