

Virtual Professional Communities and their role for Knowledge Management

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Abstract: Virtual professional communities provide an environment for professionals to share their knowledge and develop their skills without geographical constraints. Virtual professional Communities became strategic instruments for enterprises, especially for the fields of Research and Development, maintenance and product development. This paper is a bibliographical research about virtual professional communities and their role for knowledge management. One purpose is to give an overview of the research work about virtual professional communities, their definition, benefits, typologies and processes. The focus of this paper is a synthesis of the literature about virtual professional communities and knowledge management. Different approaches, which discuss the integration of the knowledge management concept into the theory of virtual professional communities, are discussed.

1 Introduction

Virtual professional communities are virtual places realized by collaboration tools or Internet platforms. They are used by their members to share and create professional knowledge. The community proposes an environment to the members to share distributed knowledge and to collaborate via information systems without geographical frontiers. The objective for enterprises to use this organization form is to generate economical value. This means for example to reduce costs, to optimize processes or to innovate as a consequence of knowledge exchange. This can help enterprises to stay or become more competitive in today's global market. Especially in the fields of Research and Development, new product development and maintenance, virtual professional communities with their dynamic learning aspect can be a strategic instrument for the creation of a competitive advantage.

The objective of this research work is to give an overview about the theory of virtual professional communities and to identify their role for knowledge management (KM). The focus is on the common elements of the virtual professional communities approach and the knowledge management theory. The potential advantages of this recent organization for knowledge management are discussed.

In recent literature, several scientific papers discuss explicitly the virtual professional communities, their motivation, organization, technical realization and approaches to integrate the concept of knowledge management. In addition to this, there are three theories touching the subject of this paper. First of all, there is the theory of the communities of practice with often cited authors like Etienne Wenger. Then, there is the literature about information systems which concern more precisely virtual communities and their realization and benefits. The third field, which is indispensable for this research work, is the literature about knowledge management in organizations. These fields are briefly presented in the second part of this paper.

The definition of virtual professional communities as original information system is presented in the third part and allows discussing the common elements of knowledge management and virtual professional communities in the fourth chapter. Different approaches of uniting these two theories are briefly described.

The paper closes with a conclusion in which the limits and possible further research on the field virtual professional communities are mentioned.

2 Research Axes

In the following, the main research axes concerning virtual professional communities will be presented. A short overview of authors cited in this specific field is introduced. The aim is to underline, that the virtual professional communities are touching three big research fields. It is necessary to take these fields into account for an appropriate discussion about virtual professional communities and knowledge management.

Specific **papers about virtual professional communities** are, on the one hand, about their typology, definition and the choice of the right tools for realization. Authors like Katzy and Ma (2002) or Boughzala and Kaoune (2005) introduce the virtual professional communities and give a general overview about this organization form. Another part of scientific papers is about the organization structure of virtual professional communities. Lin and Hsueh (2002), Isckia, Tounkara and Boughzala (2005) discuss organization approaches of virtual professional communities, as for example a knowledge map creation to facilitate knowledge management. Nevertheless, there are very few papers discussing explicitly the virtual professional communities. Such papers present also real cases that show the benefits of using virtual professional communities (Sivan, 2000).

A theory which has a lot of parallels with the concept of virtual professional communities is the theory of communities of practice. **Virtual professional communities are in fact a subclass of communities of practice (COPs)**. They are communities of practice which are based on information systems and focus on a professional field. E. Wenger (1998) created the foundation of the recent theory of communities of practice and defines the community 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.”* The basic benefit of communities of practice is the learning aspect and the theory of communities of practice is seen as a possible source of inspiration for the stimulation of learning capacity.

Lefebvre, Roos and Sardas (2004) describe two research axes on COPs. On the one hand, there are researchers who work on the aspect of the spontaneous emergence and operation of these structures. Their research work in this field is for example about the organization structure or the integration of the knowledge management approach in the theory of the communities of practice. On the other hand, researchers treat the aspect of informal learning in these communities. Their work is for example about the animation procedures with the purpose to make learning as effective as possible. Lefebvre, Roos and Sardas (2004) present also the link between researches on COPs and the **theory of knowledge management**.

The last relevant field for our research work is the theory of information systems, more precisely the work about virtual communities. It is relevant to understand how virtual communities are realized and organized. Li (2004) classes the totality of research work about virtual communities in four areas: the social perspective, the business perspective, the development issues and the application issues.

In the next chapter, the virtual professional communities are introduced. The aim is to give an overview about the definition, typologies, benefits and other aspects of this organization form.

3 Virtual Professional Communities

Virtual professional communities provide an environment for professionals to share their knowledge and develop their skills. Emerging Internet technology can be used as a cooperation platform without geographical constraints. These online communities of professionals are probably one of the oldest forms of computer mediated working. Since 1990s, online communities were made broadly accessible due to user-friendlier graphic interfaces and browser technologies. Websites and internet portals emerged that allow the exchange of knowledge and the management of relationships with colleagues, customers or suppliers.

Virtual professional communities are Information Systems which are defined as “*social actors that transform representations thanks to information technologies and operating modes*”¹ (Reix & Rowe, 2002). Virtual professional communities could be defined and analyzed by characterising their aims, their places in organization, their lifecycle, the role of the actors and users of this technology and their specific processes and technical aspects.

