

Management of Knowledge as Interface Management

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From Exo-Worlds to Endo-Worlds

The aim of this article is to sketch an alternative "organizational" way into a knowledge-driven society. A society in which the management of organizational intelligence becomes the essential resource of any organization. We show that two prominent approaches focused on organizational intelligence, namely "learning organizations" and "virtual organizations", are not well suited to meet the knowledge needs of organizations in the future.

Introducing the concept of interface management we develop an alternative route, merging some of the principles of the two other approaches. On this route, we show how interfaces, endo-worlds and endo-management allow for a continuous utilization and generation of knowledge within the broader realm of cyberspace; constituting a new endo-economy.

The Knowledge Economy: From Silicon Valley to Cyber Valley

There is broad consensus that we are in the midst of a fundamental global transformation of society comparable to the first (steam machine, railway) and second (computers) industrial revolution. A transformation toward a "post-capitalist society", in which "it is certain that knowledge will be the primary resource" (Drucker, 1994: 4) - not money anymore (Toffler, 1980: 394). In terms of the economy, the changes are obvious. In an industrial and service-based economy, the value of a product is based on the integration of work and material. In a knowledge-based society, the value depends much more on the "embedded intelligence" of products and services (as is the case with software, computers, microchips etc.). Consequently, the importance of traditional productive factors (land, capital, work) will diminish while the importance of expertise and knowledge will increase (Drucker, 1994: 64-65).

In the hub of this transformation lies the development of a technical infrastructure that is known as "information-superhighway" or as telecosmos (Morath 1998). This evolving telecosmos contains modern information technologies with its hard components (e.g. computers, fax machines, cellular phones), hard/soft components (e.g. network and videoconferencing systems, virtual reality) and soft components (e.g. groupware, edi programs). It is wrapping up the globe like a new electronic atmosphere. Enabling new individual, social and economical "forms of life" on earth. At the leading edge of this knowledge (r)evolution is a striving group of high-tech companies.

Within this group one can distinguish two types of companies. Phase 1 companies (companies building "telecosmos") and phase 2 companies (companies inhabiting "telecosmos"). You might compare this situation to the beginning of the Industrial Revolution: The railroad companies (phase 1) spread out the infrastructure, while the first factories (phase 2) were "driving on" the infrastructure. The history of economy since these early days has revealed a simple principle: Phase 2 companies move on and prosper, while phase 1 companies eventually stop developing and diminish. We believe that this principle is valid with our modern information infrastructure, too. Phase 1 companies build the future; phase 2 companies are the future. Hence it seems reasonable to regard phase 2 companies for innovational impetus; companies such as ID-Mediengruppe in Germany, constructing the cyocosmos, a virtual communication platform to bring together people who share common interests. ID also created the virtual figure E-CYAS (Endo-Cybernetic Artificial Superstar), the counterpart to the virtual Japanese popstar Kyoko Date. Let's look at some of the characteristics that distinguish Cyber Valley companies (phase 2) from Silicon Valley companies (phase 1).

Moving on from Silicon Valley to Cyber Valley one major change is obvious: The companies and products are becoming more virtual and more intelligent. In the virtual Cyber Valley you do not find a production site at a physical location, with physical borders and a physical product. In Cyber Valley companies and products are built in a virtual logic: Only to be seen when activated. Formed through networking of participants all over the world, local and global, physical and virtual, human and non-human, encompassing virtual industries, service centers and software producers around the globe (Schmidt, 1998: 639).

To follow this virtual logic, they have to be more intelligent, i.e. built on knowledge rather than on physical components. This development will change the rules of the game fundamentally. Companies in Cyber Valley take social constructivism one step further. They are more than "thinking organizations" (Sims/Gioia 1986) that function as collective interpretation systems to make sense of the "real" world (Berger/Luckmann 1967, Daft/Weick 1985, Weick, 1967, 1995). Instead of relying on a questionable physical and social reality, they invent their own symbolic virtual worlds (cyberspaces) constituting their own (business) reality. A reality or technosphere with completely different rules: A complete immersion of individuality and collectivity; global interaction and new forms of synergy between human and artificial intelligence (Barnatt 1996).

If this reality invention were an individual phenomenon, one might call such a company "schizophrenic" or simply "crazy". However, the construction of this new reality is inter-subjectively shared and appreciated. Hence it seems more appropriate to term these companies "innovative" or "creative". If they are indeed the future, the art and practice of innovation and creativity in cyberspace obviously becomes essential for a company's survival; "organizational intelligence" as the "complete system of knowledge which permits people to coordinate their activity together" (McDaniel Johnson 1977: 6) has to become the focus of managerial activity.

