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Knowledge Management and Virtual Communities

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**A community of people is the best way to handle complex and fast-changing dynamics in any field of the knowledge business. And once you are in the knowledge business, you find you need knowledge communities to run them.*

(Botkin, 1999, p.85)

Abstract: The objective of this article is to illuminate the relation between knowledge management and virtual communities. A model which comprises four types of knowledge management is presented. A central theme in this article is the suggestion that knowledge management is not an unequivocal concept. Depending on the environment of the organization, the knowledge management will differ in focus and content. Increasing complexity and dynamics in the environment induce organizations to collaborate within and beyond their boundaries. In this collaboration there will be more attention for virtual communities.

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1. Introduction

In the literature there is frequent discussion on both virtual communities (VC) and knowledge management (KM). In this article we will indicate that these concepts are also mutually related. This relation, however, is not valid for all kinds of organizations and their KM. We postulate that generalized knowledge management strategies are not effective. More than ever before in the management of knowledge, the environment in which an organization functions will have to be taken into consideration. Thus, for example, in situations of high degrees of complexity and variability, the content of knowledge management will necessarily be fundamentally different from situations with a low complexity and variability.

This article suggests that in a highly dynamic environment new collaboration forms such as the virtual organization, and especially virtual communities, will play a significant role in knowledge management.

This article is structured as follows. In chapter 2 we will go into knowledge management. In this chapter the importance of the environment of organizations in terms of complexity and dynamics will be demonstrated. Chapter 3 is devoted to the concept of virtual communities. Its first section describes three models, which show the development of virtual communities. In the second section of chapter 3 three types of virtual communities are distinguished. In Chapter 4 we will state that virtual communities are not a phase in (or rather after) knowledge management but a possible form of knowledge management. This article concludes in chapter 5 with a survey of types of virtual communities and the accompanying management functions, emphases and objectives.

2. Knowledge Management

The organization is often viewed as a knowledge-processing system.ⁱ Much attention is paid to the ever-increasing role of knowledge in the functioning of individuals and their affiliated organizations (refer to Davenport en Prusak, 1998). Measures are proposed, in order to better utilize the knowledge present in organizations and in addition, to promote its development. We define knowledge management as ‘the way in which organizations organize necessary knowledge’. In this article, we focus on knowledge management as a design issue. We suggest that organizations implicitly adopt a certain manner of dealing with knowledge by choosing a certain organization form.

Complexity and variability

In the professional literature, managers as well as employees acknowledge that the majority of organizations have to function in an increasingly variable and complex environment. Thus, each organization-design model that aims to keep up with current developments, will have to give priority to finding solutions for this variability and complexity. Many organizations can no longer afford to be passive in their attempt to reduce the uncertainty stemming from these developments. However, this is not an

effective strategy when seen from the point of view of the organization as a knowledge creation system. Uncertainty and complexity are conducive to the creation of knowledge. Organizations have to be able to deal with them and even, in some cases, increase the level of complexity in order to optimally create knowledge. On the other hand, organizations with a low uncertainty factor will continue to exist, due to the fact that, for example, they are mainly focused on the continued production of the same type of product or service, in which case, the issue is one of utilizing existent knowledge rather than the creation of knowledge. Here, reducing the uncertainty that stems from complexity can be an effective strategy. The following model indicates the options in the area of knowledge management as dictated by the nature of the organization's environment.

Figure 1. Organization design and knowledge managementⁱ

The aspects of complexity and variability are positioned on the axis in figure 1.

Complexity regards the degree to which an organization is confronted with complicated issues and the number of factors which it needs to take into consideration. These can stem from the environment as well as from the work itself. Our understanding of variability regards the pace and unpredictability of developments in the environment, e.g., the pace of change in market demand. These situational factors determine the design. Organizations which insufficiently adapt to the degree of complexity and variability will, ultimately, not be able to meet up to the demands of the environment (Mintzberg (1979), Jansen & Jägers (1991)).

It is obvious that an organization (-unit) will never make a perfect 'fit' with one of the model quadrants, and that the model must therefore not be viewed as a precise tool of measurement, but as a conceptual framework.

A. The division of existent knowledge into business functions

In a situation that is neither complex nor variable, an organization will have been structured in such a way as to optimally utilize knowledge. It does not, or barely, create knowledge itself. The knowledge used for the primary process is attained externally, or was developed in the initial phase of the organization and subsequently 'frozen' (Hedlund, 1994). The staff organs are highly occupied with the continued refinement of this 'frozen' knowledge, in the form of rules and procedures. The knowledge management choice in this type of organization form is to split up the knowledge into business functions (such as marketing, personnel, finance, etc.) and hence, in the organization design, to relegate this knowledge to departments that become responsible for these business functions.