In this chapter, the virtual professional communities will be presented more in detail to give an overview about recent research work in this field. At the end of this chapter, a concrete example will be given.

3.1 Definition

Virtual professional communities are first of all virtual communities. A lot of definitions of virtual communities proposed by different authors exist in the literature. Often cited in the literature is Rheingold's (1993) definition: “*Virtual communities are social aggregations that emerge from the Internet when enough people carry on public discussions long enough and with sufficient human feeling to form webs of personal relationships in cyberspace*”. To resume existing definitions, Boughzala and Kaouane (2004) characterize a virtual community by six aspects: a group of individuals, a regular engagement, a shared virtual space, formal and informal interactions, a centre of interest/a common enterprise and a common framework. An overview of popular virtual community definitions are presented in table 1.

¹ « Un système d'information est un ensemble d'acteurs sociaux qui mémorisent et transforment des représentations via des technologies de l'information et des modes opératoires »

Author	Definition
<i>Lin and Hsueh, 2002</i>	"A virtual community is the gathering of people with common interests to share information and coordinate their works via information technologies."
<i>Rheingold, 1993</i>	"Virtual communities are social aggregations that emerge from the Internet when enough people carry on public discussions long enough and with sufficient human feeling to form webs of personal relationships in cyberspace."
<i>Sudweeks and Rafaeli, 1996</i>	"A virtual community is a computer mediated social group which is based on the belief that humans are social creatures and that communities enable socializing, and the virtual community is the technological response to this inherent human need."
<i>Rothaermel and Sugiyima, 2001</i>	"A virtual community is similar to a community of mind described by Tönnis (1967), except that it forms through an electronic communication medium and is not bound by space and time."
<i>Bagozzi and Dholakia, 2002</i>	"Virtual communities are mediated social spaces in the digital environment that allow groups to form and be sustained primarily through ongoing communication processes."
<i>Hagel and Armstrong, 1997</i>	"Virtual Communities are computer-mediated spaces where there is a potential for an integration of content and communication with an emphasis on member-generated content."
<i>Boughzala and Kaouane, 2004</i>	A virtual community is characterized by six aspects: a group of individuals, a regular engagement, a shared virtual space, formal and informal interactions, a centre of interest / a common enterprise and a common framework.

Table 1 - Overview of virtual community definitions

H. Li (2004) concludes in his literature review, that virtual communities are still in their infancy. Most of the studies on it are exploratory and qualitative. He describes the lack of completeness in virtual community studies with three perspectives: lacking grounded theories, lacking empirical studies and lacking studies in real settings.

Virtual professional communities are a subclass of virtual communities which allow developing knowledge to contribute to the creation of new solutions, products and services. Virtual professional communities have, like the name already indicates, a professional background. In virtual professional communities, professionals can communicate and share their knowledge of their field of expertise regardless of time and geographical distance. A definition by ECOLEAD (European Collaborative networked Organizations LEADership initiative) is: *“A virtual professional community is an association of individuals (being those employed by companies or individual professionals) explicitly pursuing an economic objective, identified by a specific knowledge scope and aimed at generating value through members’ interaction, sharing and collaboration. This interaction is optimized by the synergic use of Information and Communications Technology-mediated and face-to-face mechanisms”*.

Katzy and Ma (2002) characterize virtual professional communities by a strong homogeneity among the members regarding their professional education. The members share common values and professional norms. Virtual professional communities can have members of only one enterprise or of different ones. This can be the case for a client and its suppliers.

Virtual professional communities do have a certain degree of organization so that one can compare it with other organization forms in the economy (Katzy and Ma, 2002). They are distinct organization forms and exist in parallel with other organization forms. The lowest degree of organization has the market, which is organized by market mechanisms. The highest degree represents the hierarchical firm, which is entirely administered. The virtual professional communities have an organization structure which is positioned between the market and the virtual organization, which includes the cooperation of entire organizations as well.

3.2 Added Value

Kazy and Ma (2002) mention the existence of at least two concrete expectations of what virtual professional communities can contribute.

The first point focuses on the aspect knowledge. Knowledge is fragmented in organizations, which is a result of organizational differentiation in hierarchical layers, departments or different geographical locations. The motivation to use virtual professional communities is to increase the efficient use of already developed knowledge. An example is the sharing of knowledge by two engineers working in the same field but in different geographical locations. Sharing knowledge permits the organization to reduce cost and save time. Knowledge sharing can therefore cause an improvement of efficiency due to the utilization of already existing knowledge.

The second expectation of virtual professional communities is the generation of innovation that is based on high knowledge levels. Professional communities can evaluate the quality of technological development and help developments to become a success.

Henschel (2001) describes that communities of practice may decrease learning curves, increase customer responsiveness, reduce rework and prevent reinvention, and leverage ties that provide exposure to new ideas. These advantages can be transferred to the virtual professional communities, too.

After the definition and the added value, the approaches of classification and different typologies of virtual professional communities are presented in the next section.

3.3 Classification and Typology

In the literature, a classification of virtual professional communities in intra-firm, inter-firm and public professional communities is often proposed (Kazy and Ma, 2002).

