

# On the Design of Support Systems for Knowledge Sharing within a Social Learning and Sharing Context

Niclas Eberhagen

School of Management and Economics, Växjö University, SE-351 95 Växjö, Sweden  
niclas.eberhagen@ehv.vxu.se

**Abstract:** The issue the paper address concerns the design of IS-based support systems for the sharing of knowledge within a social learning and sharing setting, such as a community of practice. Here we take a look at theories of social learning systems and social context in order to draw forth design implications for IS-based support systems. This is done in order to address issues or problems of traditional support systems for sharing knowledge, such as 'digital libraries' or 'best practice' sharing systems. These issues or problems are related to both the contribution and adoption of knowledge as well as the processes of creation and upholding of shared interpretations and meaning.

**Keywords:** knowledge sharing, communities of practice, support systems

## I. Introduction

Many of the efforts for building support systems for the sharing of knowledge, in promoting effective problem solving and better decision-making, have been directed towards an individual learning level. Organisations have constructed digital library resources, such as with best-practice systems, FAQ systems and similar, that may be used by individuals when they find themselves in problematic situations that require they draw upon the collected (and of course the legitimised) wisdom of the organisation.

However, in many of the development efforts for IS-based support systems, for the sharing of knowledge, it seems that issues as social context are sorely neglected. Interpretations of knowledge and negotiating of meaning, derived from experiences generated through previous problem solving, are socially constructed and situated as well as directly related to the problem situations at hand, see [4, 16]. Most of the knowledge sharing and learning processes, within organisations, are social processes. They are anchored in the daily work practice with its unique problems and made up of informal and interactive contacts between colleagues. It is the engagement and participation of the individuals in the practice that motivate the processes of learning and knowledge sharing. They are the very means by which peers enhance their expertise, solve problem quickly and efficiently and newcomers learn the trick of the trade, thus affecting positively the effectiveness and learning of the organisation as a whole.

That many of the efforts have been directed toward individual learning seems mostly due to the fact that these have been easier to manage and incorporate into the

formalised organisational structure as opposed to informal networks of knowledge sharing [14]. It has been far too easy to design performance measures for these and, thus, gain the approval of the ruling echelon and an appropriate budget.

Different authors have indeed addressed the issues of knowledge exchange and creation. Two such different examples of work are Goodman and Darr [11] and Nonaka and Takeuchi [20]. There are indeed many other fine examples of work done, but these two suffice to show the wide range of issues that are tackled. The first concerns the usage of computer-aided systems for knowledge exchange, although within an organisational learning context. Here the authors have discussed a number of dilemmas that concern both the contribution and adoption of knowledge, upholding shared meaning and measuring the effects of sharing. In the latter work the authors point upon a number of enabling conditions that an organisation must strive to meet in order to provide a proper context for facilitating activities of organisational knowledge creation and leverage. Although both examples elaborate on the conditions and problems on knowledge sharing they, however, address factors that concern the organisational level of learning and knowledge transfer and do not adequately take into consideration the underlying social forces of motivation for knowledge sharing and learning.

It seems clear that when designing support systems for knowledge sharing there is a need for focusing on the processes of learning and knowledge sharing at a social level. As in the words of Bob Pucinelli [23, p. 41]: "Too often we try to solve business problems with technology alone and fail to see the real obstacle in a solutions success - the users. Because knowledge is fundamentally a product of people and technology the focus should social and not technical".

The question raised here is what characteristics and properties IS-based support systems for knowledge sharing should uphold in order to more accurately reflect the processes of creating and maintaining shared meaning and interpretations within a social learning and sharing context, such as within a community of practice.

That it has become important to look upon characteristics and properties of possible IS-based support systems becomes even more apparent when one acknowledge the trend of globalisation of our organisations, as well as our society at large, something which Castells [6] in his work has so elegantly elaborated upon. This has implications for the different network of practices within organisations that individuals are involved in and through which they share knowledge. As organisations go global so may all the possible networks of practices that knowledge may flow

through, challenging the constraints and conditions of the situated practice within it was generated. If we are to uphold the good characteristics of communities of practice within a distributed setting then it becomes apparent that we must understand what dictates these characteristics.

As most of these processes for knowledge sharing take place within a social arena, characterised by high degree of interactivity and interpersonal communication, one requirement of a support systems is that it should at least uphold functionality that supports a platform for communication. The current research strives to investigate this and meet the challenge of the question raised by looking at the social context for knowledge sharing. Here we specifically look into theory of social learning systems [29, 30], both drawing upon the work of [16], as well as the concept of communities of practice [3, 16, 29 and 31] as the unit of analysis and social context for knowledge sharing. This is done in order to address issues or problems related to both the contribution and adoption of experiential knowledge in a social environment and the creating and upholding of shared interpretations and meaning within that context.