The organizations in this quadrant are targeted towards the efficient utilization and recycling of knowledge. The measures for knowledge management serve primarily to make the existent knowledge explicit (codification), thus enabling additional parts of the organization and individuals to make use of it, as well as those who are outside the involved business functions.

B. The division of knowledge into markets

In situations with a high degree of variability and a low degree of complexity, organizations are structured in such a way that the presence of knowledge is concentrated within a single business unit (refer to Hedlund, 1994). This knowledge is specifically market-focused. By concentrating the increment and compilation of knowledge within one business unit, rather than spreading it out over the remaining business units, the organization attains a special manoeuvrability and flexibility, in that the changes required by the market are easily dealt with by the business unit due to this low complexity. Market knowledge is often quite subjective and has a low predictive value. As a result of this, the role of implicit knowledge becomes larger and can be supplemented with general knowledge (demographic developments, available income) and specific-explicit knowledge (business-unit sales figures, competition results).

Naturally, the strongest point of the organization form in this quadrant (focusing the knowledge on one unit) simultaneously forms its weakest point. The division of knowledge leads to a lack of innovation within the entire organization. As business units are largely driven in practice by financial results, in most cases little or no thought will be spared for innovation within the business units. A results-focused policy always leads to short-term efficiency. In this quadrant, the knowledge management will be largely decentralized and it takes place within the business units, having to focus on the exploitation and codification of the (hitherto implicit) knowledge within the units. This process is organized per business unit, when possible by knowledge-managers.

C. The division of knowledge into domains or areas of expertise

In a situation that is complex but not variable, the organization needs to manage this complexity. An important measure for the realization of this, is the division of activities into different areas of expertise or domains. By hiring professionals who are specialized in a limited area and who have the pertinent

knowledge at their command, it becomes possible to adequately manage the complicated problems that arise in the environment. Examples of this are teachers, medical specialists and lawyers. The increment of knowledge *within* the organization does not, or barely, occur, as the professionals within the organization work autonomously and have little shared communication and co-ordination. The knowledge remains implicit, possessed by the individual organization members. Knowledge increase in the areas of expertise occurs outside of the organization in specific institutes or groups, which focus on the development of these areas of expertise, such as training institutes and professional groups. At the same time, the increase of knowledge occurs during the activities of individual professionals within their specific domain of knowledge. Professional groups often share this knowledge, for instance, by way of modern communication technologies (news groups, bulletin boards or listservers). The Internet makes countless other sites (often university-supplemented) available, which try to dam the overflow of information and publications by offering summaries. These sites are generally organized per expertise.

D. The creation of knowledge through the increase of the combined capacity

In situations that are highly variable and complex, the knowledge of each independent participant or employee is no longer sufficient for the management of this knowledge. The organizations have to be structured in such a way to ensure the sharing of knowledge. This is called the enhancing of the combining capacity or fusion (Davenport and Prusak (1998). For example, organizing activities in projects enables the explication of implicit knowledge, as well as the transformation of 'old' knowledge into new knowledge (projects result in learning and new knowledge). Organizations must take care to build in sufficient mechanisms to anchor this compiled knowledge (in knowledge banks, for example) and to make it transferable (via intranet and symposia, for example) and recyclable.

The increment of combined capacity, is the only way in which new knowledge can be created out of existent knowledge. This requires the highest possible degree of freedom to be built into the organization form and the minimization of rules and procedures.

The first three organization types discussed, are mainly focused on knowledge utilization. Up to now, the organization forms that have been chosen by organizations for knowledge utilization, have always led to the division of knowledge rather to the fusion of knowledge. As a result of the division of knowledge, those employees and organization-units not directly involved do not have this knowledge at their disposal. The knowledge utilizing organizations will have to do their utmost to anchor their knowledge at a central level and must develop measures and procedures that promote the easy accessibility of knowledge, as well as ensure that it is offered in a highly standardized form. This strategy is of importance in stable, uncomplicated organizations.

However, there are increasingly situations in which the variability as well as the complexity is high. In these cases, the organization focus is on creating as much knowledge as possible by collaborating with customers, suppliers and other relevant organizations and persons.