Intra-firm communities have the purpose to improve knowledge sharing among employees of only one organization. They stimulate a creative and innovative enterprise culture and improve the competitiveness of the firm. The consequence is the creation of core-competencies. The infrastructure and administration of an intra-firm virtual professional community can have parallels to the organization structure of the firm. For example, hierarchical structures can be transferred from the firm to the virtual professional communities.

Improve and strengthen the relationship with customers or partners can be the purpose of **inter-firm communities**. Concepts like concurrent engineering, supply chain management or customer relationship management are used more and more by companies. Virtual professional communities can support these relationships between organizations. For this type of community, it is important to establish the management support with an inter-firm agreement.

The third class is **the public professional community**, which brings together people with interest on a specific subject (SAP Interest Group, the Linux community or KnowledgeBoard). In these communities, membership is usually open to all qualified professionals. A freely exchange of experience, a sharing of information and an improvement of social relationships determines the public professional communities.

In addition to the classification into intra-, inter- and public professional communities, there exist various other typologies of classification. For instance, Katzy and Ma (2002) classed **the types of virtual professional communities in a matrix with two dimensions**. The first dimension concerns the **added value**. A virtual professional community can focus on efficiency gains by using knowledge already existing in the organization. This can be measured by cost reduction or increased quality of products and processes in the firm. Other types of virtual professional communities focus on creating innovation to generate added value. This can be measured by transformation into additional business, for example. The second dimension is **the contribution of a virtual professional community to the individual professional**. On the one hand, virtual professional communities can focus on developing professional knowledge standards and contributing to building professional skills and expertise of each professional. On the other hand, virtual professional communities can focus on connecting professionals to new business opportunities and enable exploiting the knowledge and the skills of professionals.

In comparison to virtual teamwork for example, organizations use virtual professional communities for new projects or to create new communities or networks. Therefore, virtual professional communities can work formally and informally. Virtual teams are created for projects and have usually a hierarchical organisation. Virtual professional communities have more network character.

In the next section, an approach for a lifecycle model of virtual professional communities or virtual communities in general is presented.

3.4 Lifecycle

Boughzala and Kaouane (2004) do a synthesis of several lifecycle approaches of communities, which is adapted to the virtual professional communities. They propose a lifecycle with six different phases (Figure 1).

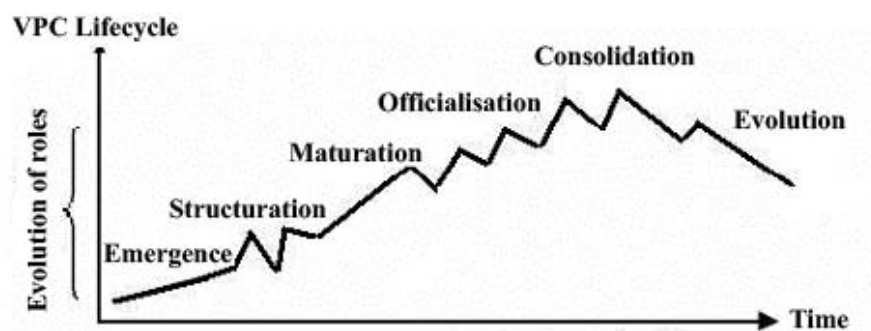


Figure 1 - Lifecycle of virtual professional communities (Boughzala, Kaouane, 2005)

The first phase is the **emergence of the community**. A community emerges around an idea or an objective more or less clear. Lefebvre, Roos and Sardas (2004) identified two conditions to the spontaneous emergence of communities of practice, which can be transferred to virtual professional communities. The first condition is the existence of sufficiently shared professional identities. The other condition is the existence of sufficiently shared representations of the knowledge which is exchangeable by two individuals. The second phase is called **structuration phase**. The community's objective becomes more precisely, the community grows and the structure starts getting defined. In the maturation phase, the roles are already defined and the members collaborate and develop new resources. The **officialisation phase** implies that the community is legitimated and acknowledged by the company. The community still grows, but participation and activity decreases in the consolidation phases because of identity, motivation, and objective reasons. The last phase is the **transformation phase**. In this phase, a transformation is taking place. This can be a new objective, a reorganization or new technology usage.

The roles of the community members evolve at every phases. The virtual aspect is linked to every phase of the lifecycle and influences also the roles of the participating members. The different roles within the community are presented in the next section.

3.5 Roles within the Community

There exist various types of classification of member roles within communities in the literature. A proposition by Blachard and Markus (2002) classes the members of a community into three groups: **leaders, participants and lurkers**. Leaders are identified as influential in the group. They identify themselves as leaders and they are identified by other participants as leaders. These members perform a greater share of community maintenance activities than other members do. Participants, active members, post and respond to messages. Passive members, mostly lurkers, merely read messages. One can distinguish the participation level also into public and private participation. Public participation refers to messages posted to the entire group. Private participation is for instance when a member sends a personal message to another member.