## II. The sharing of knowledge

Why do organisations encourage and establish processes for sharing knowledge? Well, there seem to be, looking in to the general literature of the last decade, a growing awareness of the strategic necessity for organisations to manage its knowledge resources (people, documents, or other artefacts) in order to gain a competitive advantage. The keyword one often is confronted with is 'reuse'. Reuse of knowledge, i.e. experiential knowledge generated from recurrent problem solving situations and transformed into a form that is meaningful for others within the organisation, is done in the hope that it is beneficial to the effectiveness of the organisation. All done in order to counter, for example, problems of knowledge loss due to employee turnover, to address the need to increase problem solving speed and to prevent the re-inventing of the wheel so to speak. Here, as Hansen, Nohria and Tierney [12] report, organisations, in order to achieve the above aim, tend to apply either of two general strategies: codification or personalization strategies. Codification strategies, referring to people-to-document strategies, rely heavily on technology solutions for capturing, storing and disseminating knowledge. Personalisation strategies aim to create platforms and common grounds for people to meet and interact, building networks of people. Technology plays an important role here as well but its focus is on how to get people together, not replacing face-to-face interactions but to complement them.

Why do people in organisations share knowledge? To answer this question we will look into the work of Dixon [8]. She first starts out by defining the terms of sharing and knowledge. Dixon does this by pointing out that, even though it is often heard that it is oh so difficult to get people to share what they know, people are naturally willing to share what

they know. Dixon refers to the work of Constant, Kiesler and Sproull [7] who made a study about attitudes about sharing information (or knowledge). They found that people distinguished between tangible and less tangible information. The willingness to share both was attributed to different attitudes in motivation. The tangible things, such as documents and programs, were willingly shared because they belonged to the organisation. However, the motivation for sharing less tangible information (tacit knowledge, insights, hard-earned experiences and so forth) stemmed from a different source of incentive. Such knowledge was shared because the sharer got something back. The view of less tangible information as something as part of one's identity and self-worth made it appealing to share if the very act of sharing gave something back, such as the recognition of one's expertise. Here sharing becomes a question of gaining personal benefits apart from input to problem solving processes.

Dixon [8] points out that indeed very little personal benefit is gained from contributing to a database which is like a black hole and gives nothing back, accessed by others whom the contributor has no connection with and will never hear from.

The term 'share' rightly recognises the personal nature of the knowledge that is gained from hard-earned work in the form of experiences. Such experiences are not shared whimsically. The act of sharing needs to be met with conditions for the sharing to result in personal benefits, whatever they are. The very act of sharing has here indeed two meanings. It means to give away a part, which is an act of generosity, and it means to hold in common, as in a 'shared belief systems'. If knowledge is shared both the giver and receiver can hold it in common.

To define what knowledge is Dixon [8] distinguishes between common knowledge that is knowledge generated from the experience of people engaged in organisational task, i.e. know-what, and theoretical knowledge, i.e. know-why. Here, common knowledge is always linked to action, derived from action and carrying the potential for others to take action. Common knowledge is unique to a specific company and it this is this characteristic that gives knowledge gained from experience its potential to provide and organisation a competitive edge.

According to Dixon [8], organisations must continually reinvent and update their common knowledge. Thus, they must engage in two kinds of knowledge activities. They must find effective ways to translate their ongoing experiences into knowledge, i.e. create common knowledge, and then they must transfer that knowledge across time and space, i.e. leverage it. One may well compare this to the work of Nonaka and Takeuchi [20], where they explore the processes of transforming knowledge, generated within a project group, and leveraging it to the rest of the organisation, as well as the organisational conditions that must be met in order to enable these processes.

Dixon [8] further developed five categories within which different kinds of knowledge sharing processes may fall into.

First, serial transfer, the knowledge individuals has gained from doing tasks in one setting is transferred to the next time they do the same task in a different setting. Secondly, near transfer, explicit knowledge individuals have gained from doing frequent and repeated tasks is reused by others doing similar work. Thirdly, far transfer, tacit knowledge gained from doing non-routine tasks is made available to others doing similar work in another part of the organisation. Fourth, strategic transfer, that is the sharing of the collective knowledge of the organisation needed to accomplish a strategic task that occurs infrequently but is critical to the whole organisation. Lastly, expert transfer, this kind of sharing occurs when facing a technical question beyond ones scope of knowledge that results in seeking the expertise of others in the organisation. In this paper when we talk about knowledge sharing processes it is the processes that falls into the categories of near transfer and far transfer we refer to since they most closely matches our interest and focus.