Collaboration between various organizations leads to an increment of combined capacities. The creation of added value for the client is an increasingly complicated process, in which divergent types of knowledge need to be fused. Independently, organizations do not have the necessary scale for this at their disposal, hence collaboration becomes a must. Virtual communities are a particular form of this collaboration.

3. Virtual Communities

3.1 The development of virtual communities

Virtual communities are seen as a stage in the organization of cooperation forms. They offer the possibility to give a fitting answer to the demands of innovation of products and services.

One of the earliest descriptions of functions of virtual communities can be found with Venkatraman and Henderson. Their model consists of two axes, the vertical of which contains three stages of virtuality, the horizontal three vectors. The vectors are independent in so far as the attainment of a stage within a vector produces the expected benefit only if the other vectors are also considered properly. Stage three focuses on the interorganizational network to design and leverage interdependent communities for innovation and growth. Table 1 shows their three stages of development in which virtual communities represent the last stage. (Venkatraman and Henderson, 1996).

Vectors Stages of Virtuality	Market Interaction (Virtual Encounter)	Competency Leverage (Virtual Sourcing)	Work Configuration (Virtual Work)
Stage 1	Remote product or service experience	Efficient sourcing of standard components	Maximizing individual expertise
Stage 2	Product or service customization	Effective asset leverage	Harnessing organizational expertise
Stage 3	Shaping custom solutions	Create new competencies through alliances	Leveraging community expertise

Table 1: The three stages of cooperation (following Venkatraman and Henderson, 1996)

Coleman (1997) describes five levels of cooperation, making use of a pyramid (see figure 2). At the lowest three levels there are not any real virtual communities, although all sorts of cooperation forms are taking place, supported by electronic connections (groupware, email). At the highest level virtual communities serving a certain objective can be found. The cooperation is directed towards the creation and maintenance of relations on the one hand, and at the content of the communication on the other. The exchange of knowledge and the creation of new knowledge in the relations with the partners of the virtual community makes up an important part of the cooperation. The Internet and intranet are important aids in this.

Figure 2. Evolutionary Pyramid of collaboration (ontleend aan Coleman, 1997)

It is also possible to consider this pyramid as depicting the creation of a knowledge community, in which the several levels, as it were, form the foundation each time for reaching a higher level of knowledge.

Botkin (1999) heads in the same direction when he postulates that organizations have to go through four stages (stovepipe, sharing, cooperation, community) in order to reach the level of knowledge community. Table 2 shows his model, which describes four stages organizations go through to attain the level of knowledge communities.

Stages	(1) Stovepipe	(2) Sharing	(3) Cooperation	(4) Community
Technology	Desktop PCs	Internal e-mail	One-to-one customer connections	Interconnected to customers and suppliers
Connectivity	Unconnected	Departmentally connected	Cross-functionally connected	Enterprise-wide connected
Culture	Every man for himself	Get more of the pie	Sell the pie externally	Grow a bigger pie for all
Business purpose	Provide traditional products/services	Short term improvements to traditional products	Customer Solutions	Creation of new market and enterprises; Co-creation of future business
Organization	Individual	Task force	Team	Knowledge Community

Table 2. Stages towards knowledge communities (Botkin, 1999, pp.88-90)

Most older organizations are plagued by ‘stovepipes’ or lack of vision beyond one’s own function. At the second stage organizations form task forces with a mandate to work together and share ideas on what needs to be done to share information better. The culture does not change much. Teams with directives for cooperation are formed by organizations in stage three. At stage four, organizations start experimenting with knowledge communities. They often start by identifying communities of practice within the organization and supporting the growth of these kinds of communities. The aim at this stage is to organize radical innovation and create completely new enterprises.

What is striking in this model is that the knowledge communities stay within the organization boundaries. This is in sharp contrast with the other two models and the bulk of the literature, in which the boundary crossing character of virtual organizations is emphasized.

This survey of models offers only a limited selection of ideas in this field. It is intended to indicate the general direction of present-day thinking on virtual communities. In spite of some minor differences between these models, the common denominator clearly emerges. Virtual communities form a last phase in a development process and they are directed towards (radical) innovation and growth.

3.2 Characteristics and types of virtual communities

A virtual community is a group of people who, with the help of technology, engage in collective activities that also take place in real-life communities. The term activities should be seen in rather a broad sense. In a virtual community nice stories can be exchanged or people just chat. Sharing emotions, too, playing games, brainstorming or knowledge sharing are activities that can take place in virtual communities. The main difference with a real community is that, in principle, people cannot meet or see each other (Rheingold, 1993; Fernback and Thompson, 1995; Ratcliffe, 1996). Often, however, contacts in a virtual community do result in real meetings, or people can see each other because of the increasing possibilities of ICT, as is, for instance, the case in video conferencing.