In the current literature on organizational intelligence, two conceptual approaches can be distinguished. One approach focuses on the human intellectual capital of organizations (a people approach where organizational intelligence is pushed by people). The second approach emphasizes the importance of intelligent technology (a technology approach where organizational intelligence is pulled by technology). By looking closer at both approaches, we show that both are somewhat limited in their future reach. By ignoring the situation and reality of phase 2 companies a lot of possible knowledge about knowledge gets lost. As we shall show, by transforming the two into a third concept (interface management) one can overcome these limitations.

The need for intelligent organizations

Learning Organizations - The people approach

Since the influential work of Argyris und Schön (1978) the concept of learning organizations (LOs) has been a popular theme in the management literature (Eberl, 1997, Klimecki/Thomae 1995, 1997). A LO is an organization "that facilitates the learning of all its members and continuously transforms itself" (Pedler et al., 1991: 1). Depending on the theoretical provenience of the author(s), this transformation reflects an adaptation to the environment (March/Olson 1975), a change of the culturally embedded organizational theories (Argyris/Schön 1978), an expansion of the knowledge base of the organization (Blackler 1993), or the perfect systemic tuning of individual abilities, culture and communication (Senge 1990).

In general this learning process is described as continuous cycle balancing between individual learning and organizational learning (Kim 1993). A process that Nonaka/Takeuchi (1995) call "knowledge

conversion". However, a lot of authors stress that "OL draws upon the integration of the sum of individuals' learning to create a whole that is greater than the sum of its parts" (Starkey, 1996: 2, Kim 1993: 40). Two major obstacles may impair organizational learning. One is the existence of defensive routines (Argyris, 1990). These routines are a result of processes which typically take place in organizations: micro-politics, power games or groupthink. These defensive routines result in "skilled incompetence" in dealing with new insights. Leading to organizational inertia, as expressed by idea killers like "the boss won't like it", "I do not have the authority", "it's never been tried". If one looks closer, most of these organizational learning disabilities are rooted in a clash of different realities: Due to their dominant "mental models" (Senge 1990: 174) organizations or individuals can only see what they can see. Strange, new or just other ideas that do not fit with the own concept of reality are not taken into account (Senge 1990: 174-205, Dörner 1989: 288-294, Watzlawick 1976).

The second obstacle roots in the fact that learning is fundamentally a self-organizing process (Klimecki et al. 1995). Management can try to establish learning-promoting structures and processes and work towards an open learning culture. But it cannot force people to learn and to take part in collective learning efforts. Due to both obstacles, organizational learning sometimes just does not take place.

In terms of their organizational understanding, LO authors are still inclined to a very traditional idea of organizations with stable boundaries and a relatively clear distinction between inside and outside. Concepts such as virtuality or cyberspace do not play an independent role in their approach. Computer technology, if mentioned at all, is seen instrumentally as a possible learning tool such as "Microworlds" including computer simulations and scenarios of real business processes (Senge 1990: 313-338). In other words, the cyberspace, in which phase 2 company work and prosper, is terra incognita in the LO literature.

Virtual organizations - the technology approach

In contrast to the people approach, regarding organizations as virtual organizations (VOs) is a very technical perspective. The term virtuality was first coined in the field of information technology where it was used to describe memory that could be activated ("put into being") only for a specific purpose. With such a task specificity it is possible to make computer memory appear bigger than it is in reality. It was applied to organizations to preserve a similar phenomenon; this being organizational structures and processes that do only exist when activated. Thus, VO appear big on the outside, while being small on the inside. This is possible with the extensive use of computer-mediated networks. VOs have been circumscribed as "dynamic networks of knots (individuals, organizational sub-units, organizations) whose (computer-mediated) links are configured dynamically and only for specific problems" (Picot et al. 1996: 396). Hence, VOs are characterized by a constant process of shaping and re-shaping (Barnatt 1995, Davidow/Malone 1992).

Organizational intelligence is treated in a somewhat mechanistic and rationalistic way. Each knot is said to have a specific set of core competencies which makes it the most competent provider of services or goods within the value chain. The specific know-how of each knot of the network then adds up to the overall knowledge (Wüthrich et al. 1997, Harris, 1998: 76-77). The role of Information technology is to push the production of knowledge by enabling direct and instant connections between knots. In this view, a perfect information technology environment logically leads to a perfect knowledge accumulation.