We will further on in the paper adopt the concept of common knowledge when talking about sharing experiential knowledge since it as a concept defines what the sharing process is all about, namely making common the experiences and knowledge individuals derive through daily strife. We also view the process of learning intimately coupled with the process of sharing. Learning is not only tightly coupled to the reflection on the experiences drawn when dealing with problems in the daily work but also coupled to the process of sharing. You learn by reflecting upon the experiences you make and you learn by adopting and applying, in your own context, the wisdom that others share with you. Therefore we see the sharing process of common knowledge as being part of the learning process. We will however return to this further on when discussing the social context and social learning systems.

### III. Systems for the sharing of knowledge

In its most basic form support for the sharing of common knowledge just requires the means for one individual to query another for a solution, or a best-practice, to a problem and could be achieved through the usage of an simple e-mail system. This is however, as Goodman and Darr [10] point out, learning on an individual level. If we are to consider learning on an organisational level and the sharing of experiential knowledge in that context, then more is demanded of such a system than mere communication support for overcoming time and space constraints.

How do we guarantee that valuable knowledge and expertise can be used in the future and be effectively leveraged through the organisation to others? One answer that Wijnhoven [32] gives in order to solve these issues is to locate the common knowledge within the shared organisational memory.

Goodman and Darr [10] have made a study of computer-aided support for the exchange of best practices. Here they define a best practice as common knowledge of a solution

that can affect a whole variety of organisational effectiveness indicators. They have pointed out a number functionality that is required, besides communication support, of such a system aiding in the sharing of best practices. There need to be an organisational memory for making best practices available to all, means for updating best practices as better solutions are found and an organisational legitimisation for best practice sharing. Here the work of Stein and Zwass [26] further contributes to an understanding of how organisational memory may be actualised through information systems. Their result is a conceptualisation of the functionality that is needed for such a system to contribute effectively to organisational learning and decision making. Thus, the functionality of a memory of some sort seems to basic a requirements for any support system preserving wisdom gained and making it available to others, whether it is a system of organisational activities or means (technical capabilities).

The most important finding of the work of Goodman and Darr [10] is a set of dilemmas related to the use of computer-aided support that may seriously detract its contribution to organisational effectiveness. These relate to problems in motivation for best practice sharing and difficulties in matching computer-aided systems to the distribution of problems and solutions in the organisation (e.g. if the problem and/or solution is difficult to articulate). Further, they relate to competition from alternative mechanisms for transferring best practices and difficulties in determining the effectiveness of sharing. Goodman and Darr [10] have then suggested different strategies that managers may adopt in order to overcome or circumvent these dilemmas. These dilemmas or issues must be resolved if the support system is to be effective.

However the usage of an organisational memory is not unproblematic. Problems with a memory that preserves experiences, best practices, or common knowledge is that it tend to be inflexible in that these, even though outdated, tend to be drawn upon and affect the performance of the organisation. This issue relates mainly to the maintenance of the retained knowledge. The necessity for resolving this issue becomes clear in the case when the knowledge is updated at one site while at another site people are still using the old and invalid. The solution proposed through database literature is to reduce redundancy in the organisational knowledge base. On the other hand one can argue in favour of redundancy since it leads to more people being actively involved in the improvement of the experiential knowledge [20]. The question here is how to avoid differences in knowledge that lead to organisational differentiation, which can become political in nature, and how members of the organisation can improve their learning capacities by solving knowledge and information conflicts [24]. Goodman and Darr [11] have also pointed upon other issues concerning systems for sharing experiences or best practices such as its interpretation, especially when it crosses organisational setting boundaries, impairing the incitement for contributing and adopting such

knowledge. Ackerman and Halverson [2] have given the same problem light in considering memory as boundary crossing objects that in order to move from one organisational setting to another must first be decontextualised and then recontextualised.

Even though it is acknowledged, see [13], that an organisational memory, harbouring common knowledge, is important to an organisation it has gained little attention within research as to the systems of organisational behaviour, routines, practices and strategies that are used to administrate such a memory. Despite the attention of the last decades that has been given the concept of organisational memory, where a system for sharing experiences and best practices within an organisational setting resides, there has been little empirical foundation. Ackerman and Halverson [2] point upon this fact that, even though other authors [13, 26, 28] has defined, discussed and pointed upon the need for such a memory and its means, they all lack an empirical foundation for defining it. Some attention has been given towards specific systems, e.g. [1, 25], but they have not taken into consideration the organisational setting and mainly focused on the artefact as such.