For the division of communities into categories two aspects are of decisive importance, irrespective of whether the community is virtual or not. These aspects are content and (social) relations (Coleman, 1997; Otten, 1999). On the one hand, people exchange information or knowledge in communities. The content of this information exchange matters rather than the social character. On the other hand, relations form an important part of communities. The exchange of emotions, informal and personal information exchange and such like activities are good examples of the relational aspect of communities.

In no virtual community the sole objective is content or social relations. The emphasis on either of them, however, differs per type of community. Depending on whether the emphasis lies on content or on relations, three different types of virtual community can be distinguished, viz. the chat type, the expert type and the innovative type.

The chat virtual community

In the chat community social relations are more important than content. It is not so much the exchange of knowledge or information that matters, but more the talking to each other about this, that and the other. These communities are usually organized around certain themes, but they will be so general that they will offer starting points for everyone to start chatting happily away.

Communication and the organizing of social relations is inextricably bound to (virtual) communities (Fernback en Thompson, 1995). The content of the messages is not so important, which means that anyone can take part in this type of virtual community. The chat community has no direct link to knowledge management and therefore it will not be dealt with further in this article. There is, however, the possibility that the community will shift in due course towards one of the other types, for instance, when the content gains more weight or even begins to dominate the possibility to chat.

SmulWeb (Tuck-in Web). SmulWeb is a meeting place on the Internet for anyone who loves healthy and tasty food and drink. SmulWeb differs from what has been customary up to now on the Internet. It provides much information on anything that has to do with culinary enjoyment, like food and health, drink and health, eating in, eating out and 'slimming to last'. The success of Tuck-in Web lies not so much in information exchange, but in the possibilities that the site offers for chatting. Thus, a tea-chat has been created, because many people (women in particular) were present in Tuck-in Web at certain times and they felt the need to chat with each other. Apart from that it is possible to send in recipes, put together a menu, mix creative cocktails and rate restaurants.

The expert virtual community

In this type of virtual community the exchange of information and knowledge comes first. In general, the majority of this community consists of experts in a certain expertise. The exchange of information and knowledge holds pride of place in this type of virtual community. Having a common background (expertise) ensures that the meaning of the information/knowledge exchanged is unambiguous.

For several years now a number of scholars in the field of Information technology and Organizational Science have collectively carried out a research project, called PrimaVera (http://primavera.fee.uva.nl). In order to enhance the discussion in their field of expertise a discussion forum has been established. In this so-called Delphi-forum (http://www.delphi.com) they draw each other's attention to conferences and articles on the Internet or in periodicals. Apart from that there are discussions on topics of interest for the target group. The sole object is content. No (personal) information is exchanged that has no bearing on the field of research of PrimaVera.

The innovative virtual community

In this type of virtual community content as well as relations are important. The community has to ensure an integration of communication and content (Hagel III and Armstrong, 1997). Social relations can increase the trust between the parties that share knowledge (Nottingham, 1997). In general it is taken for granted that true knowledge encompasses more than just information. In the case of knowledge it all comes down to the meaning or content of the information (Davis en Botkin, 1994; Ratcliffe, 1995). Nohria and Eccles (1992), too, state that when personnel members want to strengthen weak ties, they have to exchange social as well as meaningful information. For this reason it is especially important in the case of new product development not only to pass on information, but also the meaning of information. A requirement for a potential knowledge information mechanism for innovations is therefore the possibility to express the meaning the holder of the information attaches to it (Otten, 1999).

The partners in a virtual community have different fields of knowledge, so that they can complement each other through knowledge sharing. Different roles can be fulfilled by different partners. This type of community will be characterized by a great variety of roles, such as experts, project-facilitators, discussion facilitators, technical development and support and nurturers/communicators. Because knowledge is shared, new products can be developed, which in knowledge management terms is called increasing the combining capacity.

Suppose your company wants to bid on a large project to build a dam in Africa on the Congo river. Initially a team would be organized from all over the U.S., some locals in Africa, and some people in Europe with expertise in building this type of dam. An e-mail goes out to all the prospective members of the team inviting them to be part of the project.

All reply affirmatively. They are given a password and asked to look at a discussion forum. This forum is located on a web page where everyone involved can look at the RFP and discuss the various parts their expertise impacts. The RFP is explicit knowledge, and the discussion is tacit knowledge which will lead to a proposal (explicit knowledge again).