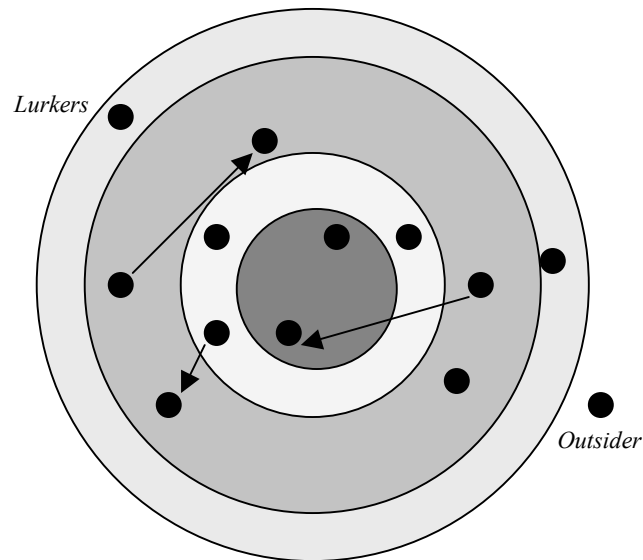


Figure 2 - Levels of participation in a community (Soulier, 2004)

Soulier (2004) describes four levels of participation in a community (Figure 2). This approach is very similar, but refers more to the communities of practice. Nevertheless it can also be useful to explain the roles within a virtual professional community. The **core users** participate very actively and certain assure also human and intellectual management. This group is relatively small and represents 10 to 15 % of the members. The next group represents the **active members**. These members participate regularly, but not with the same intensity than the core users. This group is small, too, and represents 15 to 20 % of the community members. A larger part of the users are classed as **occasional and peripheral users**. They only participate rarely, but often observe the interaction between the active and core users. In this approach, lurkers are members, who don't send messages, don't participate in forums and don't contribute to discussions. They represent 10 to 50 % of the members in virtual communities. During the lifecycle of a community, it is possible that members switch between the different levels of participation. For example, active members can participate very intensively for a short time period. After this period, it is possible that active members switch to a lower participation level.

3.6 Processes

Blachard and Markus (2002) discuss in their study about a virtual community the maintenance of the community through social processes of “*exchanging support, creating identities and making identification, and the production of trust*”. These processes in virtual communities are similar those in non-virtual communities, but related to the challenges of communication via information systems. Exchanging support means the giving and receiving of support. This exchange contributes to the sense of the community. It is “*something one belongs to and which one had a sense of attachment or obligation*”. The creation of identities and making identifications (for example by message signatures) moves the community out of an “anonymous and largely invisible mass of potential members”. Trust plays an important role if members hope to develop meaningful relationships associated with the community. For example, trust can be provided by using real names or by a face-to-face meeting with other members of the community. Blachard and Markus (2002) conclude their research with the statement “*Building a virtual meeting place may produce a virtual settlement. But a virtual community is a virtual settlement in which a sense of virtual communities has emerged from a set of community-like behaviours and processes.*”

3.7 Technical Realization

The problem to find the right technical solution for a virtual professional community is to know which technology can support the diversity, the growth and the performance as best as possible. To collaborate successfully there is a growing need to integrate network information systems. They can be composed out of standard Internet-based tools. Mailers, mailing lists and a great variety of Web-applications are potential tools (Moor, Weigand, 1999).

One potential technical solution for virtual professional communities is the use of collaboration tools. Most virtual professional communities, at least the public professional communities, are realized in form of an Internet platform. This has the advantage, that the access is very easy and that there are no specific hard- and software constraints. These platforms have for example features like discussions, chats or forums. Nevertheless, these platforms are less powerful than recent collaboration tools, which are specifically designed for collaboration.

Boughzala and Kaouane (2004) summarize in their work about virtual professional communities three essential conditions for an effective collaboration: a common goal, a collective action and a mutual confidence. One of the keys to the success is to analyze the collaborative situations the participants of the communities are confronted with. Especially the choice and the setting up of appropriate tools are a key to the success of a community.

In the last section of this chapter, a specific example for Internet-based virtual professional communities is briefly introduced.

3.8 The Lamda Community: an example of a virtual professional community

The Lamda Community was a virtual professional community started in 1995 which was based on four “self-serving” principles. The community was created for Israeli educators to build a national knowledge market and the basis of a national knowledge infrastructure. Y. Y. Sivan (2000) describes that **the objective of the community was to give the ability to educators to develop, share and review educational subjects and programs relating to their professional interests**. The members should create, share and archive knowledge.

The community is featured with a graphic user interface in form of a geographical map, which gives access to the different features (Figure 3). This was not only intended to be user friendly, the designer also wanted to encourage graphically the building of an infrastructure. **The technological realization, an internet platform, permitted the members to meet, work and build the community without time or place constraints.**

The Lamda Community focused from the beginning on the members. The higher goals of the community were to find the right people and encourage them to be active participants. Therefore, the Lamda Community was not open to everyone, the members were carefully selected.