Tuomi [27] continues further with the problematic view of computer based support systems. Information systems designed for knowledge management and organisational memory should be seen as media that is used as an interpersonal cognitive artefact. What is critical to consider, in designing such systems, are those knowledge stocks that are needed in order to make sense of the information stored in the system. When computers are used to support collaboration collective sense making becomes a problem. The people using the system may not speak the same language, their expectations and practices may differ, or they may have different stocks of cultural knowledge, thus contributing further to such barriers to effective knowledge exchange such as have been discussed by Goodman and Darr [11].

It is therefore important, according to Tuomi [27], to view knowledge management and organisational memory systems as essentially social systems, where technology complements and supports the processing of knowledge and meaning. He further points out that it is vital that designers understand those social processes that underlie meaning processing.

When traditional computer databases are used to store knowledge, the conceptual design of the database fixes the semantics and makes it difficult or impossible to re-interpret stored data. This may become a problem when computer systems are used to support strategy processes, business intelligence or creation of new product designs. The problem arises because the information drawn upon in these situations is often ambiguous and equivocal. That the information may show such characteristics is "not because we would lack information, but because the world is not ready, but under construction" [27, p. 10].

When tacit knowledge is articulated and data is created out of it, a lot of flexibility in interpretation is lost, leading to

organisational rigidity. It may be attractive to create organisation-wide information systems where the same repositories of data are used in all organisational processes. However, such underlying beliefs of getting the semantics right in order to make the organisation function as a perfect machine might be a too nearsighted strategy. According to Tuomi [27] a major challenge for the designers of organisational memory and knowledge management systems is to understand, not only the relationships between tacit and explicit stocks of organisational knowledge, but also the cost of changing their relationships within these systems when the world changes.

Here, an important aspect of knowledge management and organisational memory support systems is the social processes that makes it possible for the users of the system to make sense of each other's worlds. Such systems can not be understood as stand-alone systems since they combine technical artefacts with social processes. Huysman, De Wit and Andriessen [14] further point out that solely using a system for storing experiences in a database seems not to work as one cannot learn from others as such. Knowledge happens through face to face communication and much of the collective knowledge is gained during day to day interactions. That the focus has been mainly on individual learning than on collective learning might be explained by the less effort it takes to motivate individuals to contribute to a shared knowledge base than it takes to motivate collectives and that individual learning is much easier to manage.

Despite the critique and problematic issues, voiced above, the benefits with the usage of IS-based support systems for sharing of common knowledge that makes them attractive. They do allow an organisation to support good traditions and uphold continuity. They may be used in order to promote effective problem solving by allowing the members of an organisation to draw upon the collected wisdom in face of unknown problem situations (not re-inventing the wheel yet again). They may also help 'rookies' or newcomers to fall back on good examples and learn from them.

However, if support system for sharing of knowledge organisation-wide are to be implemented and used successfully an understanding of the needed functionality or wanted behaviour of such systems must be achieved. What functionality should such a support system for sharing of knowledge uphold in order to handle the above-discussed issues such as e.g. how to solve the problem of decontextualisation when knowledge moves between different organisational setting and units? In order to further investigate this we now turn our attention to the context for the knowledge sharing.

#### IV. Social context of knowledge sharing

In this chapter we will explore the social context and conditions for knowledge sharing. We do so by taking a look first at the concept of communities of practice [3, 16, 29, 31],

then into the theory of social learning systems [29, 30] and finally at the concept of community memory [18].

First, when turning our attention towards the social context wherein the knowledge sharing processes take place we cannot help but to stumble upon the concept of *communities of practice*. It is the natural unit of observation and context for studying the conditions of knowledge sharing processes and the possibilities for design of support systems. The concept of communities of practice, as most of us would agree, was first derived from the work of Lave and Wenger [16]. Here they studied how learners (newcomers or apprentices) in order to master knowledge and skill of a specific practice (as well as gaining recognition) were required to go through the process of becoming full participants of the sociocultural practices of a community. However, before examining the concept we will first take close look at its roots by examining what a community is.

Mattelart and Mattelart [19], drawing upon Park and Burgess [22] and Park [21], define a community as follows. It has a population that is territorially organized, more or less completely rooted in its territory, and whose individual units live in relationship of mutual interdependence that is symbiotic rather than societal. Here relationships between individuals are governed by the 'struggle for space', where competition functions as an organizing principle. In human society, the competition and division of labor results in forms of unplanned competitive cooperation that makes up the symbiotic relations. This sub-social level is the expression of the web of life.