In such a perspective, human aspects of knowledge generation are not taken into account. Questions such as "are people willing to share their knowledge (electronically)?", "what personal benefits do people have from participating in VOs?", "can they trust other participants they have never seen or met

in reality?" (Handy, 1995, Nohria/Eccles 1992) are ignored. Hence, the VO approach only exploits the very technical surface of cyberspace. It does not explore the inner workings and possibilities of cyberspace (as indicated by cyber valley companies). Nor does it consider its human side. **Interfaces: synthesis of people and technology**

To integrate both people and technology and to accommodate for the intellectual possibilities of cyberspace and cyber valley companies, a broader perspective is necessary. The concept of interfaces opens up such a perspective. In our understanding, interfaces have a number of distinct features:

- (1) Interfaces are temporary networks of people and/or computers, integrating human beings as well as intelligent agents and databases. They only exist by means of inter-subjective construction and maintenance. Interfaces are, in other words, socio-technological actor-networks (Callon 1986: 28-34).
- (2) In contrast to closed system concepts (e.g. organizations), interfaces have open structures, thereby enabling constant bifurcations that can lead to new solutions. Hence, interfaces are very flexible in their adaptation to new realities.
- (3) The construction of interfaces does not follow a simple human or technological logic. Instead, in interfaces computer and human logic is intertwined: Interfaces expand electronically the human thinking by "copying" the function principles of the human brain, allowing human-based computer thinking. And interfaces provide a digital coding and decoding of cyberspace and (virtual) realities, providing for a computer-based human thinking.
- (4) Interfaces evolve through a continuous process of participation and feedback. Bi-directional feedback loops between interface and participant secure a two-fold responsibility both for individual and interface activity. Thereby enabling a trustful environment in which individuals are willing to participate.
- (5) Interfaces form parallel worlds. With their capacity of simulation, evolution in interfaces can be reversible in contrast to the irreversible evolution of physical worlds. With the advance of interface technologies (nanotechnology, quantum computers, biotechnology) this permits new human life configurations and the formation of a global brain with a possible meta-consciousness.

With such an interface perspective, it is possible to address both human as well as technical questions of collective intelligence. Such a perspective will also change some of the paradigmatic principles guiding our epistemological and managerial understanding (see table 3).

Interfaces as Endo-Worlds

Endo (Greek 'from inside') means that we are inside an interface - a constructed borderline of our knowledge. Interfaces as a lens for construction of reality allow us to make an endo-/exo-Cut between the knowledge of a network or a participant and the outside world. Exo (Greek 'outside') means that we are outside of this interface. For example, if you have a Submarine team, the people which are in the submarine are "endo", and the rest of the world is "exo". Cyberspace is virtual and endo to the physical world. So we can say that any virtual world is endo to a physical world, but not every endo-world has to be virtual. With this endo/exo distinction one can (analytically) cut through the fluidity of interfaces. Providing some useful first interface insights.

Take for example the largest electronic endo-world existing today: the Internet. What most newcomers in the Internet do not understand, is that the main topic in the Internet is not to sell an exo-product or an exo-service, but to connect people to communicate. They mistakenly believe that the Internet is constructed as digital copy of the physical exo-world. Yet, it is a living electronic endo-world with its own rationale: It has no owner (if at all, the Global Brain is the "owner"). And it is still a non-regulative

world. So, the most important rule in the Internet is to minimize the number of rules to provide enough space for different interfaces to connect. The main currency is attention. Hence, a constant effort has to be put in to maintain it and attract participation. And, the Internet does not follow the same causal logic as some of the exo-worlds do. Which leads to non-linear dynamics and chaotic patterns of events. Yet, one thing should be kept in mind: Endo-worlds and exo-worlds are not two clearly distinguishable; they are more like a seamless meta-interface itself.

Interfaces as virtual communities

In the last couple of years virtual communities have evolved in "the Net" (Turkle, 1995 and Rheingold, 1993). These MUDs (Multi-User Dungeons) are social virtual realities displaying many of the interface features. Technically speaking they are nothing more than computer programs allowing distant people to communicate instantly. Virtually, they are much more. In contrast to other similar technologies, e.g. video-conferencing, e-mail, bulletin boards, MUDs have a life of their own. They exist, because people want them to exist. And because people want to build their personal world and realize their vision within it. They log-in and become their virtual character, their personae. And with it they and their virtual friends build their virtual community.