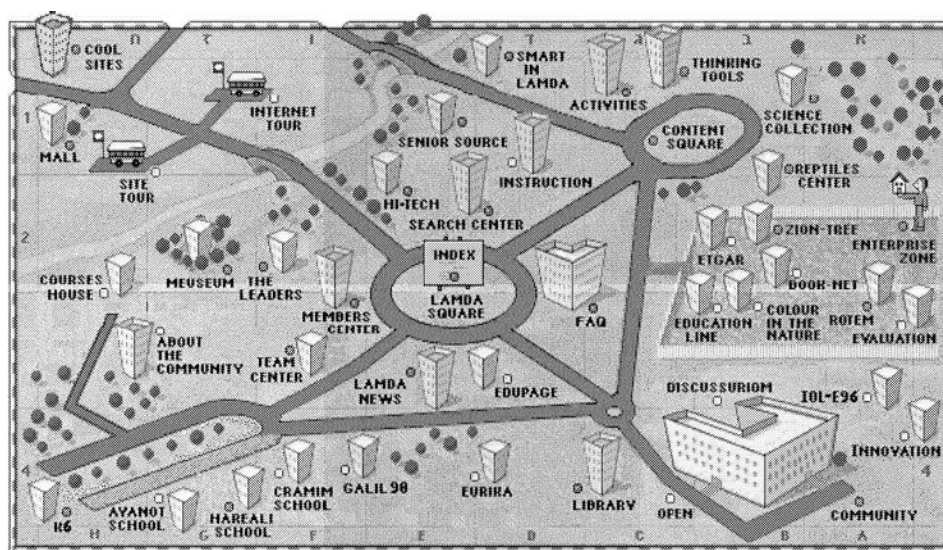


Figure 3 - The graphic user interface of the Lamda Community (Sivan, 2000)

As already mentioned, the particularity of the **Lamda Community** was an approach which bases on 4 self-serving principles. These principles are restriction, guidance, involvement and leadership.

The principle restriction means that visitors could not access to the community. A difference to other communities was the principle of guidance in the Lamda Community. Here, all new members received introductions to the community website and technical staff was provided. In addition to this, a statistic system allowed the organizing staff to monitor the use of the different sections of the site. Members had to meet on an ongoing basis certain criteria, which were checked with an evaluation system. The principle involvement refers to this monitoring of participation. The principle leadership intends to motivate the members of the community by proposing payments for contributions.

Y. Y. Sivan (2000) writes that following the four self-serving principles was an important element of this community. He noticed that the four principles strengthened the community. Members worked for their own interests and therefore advanced the community's needs as well. In his opinion, this is the critical point of a community: *"In order for a community to succeed as collective, individual members need to advance"* (Sivan, 2000).

Thanks to this example and the brief state-of-the art presented in this section we propose a discussion about the common elements between knowledge management and virtual professional communities. The use of virtual professional communities as a tool for knowledge management is more precisely discussed.

4 Knowledge Management and Virtual Professional Communities

An introduction to the theory of knowledge management is necessary to understand the specific advantages of virtual professional communities for knowledge sharing and knowledge creation. Also, it gives an understanding about the common elements and parallels of the knowledge management theory and virtual communities.

In the first section, the definitions and typologies of knowledge are introduced. The understanding of the different types of knowledge is an important factor to identify the role of virtual professional communities in knowledge exchange and creation.

4.1. Definition and Typology of Knowledge

In literature about knowledge management, authors distinguish among knowledge, information and data. A popular view with some variants is that data is raw numbers and facts, information is processed data and knowledge is authenticated information (Dretske 1981, Machlup 1981, Vance 1997). *"Knowledge is information possessed in the mind of individuals, it is personalized information related to facts, procedures, concepts, interpretations, ideas, observations and judgments"* (Alavi & Leidner 2001). Inverse, knowledge becomes information once it is articulated and presented in text or other symbolic forms.

In addition to this, many other definitions of knowledge exist in the literature. As common perception, knowledge is personalized and to become useful, it has to be expressed in such a manner as to be interpretable by other persons. Only information which is actively processed in the mind of an individual can be useful (Alavi & Leidner 2001).

Polanyi and Nonaka (1994) identified two dimensions of knowledge in organizations: tacit and explicit. The tacit dimension is comprised of cognitive and technical elements. The explicit dimension of knowledge is articulated, codified and communicated in symbolic form and/or language.

After Nonaka (2004) knowledge can also be viewed as individual or collective. Individual knowledge is created by and exists in the individual. Collective knowledge is created by and affected to the actions of a group.

To understand and interpret explicit knowledge, tacit knowledge is necessary and forms the background. This implies that only individuals with a requisite level of shared knowledge can effectively exchange knowledge. There must be some underlying knowledge bases, a shared knowledge space (Ivari and Linger 1999, Tuomi 1999). So Weick's and Wenger's research works (Weick, 1995) (Wenger, 1998), interactions and works practices are able to create this shared knowledge space. Knowledge could only be create in interactions and in common practices.

The definition and typology of knowledge is an important aspect to understand the role of virtual professional communities for knowledge management. The community approach, which is presented in the next section, focuses on the exchange of tacit knowledge and on interactions (Swan, 2001). Virtual professional communities are not static knowledge repositories in which codified knowledge is stocked. Individual knowledge is shared by the interaction of the members, the proactive exchange of know-how. This exchange or discussion about for example problems in a professional area can generate new collective knowledge within the community. The community members try to find collectively a solution to the discussed problem.