Park [22] also made a distinction between this biotic substructure and the social or cultural level, which he conceived as a superstructure erected on top of it, functioning as a necessary instrument of direction and control. The social or cultural level is managed by the community and by the consensus or moral order, which regulates competition, thereby giving individuals the opportunity to share an experience and establish ties to society. Culture is here both a body of customs and beliefs as well as a set of artifacts and tools or technological systems.

Following the view of what a community is, as discussed above, a community of practice includes those organisational members that share feeling or sense of community due to shared goal or interest because they work or occupy themselves with similar things or face similar problems. They share or engage in a joint venture. Members of a community share both body of customs and beliefs, as well as set of artefacts and tools or technological systems. Because members of communities share a feeling or sense of common 'culture', as defined by Park [22], they also come to share, to a large degree, the same interpretive frames for information and knowledge. Thus they are able to transcend barriers or inhibitors towards both adopting the experience of others as well as contributing with knowledge on solutions to others. A community of practice is not viewed primarily as a formal workgroup, although such ones may be included, and is not restricted to only the members of one organization (although

due to practical reasons it may well turn out that way). Taking a look at fig. 1 below we see what some of the main characteristics of communities of practice are as compared to other forms of organisation.

	<i>What's the purpose?</i>	<i>Who belongs?</i>	<i>What holds it together?</i>	<i>How long does it last?</i>
<i>Community of practice</i>	To develop members' capabilities; to build and exchange knowledge	Members who select themselves	Passion, commitment and identification with the group's expertise	As long as there is interests in maintaining the group
<i>Formal work group</i>	To deliver a product or service	Everyone who reports to the group's manager	Job requirements and common goals	Until the next reorganisation
<i>Project team</i>	To accomplish a specified task	Employees assigned by senior management	The project's milestones and goals	Until the project has been completed
<i>Informal network</i>	To collect and pass on business information	Friends and business acquaintances	Mutual needs	As long as people have reason to connect

Fig. 1. Characteristics of communities of practice, adapted from [31, p. 142].

Brown and Duguid [3] distinguish between networks of practice and communities of practice. The networks of practitioners may well spread over several organisations, as that which its members practice may be used at several places. If you are an IT-security officer then you probably share a lot of skill and understanding with other IT-security officers in other companies. You may even feel some sort of kinship with them, stemming from membership you have in common to the professional body. You encounter similar problems, come from similar backgrounds and so forth. However that does not imply that you meet with these other professionals regularly, share information with them or turn to them in times of trouble and question. The concept of community practices refers to those of the same professional body but who in their daily strife come in contact with each other, either because they work together, share common interests or because the proximity or organisational conditions either allow or demand it.

According to Wenger and Snyder [31] communities of practice have the following four positive characteristics. First, they tend to solve problems quickly. Members of a community of practice know whom to ask for help with a problem. They also know how to phrase questions in a manner that peers can quickly comprehend and focus on the heart of the problem. Secondly, communities of practice do much more than work on a specific problem. They also function as an ideal forum for sharing and spreading best practices across a company. Thirdly, they develop professional skills. Here apprentices learn as much from journeymen and more advanced apprentices as they do from master craftsmen. Effective learning depends on the availability of peers and their willingness to act as mentors and coaches. This applies not only to the education of inexperienced workers but also to that of experts. Finally, they help companies recruit and retain talent as peers within a

community may help individuals in identifying new opportunities for that are tailor-made to his/hers expertise and interests.

Burk [5] brings to us the following example of a community of practice that lets us glean some of characteristics at work. At Xerox, it was noted that a group of repair technicians gathering round the office coffee machine to exchange tips about repairs and swap stories about experiences at customer sites. The technicians seldom consulted repair manuals or training materials, relying instead on their informal network to transfer knowledge and solve problems. Interaction with the group, which had no official recognition from the company, was also the way that new technicians learned the tricks of the trade.

Here learning emerges here as a fundamentally social process, motivated by engagement and participation in practice. The community of practice, in the above example, has here come to play a key role in transferring good practices, solving problems quickly and efficiently and developing professional skills.

Despite all the positive characteristics, discussed above, the effects of the knowledge sharing and creation within a community of practice are difficult to measure. Its effects are often delayed and the results generally appear in the work teams or business units, not in the communities of practice themselves. However, Brown and Duguid [3] stress the importance and value of the role these communities of practice play to the generation of learning and innovation taking place within organizations, which in their eyes is viewed as a community of communities. Innovations are brought about since participants of a community of practice continuously develop a rich, fluid, non-formalised worldview to bridge the gap between their organisation's static formalised view and the challenge of changing practice. A community of practice allows, so to speak, parts of an organisation to step outside the organisation's limited core worldview and simply try something new.