If the company loses the bid, those on the team can go back and look at what decisions were made preparing the proposal to uncover how to avoid making those mistakes in the future (organizational learning). Finally, the team makes recommendations for itself (or any other group doing a similar project) on best practices, or what they think will win the bid. Afterward, this whole project is indexed and put on the corporate intranet so other teams can sidestep re-inventing the wheel (they can even modify the proposal the first team made), as well as see the decision processes and pertinent data that culminated in the initial proposal. The Congo Dam Project, although a short-lived community, has added value to the organization even if it has not contributed directly to the bottom line.

Taken from Coleman, 1997 (http://www.collaborate.com/hot_tip/tip1097.html)

4. The relation between the Knowledge Management model and Virtual Communities

The three models/pyramid described in section 3.1 all give the impression of a linear and evolutionary development. An underlying supposition is that organizations pass on from one phase to the other, knowledge management (merely) being one of them. Another premise is that technological progress forms the basis for this phasing (see, amongst others, Coleman, 1997). We do not deny that a development can be noticed, in technology as well as in the emergence of organization forms and the alternative ways of organizing knowledge. We also recognize the relation between technology and these alternative ways, as technology greatly expands the number of choices for possibilities of cooperation.

Nevertheless, we want to postulate that the emergence of virtual communities is not only a phase in an evolutionary development form of organizing. We are of the opinion that the formation of such communities - as a conscious or unconscious (but increasingly conscious, because organizations see the need for them) choice - is an effective answer to the demands the environment makes. Increasing complexity and variability ask for cooperation between experts within and across fields of expertise,

business functions and even organization boundaries. Both suppliers and customers may become important participants in the collaboration and the sharing of knowledge (see the description of the Dell virtual community, by Venkatraman and Henderson, 1996). As more and more organizations find themselves in a highly complex and dynamic environment, they increasingly tend to form virtual communities. It may seem that this is a next phase in knowledge management. However, we state that the development of virtual communities, like the optimizing of knowledge in business functions or the chopping up of knowledge in business units, is a realization of knowledge management that is the most effective one with a view to the environment of that organization.

In practice we see forms of virtual communities in two quadrants of our model.

Figure 3. Positions of Expert and Innovative Communities

In quadrant C we see the emergence of virtual communities within the fields of expertise, usually on the initiative of the experts themselves. In these communities the emphasis lies on the content of the knowledge and not on the social relations, although they may develop over time. Because the exchange of knowledge between specialists in the same field is central here, it is understandable that the content of the knowledge is most important. The social component is not as relevant here as in other types, because the meaning of the knowledge does not have to be explicated anymore for the experts (Otten, 1999). The function of these virtual communities is also different from those in quadrant D, in that they do not strive for innovation for its own sake, but continuous improvement in the relevant field of expertise. It is also possible to say that virtual communities in quadrant C are not an absolute requirement, but a useful addition to forms of cooperation, supported by Groupware and other Collaborative Applications (phase 3 of Coleman's pyramid). Because specialists are geographically dispersed the forming of virtual communities (based on electronic connections) is an effective way of cooperating.

In contrast to this, the emergence of virtual communities is quadrant D is, in many cases, necessary and not so much a result of geographical distance. The fact that such communities also emerge on one and the same location is an indication for this. In this kind of knowledge communities the emphasis is on content as well as relations. This great attention for relations is necessary, amongst other things, because apart from the knowledge itself, there is also the meaning of that knowledge which has to be exchanged between people with often different expertise and background. The emphasis here will come to lie much more on the combination of implicit and explicit knowledge. The function of such communities is not so much continuous improvement as innovation, the development of new products and services.

Conclusions

In this article we have described the relations between knowledge management and the environment the organization finds itself in. Depending on the degree of dynamism and complexity organizations will (have to) make different choices in order to cope effectively. As they are increasingly confronted with variable and complex situations, we see new solutions for organizations to acquire and create the necessary knowledge. An important new development in knowledge management is the virtual community. In this article three types have been distinguished, two of which play a part in the knowledge management of organizations. The table below shows the two types of virtual community and the accompanying management functions, emphases and objectives.