The question what knowledge management in organizations means, which approaches exist and where the virtual professional communities are positioned in this context, are discussed in the next section.

4.2 Knowledge Management

Knowledge management is about identifying and leveraging the collective knowledge in an organization to help the organization compete (von Krogh 1998). Its purpose is to increase innovativeness and responsiveness (Hackbarth 1998). Knowledge Management includes a broad range of fields, for instance Information Systems, Organization Theory, Strategy or Human Resources.

Problems of maintaining, locating and applying knowledge in organizations have led to systematic approaches to manage knowledge. Davenport and Prusak (1998) described three aims of knowledge management projects:

- Make knowledge visible and show the role in the organization (for example through maps or hypertext tools);
- Develop a knowledge-intensive culture by supporting knowledge sharing, proactively seeking and offering knowledge;
- Build a knowledge infrastructure: a web of connections among people to interact and collaborate.

The **virtual professional communities** touch the second and the third aim of knowledge management projects. In fact, they **support knowledge sharing by offering a community platform equipped with different features**. The proactive element is certainly expressed by the fact that members have to take the initiative to participate. It depends on the motivation of each member to participate to the community. Especially **the aim of building a knowledge infrastructure is supported by the virtual professional communities**. They link people without geographic constraints and allow them to interact and collaborate. The first point is not explicitly taken into account by the communities. The virtual professional communities focus more on the knowledge exchange than on the aspect of making knowledge visible in the organization.

Knowledge management is a process involving various activities. At least, one considers four basic processes of knowledge management: creating, storing/retrieving, transferring and applying knowledge. Nonaka (1994) wrote about four modes of knowledge creation: socialization, externalization, internalization and combination. Socialization mode means to convert tacit knowledge to new tacit knowledge through social interactions and shared experience among the members of the organization. The creation of new explicit knowledge by merging, categorizing, reclassifying and synthesizing existing explicit knowledge is meant by the combination mode. Externalization mode describes the conversion from tacit knowledge to new explicit knowledge and internalization the creation of new tacit knowledge from explicit knowledge. **The virtual professional communities and communities of practice in general focus on the Socialization mode of knowledge creation.**

For Nonaka and Konno (1998), the basic question for knowledge creation is establishing an organization's "*ba*". A "*ba*" is defined as a common place or space for creating knowledge. This shared space permits to emerge the relations and interactions between the actors. Knowledge transfer appears at various levels: transfer of knowledge between individuals, from individuals to explicit sources, from individuals to groups, between groups, across groups and from the group to the organization. **An important process of knowledge management is the transfer of knowledge to locations where it can be used (Alavi & Leidner 2001). VPCs could be useful for such transfer.**

Swan (2001) describes two dominant perspectives in recent knowledge management approaches, the “*KM as Technology*”- and “*KM as People Camp*”-perspective. “*KM as Technology*” is about codification of knowledge as knowledge management strategy. Tacit knowledge is converted to explicit knowledge. Therefore, tacit knowledge is abstracted from its context. Knowledge in this case is seen as a stored and distributed resource. The focus of this point of view is on the information technology systems, which are used to capture and transfer the knowledge. Basically, the role of knowledge management in this perspective is to collect the distributed knowledge and centralize it in an information technology system which enables the knowledge transfer.

The second perspective, “*KM as People Camp*”, is about bringing people together to interact and share knowledge. This perspective has emerged in consequence of the limits of technology in codifying relevant knowledge. Communities of practice play an important role in this understanding of knowledge management. Information technology systems are seen as support for the development of such communities, but not as an essential element of knowledge management. This perspective underlines the need of sharing tacit knowledge. From this point of view, knowledge is in the head of people and situated in communities. It is the result of social interaction in communities and flows through networks that connect people.

Both perspectives may be subject to critic and have their limitations (Swan, 2001). Virtual professional communities can be a possible solution, which combines positive aspects of both points of view. In fact, **the virtual professional communities are positioned between the information technology focused knowledge management solution with big electronic libraries and the knowledge sharing and creating approach through communities of practices**. As described in section 2, virtual professional communities can be seen as a subclass of communities of practices with the some of the potential advantages. They are certainly not a virtual space to stock knowledge. The objective is to share tacit knowledge and create new tacit knowledge. A virtual professional community creates a network between its members and allow them to interact with each other and share their knowledge about a specific professional subject. Form this point of view, there is a tendency to class them in the “*KM as People Camp*”-perspective. However, there is a difference concerning the use of IT systems. Communities of practice are often but not necessarily supported by IT systems. Virtual professional communities are depended on an information technology platform where the members can meet. The used IT system, for example a collaboration tool, realizes the virtual space and is therefore an essential element of virtual professional communities.

To conclude, the virtual professional community approach can be seen as a combination of the two dominant knowledge management-strategies. On the one hand, the usage of IT systems has the advantage that distributed members can easily communicate. On the other hand, the community concept links people and includes the social aspect of sharing and creating knowledge. The approach supports exchange through social networks. It helps to informally share knowledge which comes from experienced and skilled people. **From this point of view, virtual professional communities can be considered as one of the most effective tools for knowledge management (Koh & Kim, 2004).**

In the next section, the class of IT systems supporting the knowledge management is briefly introduced.