Now, we turn our focus on the theory of *social learning systems* as developed by Wenger [29, 30]. He begins by observing that: "Our institutions, to the extent that they address issues of learning explicitly, are largely based on the assumption that learning is an individual process, that it has a beginning and an end, that it is best separated from the rest of our activities, and that it is the result of teaching", [29, p. 3]. This observation reveals to us that as far as our institutions, e.g. organisations, are concerned learning and knowledge sharing are individual 'journeys' subject to formal procedures. However, as has been stated before [3, 14], this is not the whole truth as both social and informal perspectives are sorely neglected. Here we hope to, by looking in to the theory of social learning systems, spread some revealing light on what learning, occurring as a result of knowledge sharing within a social context such as a community, is and what conditions dictates it.

Learning occurs as a result of the tension between competence and experience. The experience you make in

your daily strife is constantly confronted with the competence you uphold as a member of a community. Here competence is seen as being historically and socially defined within that community. To be knowledgeable and to display knowing is a matter of displaying competencies, which are defined within different social communities. Learning is thus seen as interplay between socially defined competence and personal experience. The analogy of a practitioner of medicine, i.e. a physicist, serves very well in order to exemplify this. Through long studies and training young would-be practitioners of medicine conquer the skills, knowledge, set of tools and language that is needed in order to call themselves practitioner of medicine. The mastering of those is what makes them members of the community and professional body of practising physicists. However, the set of skill, language and tools needed to be a practising physician are the same that the community itself has through history passing defined. Once belonging to the community and practising medicine the doctor will experience many phenomena. The experiences made while practising medicine will always be made within frame of medicinal competence. Most phenomena, experienced, will clearly belong to the domain of medicine and not be a disturbance, but some may be troublesome, be at an observation that a well-tested medicinal procedure not seem to work in every reported case and so forth. Experiences made that do not fit perfectly into the frame of the well-defined competence of the community bring about tension. The reflecting upon the tension and sharing the wisdom (reporting back) to other colleagues within the community is what promotes the evolution of the field of medicine.

What define a social learning system are of course its members, the individuals belonging to it and participating in its activities, and how they relate to each other. A natural constitutive element of the social leaning system is thus a community of practitioners. This is what forms the basic building block and focal point of observation when studying social learning systems. Communities of practice are the containers of social competencies that make up the system. Here the very participation is essential to our learning. It is the very core of what makes us humans being capable of meaningful knowing. Competence is socially defined within the community of practice through the combination of the joint enterprise we engage in, the mutuality (established through the relationships with other members and the establishments of norms and rules dictating those relationships) and the shared repertoire of skills, tools, artefacts and so forth.

However the communities of practice are not the only building blocks. Another constitutive element is made up of the boundaries of the social learning system. Boundaries of communities of practice are fluid and arise from different enterprise, different ways of engaging with one another, different histories, repertoires, communication modes and capabilities. Boundaries are defined by the tension between competence and personal experience. The phenomena one

experiences or deals with when participating in the activities of the community one must be able to relate to the domain of knowledge or competence of the community. The very convergence of competence and experience is important for the existence of a community. Without a core of 'truth' with few anomalies the community will simply not exist. Here one may well compare this to concept of paradigm of Kuhn [15]. But activities at the boundary are important for the tension that enables learning, shocking one's personal experience so to speak, as it help discover those anomalies and question the wisdom of the community, thus ensuring its viability and a healthy evolution.

The last constitutive element of a social learning system is the identities we build or associate with the communities. Wenger [30, p. 239] expresses it as "In the landscape of communities and boundaries in which we live, we identify with some communities strongly and not at all with others". The adherence to a community and the recognition of its boundaries naturally creates a sense of identity with the community. The physician practising medicine identifies himself with professional body of medical practitioners. Knowing, learning and sharing knowledge are not abstract things we do for their own sake. Identity forming and association is here an explanatory factor as it is important to the social learning systems. It combines the competence and experience into a way of knowing, decides what matters and what not, with whom we trust, identify, communicate and share knowledge. Identities become living vessels in which communities and boundaries become realised as an experience of the world. Our ability to deal productively with boundaries depends on our ability to engage and suspend our identities, i.e. looking at the same phenomena in the world from other perspectives. When we have multiple identities it usually stems from belonging to or associating with other communities.