Virtual community	Environment	Knowledge Management	Emphasis	Objective
Expert type	high complexity, low variability	division of knowledge in domains	content	(quality) improvement
Innovation type	high complexity, high variability	increasing of combined capacity	content and relations	innovation

Table 3. Survey of types of virtual community and knowledge management functions

For the management of the organizations it is of the utmost importance to become aware of the most effective way of knowledge management in dynamic and complex environments , i.e. the increase of the combining capacity of organizations. The combination of knowledge and competences in the form of virtual communities, with the objective of deepening of the expertise and/or innovation is an useful and (enabled by ICT) feasible choice. Managers will have to occupy themselves with identifying and stimulating virtual communities. We believe that virtual communities will become an increasingly important part of knowledge management of organizations.

References

- Botkin, J., *Smart Business: How Knowledge Communities can revolutionize your company*, 1999
- Coleman, D., *The Evolution of Sustainable Value-Added Communities*, October 1997,
http://www.collaborate.com/hot_tip/tip1097.html
- Davenport, T. and Larry Prusak, *Working Knowledge: How organizations manage what they know*,
Harvard Business School Press, 1998.
- Davis, S., Botkin, J., *The coming of Knowledge-Based Business*, *Harvard Business Review*, September-October, 1994, pp. 165-171.
- Fernback, J., Thompson, B., *Virtual Communities: Abort, Retry, Failure?*, 1995,
<http://www.usyd.edu.au/su/social/papers/fernb.html>
- Hagel III, J., Armstrong, G., *Net Gain: Expanding Markets Through Virtual Communities*, Harvard
Business School Press, 1997.
- Hedlund, G., *Knowledge management and the N-form corporation*, in: *Strategic Management Journal*, vol.
15, 1994, pp. 73-90.
- Jansen, W. and H.P.M.Jägers, *The Design of Effective Organizations*, Stenfert Kroese, Leiden, 1991
- Jansen, W., Steenbakkers, G.C.A., Jägers, H.P.M., *Knowledge Management and Organization Design;
dealing with complexity and variability*, Submitted to: *Knowledge Management and Virtual
Organizations: Theories, Practices, Technologies and Methods*, Y. Malhotra (ed.), Idea Group.
- Jones, Q., *Virtual-Communities, Virtual Settlements & Cyber-Archaeology: A Theoretical Outline*, in:
Journal of Computer Mediated Communication, 3 (3), December 1997.
- Mintzberg, H., *The Structuring of Organizations*, Prentice Hall Inc., Englewood Cliffs, 1979.
- Nohria, N., Eccles, R.G., *Face-to-Face, Making Network Organizations work*, in: Nohria, N., Eccles, R.G.
(eds.) *Networks, and Organizations, Structure, Form and Action*, Harvard Business School Press,
Boston, 1992.
- Nottingham, A., *The Virtual Organisation as a Community built on trust*, 1997,
<http://www.lmu.ac.uk/ies/conferences/nottingham.html>
- Otten, V.L.M., *Kennismanagement als basis voor productinnovaties [Knowledge management as a basis
for product innovation]*, in: *M&O*, nr. 4, July/August 1999, pp. 55-69.
- Ratcliffe, J., *Virtual Communities, Or Get a Life?*,
<http://wattlab.coms.uconn.edu/courses/coms239/spring97/ratcliff.html>
- Rheingold, H., *A slice of Life in My Virtual Community*. CA: Whole Earth Review, 1992.
- Rheingold, H., *The Virtual Community: Homesteading on the Electronic Frontier*: Addison-Wesley, New
York, 1993.
- Venkatraman, N., Henderson, J.C., *The architecture of Virtual Organizations: Leveraging Three
Interdependent Vectors*, Discussion Paper, Systems Research Center, Boston University School of
Management, Boston, MA, 1996.

ⁱ In knowledge management, distinctions are often made between the phases that need to be passed through in order to utilize knowledge in organizations. The following phases are distinguished:

- Knowledge creation and acquisition
- Knowledge compilation and organization
- Knowledge dissemination
- Knowledge application

For definitions and for the distinction between explicit and implicit (tacit) knowledge, we refer the reader to Nonaka (1995), Den Hertog and Huizinga (1997), Jacobs (1996), Chun Wei Choo (1997), Weggeman (1997). They all devote thoughts to this subject.

ⁱ In connection with this it is worth considering a comparable model of Blackler, in which different types of knowledge encountered in different organization forms are described.

ⁱⁱ This model was presented in an article by the present authors: Jansen, W., Steenbakkens, G.C.A., Jägers, H.P.M., Knowledge Management and Organization Design; dealing with complexity and variability, Submitted to: Knowledge Management and Virtual Organizations: Theories, Practices, Technologies and Methods, Y. Malhotra (ed.), Idea Group