4.3 Knowledge Management Systems

Information system researchers write about a new class of information systems applied to managing organizational knowledge, referred to as knowledge management systems. Advanced information systems can be used to systematize, enhance and expedite large-scale intra- and inter-firm knowledge management. In the literature there are generally three common applications for knowledge management supported by IT (Alavi & Leidner, 2001). First of all, there is the coding and sharing of best practices. This can be an information system, which contains and manages the knowledge about project management, for example. The second application is the creation of corporate knowledge, also referred to as the mapping of internal expertise. The third common application is the creation of knowledge networks. Provide online forums for communication and discussion, which can be used by experts, may form these networks.

The primary concern for knowledge management systems is to facilitate knowledge creation and to transfer knowledge through the linking of people or the codification and transfer of knowledge (Swan, 2001).

Nevertheless, computer systems only facilitate sharing information. Without an appropriate strategy to better create and integrate knowledge, these systems have just a random effect (Alavi & Leidner, 1999). Problems of KM by sharing through communities also appear with the use of those systems. Often, people don't behave in a rational way with these systems. It is possible, that they won't exchange information (Swan, 2001).

In the next section, the role of virtual professional communities as KM-tool is discussed. The aim is to find the parallels to the knowledge management theory and to show the benefits by using virtual professional communities.

4.4 Virtual Professional Communities as Knowledge Management-Tool

Getting to know the limits of IT-driven knowledge management for innovation processes, the community-based approach got more and more important. The community-based approach, amongst others developed and extended by Etienne Wenger, has been considered as one of the most effective tools for knowledge creation and transfer in organizations. The approach supports the dialogue through social networks and helps to share knowledge obtained from experienced and skilled people in an informal way (Koh & Kim, 2004).

Virtual communities use networked technology to establish collaboration without geographical and time constraints. The potential of virtual communities can extend the possibilities of the community-based approach for knowledge sharing by combining it with an IT-based platform. To take advantage of the IT-focused virtual communities, it is important to understand how their dynamics can facilitate collaboration. The transformation of traditional off-line communities of practice into virtual communities can improve the scope of the community. For example, the scope can be improved by extending a community of practice to another geographical site of the organization. The transformation to virtual communities can also improve interaction efficiency and information and knowledge sharing (Koh & Kim, 2004).

Y. Y. Sivan (2000) describes the virtual community as a critical component of a modern knowledge infrastructure. A knowledge infrastructure can be defined as the composition of three major elements: “*knowledge culture*”, “*knowledge technology*” and “*knowledge process*”. “*Knowledge culture*” means the understanding of how knowledge should be used and “*knowledge technology*” refers to the use of databases or decision-supporting systems. By “*knowledge processes*” is the sharing, transfer or creation of knowledge meant. Virtual communities draw from all of these three major components and can therefore play an important role in the knowledge infrastructure of an organization.

Two knowledge management-theories are combined in virtual professional communities. On the one hand, the technology focused knowledge repositories, on the other hand, the human-centred conventional community of practice. This is one of the reasons why they can be an effective tool for knowledge management. The use of information systems allows the members to advance their own knowledge and the knowledge resources of the community unlimited of time and place. Members of a virtual professional community can proactively pull knowledge from the community, which is created by the collective participation of the community members. Also, virtual professional communities enable “*access to and interaction with knowledgeable community members*” (Zhang & Watts, 2004). Knowledge acquisition and learning are facilitated by interaction and collaboration with others (Wenger, 1998). Soulier (2004) describes three positive attributes of communities of practice: an intensive and voluntary exchange of tacit knowledge, an informal but very efficient mode of work coordination and a space which gives sense and motivation to the work. The social interactions in this organization form are like an engine for the creation of knowledge. These positive aspects can be transferred to the virtual communities of practice.

Virtual professional communities have therefore the potential to enhance the processes of knowledge management. To become an important factor of knowledge management in organizations, it is necessary to know how to “*design and manage virtual communities to promote knowledge sharing and learning by individuals, groups and communities as a whole*” (Bieber et al. 2002).

In the next section, some approaches uniting the knowledge management approach and the virtual professional communities are presented.

4.5 Research Works on Virtual Professional Communities and Knowledge Management

In this section, some examples of research work about combining the knowledge management approach and virtual professional communities are presented. This gives an idea where the knowledge management-approach can be integrated in the virtual professional communities. Nevertheless, these are only few examples. One of the reasons is that it is an emergent field and there exists not much research work about concrete case studies in these areas.

An approach called “C-KLASS” to support knowledge-sharing and learning in virtual professional communities is proposed by Bieber et al. (2002). They developed an initial set of tools for “*supporting collaboration, knowledge sharing and learning for distributed communities*”. This set of tools for virtual community support includes computer mediated communication, conceptual knowledge structures, advanced hypermedia features, community process support, digital video for collaboration, learning and financial transaction support. Digital Video is a tool to support communication. It proposes new possibilities for synchronous and asynchronous collaboration and learning. Another important benefit is the creation of trust between members who meet the first time. Financial transaction support means that the ability to earn money or credit can make additional knowledge and learning resources available. The participation of the members to the community could be measured and rewarded in some way. Examples for such a mechanism are auctions for knowledge intensive information products.