According to Wenger [30], our belonging to a social learning system can take various forms at various levels of interaction with it. Here Wenger distinguishes between the following modes of belonging. First, engagement, i.e. doing things together, talking and producing artefacts. Through engagement in the activity of the community shapes our experiences of who we are, establishing our sense of identity and what is doable or not. The second mode of belonging is imagination. This involves constructing an image of oneself, of one's communities and of the world in order to orient oneself, to reflect on one's situation and explore possibilities. Finally the third mode of belonging to the social learning system is through alignment, i.e. making sure that our local activities are sufficiently aligned with other processes so that they can be effective beyond our own engagement. It is the mutual process of co-ordinating perspectives, interpretations and actions to realise higher goals. Each mode contributes to a different aspect of the formation of social learning systems and personal identities. They coexist in every social learning system to different degrees. A community such as a nation the participation in or belonging to it is more dominated by

the mode of imagination as compared to a community of practice which is more dominated by the mode engagement.

Wenger [29] further states that the focus on participation in social learning systems has broad implications for what is demanded of us to understand and support learning. For the individuals learning becomes an issue of engaging in and contributing to the practices of their respective communities. For the communities it is an issues of striving to refining their practices and ensuring new generations of members. Finally, for the organisations it becomes a question of maintaining the interconnected communities of practice through which the very same organisation know what it knows and thus becomes the rationale for its very existence as an effective valuable organisation.

Finally, we now take a look at the concept of *community memory* that has risen from the work of Marshall, Shipman and Raymond [18] and is related to the concept of communities of practice and the social systems for learning and knowledge sharing. When people work together they require and put effort into constructing and maintaining, shared understanding of what they are doing. What is formed out this is some form of a shared memory that the individuals within the community uphold. The memory becomes a set of collective knowledge and shared understandings. The very act of creation, maintenance and use of memory as a shared resource defines the community.

This community memory comes to function as central vehicle for communication amongst its members. It provides a crucial bridge between large-scale information bases and the day-to-day activities of a community's members. It becomes the link between distributed resources and the practices of the knowledge workers using them. 'Digital libraries' may provide the structure and means for access to collections of materials, but the community memory may enable those libraries to serve the day-to-day needs of its members. It provides them with an evaluative and interpretative frame of the content of the libraries according to its members needs.

If we look at traditional support systems, such as digital libraries, for sharing knowledge we see that these most often have fixed organisational roles of responsibilities. These are derived from formal organisational structures and an individual level perspective on learning. They may include those who are allowed to publish information, the librarians who are responsible for the maintenance and service of the library resource, those who read the content and those who write it. However, with regard to the informal nature of the community memory and from a social level perspective on learning these roles blend together and are more fluid. The individuals are not only consumers of knowledge but participate actively in its creation and interpretation through social interactions. Any member may act as author or contributor of information to the community's memory, reader or recipient as well as interpreter of the information contained within it.

The community memory may here be seen as the very forum, context and media (or means) for the knowledge sharing taking place within the community. It is through the interactions with the memory that members, participating in the activities of the community, make sense of their world and the phenomena they experience. Thus, when looking upon ways of supporting knowledge sharing processes through IS-based solutions one cannot ignore that it is important to take into account the processes that upholds and evolves the community memory.

## V. Support systems design

A common solution for organisations investing in support systems for knowledge sharing is to adopt a codification strategy [12] and develop 'digital libraries' as a means for capturing and sharing knowledge. However the underlying assumption embedded in these systems is a view of knowledge as an explicit resource (as any other organisational resource) that can be drawn upon in search for solutions in problematic situations. Examples of such a system are for example 'Answering Garden' of Ackerman and Malone [1] and 'best practice' sharing systems of Goodman and Darr [10, 11].

These systems focus upon the process of exchange that implies an unproblematic view of knowledge as something that may be easily captured, represented, searched and used by individuals as a means to solve problems. Most of these dilemmas that are pointed upon by Goodman and Darr [10, 11] stem from the view of learning as something that may be yielded from the reading of manuals. The knowledge has become detached from the practice within in it was generated thus leading to some form of alienation between contributor and adopter.

The unproblematic view of knowledge sharing ignores the fact that the sharing takes place within a social context where shared meanings are established and social motivational forces come into play. Some inhibitors to sharing and using knowledge, as discussed by Goodman and Darr [11], may very well be overcome if we focus upon communities of knowledge workers or communities of and their sharing and learning processes.