Another proposition to facilitate knowledge management in virtual professional communities is the utilisation of knowledge maps to “*specify the relationship between knowledge artefacts in order to facilitate learning in virtual communities*” (Lin & Hsueh, 2002). Knowledge map is in this case defined as “*the categorization of documents characterized by concepts contributed to communities of practice*”. It represents knowledge objects and their dependency. The maintenance of the knowledge map in virtual communities keeps the document categories up-to-date. The objective is to facilitate the knowledge sharing activities in a virtual community.

Lefebvre, Roos and Sardas (2004) propose in their article a scheme to integrate knowledge management into the community of practice approach. This approach can also be a possibility for virtual professional communities. In order to create and animate communities of practice, the developed a scheme bases on three aspects: the formalization of a knowledge map (gives a certain visibility about the knowledge of the professional area), the creation of four types of missions for the knowledge management and recasting of human resources management devices.

Isckia, Tounkara and Boughzala (2005) propose an integrated management model which combines the strategic, the organizational and technological dimensions linked to the management of virtual professional communities. It is therefore necessary to have a global approach of knowledge management. The acquisition and the development of knowledge in a virtual professional community have to be compared with the experience of its members. The community starts with a meeting about the subject the potential members are interested in. This kick-off meeting allows the members to meet each other physically. This meeting can be used to “break the ice” and especially to identify the existing experiences and knowledge of the potential members and to make sure that everyone shares the same objectives for the community. Necessary for the growth of the community is the acknowledgement of the community by the organization and their leaders. From the knowledge management-point of view, the performance of the organization is linked to the possibilities of capitalization of experiences, of sharing knowledge and acquisition of new knowledge. In this context, three dimensions have to be included for the management of virtual professional communities: the technological dimension, the organizational dimension and the strategical dimension. The technological dimension is about the used information systems and tools. In this phase, it is important to deploy appropriate tools for saving knowledge and to assure a visibility of the exchanges among the life cycle of the community. The organizational dimension considers a structure and the possibility to confirm the learning in the whole organization. More precisely, the knowledge transfer and the transfer of knowledge from the community to the rest of the enterprise are focused in this phase. That’s why it is necessary to develop interfaces between the community and the rest of the enterprise. The strategic dimension gives the objectives assigned to the community which have to be arranged with the objectives of the company. Knowledge is here considered as basic element or at least as source of strategic advantage.

5 Conclusion: limits and further research

As discussed in the sections before, the traditional communities of practice have to expand their scope in order to adapt to today’s international business environment. The development of information technology has made it possible. One of the possible solutions is the virtual professional community, which is discussed in this work.

The professional virtual community is an effective tool to support knowledge management in organizations. One important reason is that it combines two common KM-strategies: the technology focused knowledge-databases and the community of practice approach.

In addition to the advantages of virtual professional communities, there are also problems which go together with the use of virtual communities for knowledge management. These problems can already arrive at the beginning with the creation of a virtual professional community. This has to do with the distribution of knowledge connected with social practices around different parts of the firm and in other organizations. Especially for innovation processes where people from different professional areas often work together, it can be difficult to identify the different individuals and communities involved in this process. Another problem in this context can appear in linking heterogeneous communities, for example professionals from the social sciences and professionals from a technical area. Here, one solution can be the creation of a social identity of the virtual community.

Other problems can appear during the lifecycle of the communities. Certainly, one of the biggest problems is the participation level. This can have different reasons, for example the informal organization, impersonality or the heterogeneity of community members. Misunderstandings and communication problems can be other barriers to the success of the community (Johnson, 2001). The source of this problem can be the asynchronous communication form of virtual professional communities. The asynchronous communication mode can also cause poor and superficial content in discussions. Here, the traditional communities with their face-to-face communication have advantages. Nevertheless, there are several possibilities to handle these problems. For example, the before mentioned kick-off meeting before launching the community can help to increase the participation. An overview of several potential problems, possible reasons and solutions is shown in table 2.

Potential problem	Possible reason	Solution
Non involvement, non participation.	Heterogeneous nature of the community members.	Creation of a social identity.
	Impersonality of virtual communities.	Frequent personal contact between participants (face-to-face contact). Creation of a synchronous presence in the asynchronous environment.
	Informal organization form.	Formalize more. Participation rules.
Misunderstandings, communication problems.	Cultural differences among individuals can act as a barrier.	
Poor and superficial content of discussions.	Asynchronous communication in virtual communities.	Coaching and scaffolding.
Identification of knowledge and communities involved in the innovation process (during the creation process of the community).	Knowledge in organizations is distributed (geographically and among different social communities).	

Table 2 - Possible problems for virtual professional communities

Further research of the use of virtual professional communities for knowledge management should go into the direction of concrete and empirical studies. There are very few works about real cases of integrating the KM approach, for example the use of knowledge maps, into the concept of virtual professional communities. In addition to this, an analysis about the use of inter-organizational communities for knowledge management would be interesting. Especially in today's business world, many enterprises have cooperations and partnerships with suppliers and even with concurrents. It would be interesting to study the processes and the consequences for knowledge sharing among organizations.

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