In order to answer why it is important to focus upon the characteristics of such social settings, as communities of practice one may turn to the theory of social learning systems [29, 30]. The theory puts the focus upon the processes and constitutive elements that are necessary for sharing of knowledge and that take place within social learning systems. It points upon the importance of being able to establish communities and boundaries in order to define competence that members adhere to and may confront their experiences with. It also points upon the necessity of being able to form identities around communities in order to promote motivational forces for and engagement within knowledge sharing. Thus an understanding the conditions and nature of knowledge sharing and learning within a community of

practice is important to ensure the success of any support system investment.

By taking hold onto the unique characteristics of communities of practice, we should be able to transcend barriers or inhibitors towards both adopting the experience of others and contributing with knowledge on solutions to others. Questions like 'why should I help others when I can't be sure if I ever get anything back or may know whether that which I have contributed with will ever matter?' that creates barriers for knowledge exchange, should have little relevance within a community setting.

If we look upon the characteristics of communities of practice one cannot help but to notice the very informal nature of the sharing taking place. According to Pucinelli [23] one of the fundamental requirements of a sharing organisation is the lack of a formal bureaucracy. Informal work related networks for sharing of experiences and knowledge between peers and colleagues are self-governed and fall outside the organisational charts. Too much official interference from management even if it's offered with all of the best intentions may cause the network to wither and die.

Given that the learning and knowledge creation within organisations are socially motivated processes, anchored in the practice with its daily problems, informal interactive contacts between peers or colleagues becomes the pre-condition for the sharing of knowledge. Here other requirements for the development of support systems are demanded than what is traditionally thought of. From the investigation of social learning we derive that one key requirement for learning is the ability to communicate with peers and colleagues in order to establish mutual understanding and interpretations. This is especially important within a distributed environment using a system for sharing as only individuals may give meaning to knowledge.

A good example of social collaboration system or platform is the 'Tapestry' of Goldberg et al. [9] where users of the system rely on the annotations others for identifying information which is of interest. This system supports what Malone et al. [17] would call social filtering. By having access to other people's views (annotations and associations to different information items) one may rely upon one's colleagues (whose interest are hopefully known) in making sense of the world.

The act/process of establishing shared interpretations of knowledge is a social one and the sharing of common interpretations take place within a social arena. Thus it is important for a support system for knowledge sharing to take into account this arena. This arena is very much part of a community's memory. According to Marshall, Shipman and Raymond [18] support for community memory must address the following issues. It needs to address the acquisition and evolution of content and structure, support the identification of materials and community members relevant to a particular task and addressing issues of maintenance of organisations that are mutually intelligible across the community.

In view of the above support systems such as 'digital libraries' as a means for sharing knowledge may here be equipped with functionality that enhances communication between individuals in that active discussions may be held regarding the content of the knowledge base. Capabilities for individuals to publish and comment material at will within the knowledge base and making these comments available accessible to other readers makes it here possibly for the content evolve dynamically in response to emerging needs. Support systems could be equipped with mechanisms for individuals to associate themselves with different parts of the content of the knowledge base and making these associations available and accessible to others. Thus it would be possible for individuals to see who else is interested in the same material or knowledgeable regarding a specific area or issue. This would enhance the possibilities to form interest groups and forums for discussion and sharing of experiences. By building into the support system mechanisms to freely create links between material within the base and external sources and making these links searchable, the flexibility in the usage of the knowledge base is further enhanced. Different problems and issues may be viewed in a broader and different context, thus improving the conditions for their interpretation and understanding.

## VI. Conclusion

The implications drawn here for the design of support systems do not constitute a finite set. However, they point upon what is necessary to keep in mind when we deal with knowledge sharing within an informal social setting. The most important lesson to draw is about the need of ensuring mutual understanding and meaning. This is not an act of establishing one final protocol that everyone adheres to but realising that the protocol evolves as the users of the support systems interact with them.

Although the investigation here has been a theoretical one, with all of its limitations, it serves as a vehicle for establishing hypothesis regarding design principles of support systems. As such it becomes important to us from two perspectives. First, it becomes important to us if we wish to ensure that we really address the issues or problems of traditional support systems by focusing on the social learning system. Then, it becomes important to us when we strive to design systems in order to capture and leverage the knowledge generated in the informal social setting to the rest of the organisation. In view of the last perspective it becomes necessary to understand the social processes of creating and upholding of shared interpretations and meanings as, in this case, the knowledge leaves the confinements of the social practice wherein it originated.

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**Niclas Eberhagen** received the B.Sc. degree in Systems Analysis from Växjö University, Sweden, in 1993, and the Ph.Lic. degree in Computer and Systems Sciences from Stockholm University, Sweden, in 1999. He is currently holding a position as lecturer in Information Science at the department Management and Economics of Växjö University.