So let us see how such a virtual community - InterfaceMUD - (hypothetically) works: People log-in to InterfaceMUD changing their identity to whatever they want to be and possibly are best at. Thereby leaving reality and its limitations behind: A virtual personae is not bound by one's gender, societal position, sexual orientation or handicap in real life. In InterfaceMUD there is no glass ceiling, as a matter of fact, there is no ceiling at all. People in InterfaceMUD are judged by what they say and not what the sign says at their door. Turning the world from a bureaucracy, where floor level and size of your bureau determine your position, to a meritocracy - where your social position is based on what you are capable of.

In InterfaceMUD People get together who have not met in reality. Life is culturally rich, benefiting from a broad background of life-styles, experiences and a lot of different individual interface links. Without immediate real world consequences, this opens up a lot of creative space for experiencing and creating new organizational theories. The technical possibilities of InterfaceMUD are immense. People discuss problems not only with their immediate peers, but with peers from all over the world. Discussion groups on all kind of topics are installed in InterfaceMUD. Virtual Libraries, the InterfaceMUD Open University and real world databases are accessible, enlargeable and changeable for everybody.

The keyword is "free". Free information for everybody who enters InterfaceMUD. Free information that is free to be used, free to be passed by and free to be modified according to individual needs. Have a technical problem with a software program? Put it on a virtual discussion group. Need an idea for a new project? Look it up in the virtual database of former projects. Want to study "intercultural management"? Join the program at the virtual Open University. You are not satisfied with the way the real organizations work? Find some equally dissatisfied and interested people to play around with new ideas. This newly generated knowledge can easily be transferred to reality and formality via individuals and electronic links. Enabling both quick solutions and ongoing learning processes in "real" interfaces.

In terms of boundaries and membership, InterfaceMUD is open. It equals any real community or organization as much as the inhabitants want it to. In InterfaceMUD people develop a sense of belonging because they actually build a world they can oversee within self-determined boundaries. And trust people they have never seen. Because it is a world that is pseudonymous but not anonymous: Each personae stands for a set of values, beliefs and words. And each member is participating in InterfaceMUD for similar reasons: Have fun, learn and build bridges.

Interface Management as Knowledge Management

Knowledge Generation in Interfaces

According to constructivist thinking, our knowledge of reality depends on our individual cognition. Due to individual differences in perception and cognition, there is no absolute truth but only relative certainty. Hence, knowledge - in the sense of finding and defining truth - can only be described in subjective but not in objective terms.

From an interface perspective, knowledge of reality becomes an inter-subjective concept, defined by participation in interfaces. On this inter-subjective level you find the same learning barriers as on an individual or organizational level. As the research of limitologists has shown, it is impossible to see the full picture of an universe from inside. Everyone who sees the world through interfaces has only a limited view of the world. It is therefore necessary to have the ability to realize the existence of other interfaces and to understand their constructions of reality. Knowledge can then be generated by differentiation between interfaces and by producing interferences (superpositions) of different interfaces.

The construction of these intelligent interfaces through individuals, computers, communities and companies in cyberspace will change the micro interface between man and machine dramatically. The human brain is not fast enough to handle huge data amounts efficiently. By expanding into interface, individuals are able to overcome some of the biological and social restrictions: Each human brain can more easily contribute to the overall knowledge. Thus generating new knowledge in a more productive way. However, for this inter-subjective knowledge generation obviously intensive communication will be necessary. Knowledge management in this sense is communication management: Making the navigation, construction, communication and use of knowledge more efficient. Thus, the increasing use of electronic media allows a new transfer of complex contents through the parallel use of text, voice and pictures. Agents and Knowbots can freely move in the parallel navigation in n-dimensional knowledge spaces. Routine processes can be performed through programs which are capable to learn by themselves and self-organize their evolution.

Endo-Management: Tapping the Global Brain

The evolution of knowledge cannot be left alone, it has to be managed in a new, creative way. Interfaces tend to be anarchic and chaotic without effective management. Therefore, interface management or endo-management requires to understand the complexity of interfaces to be able to influence them. It is not through reducing the complexity, but by understanding the complexity, that we will have a chance to make a difference. To do so, four features are important:

(1) Interactive feedback loops

The management of interfaces is strongly depending on interactive feedback loops which can either lead to self-organization or creative destruction (J.A. Schumpeter). As described, interfaces have the tendency to self-destruct. So, existing management principles directed toward sustenance and status quo cannot be applied adequately. Positive feedback is essential for the complexity of self-organized processes and deterministic chaos. In interfaces it influences phenomena like innovations, virtual organizations and group-dynamic processes. For example, small and medium-sized firms have new chances to reach huge numbers of networks knots through positive feedback. Therefore, economy of scale is not the important factor in an interface economy, but economy of simulation - the efficiency of software and the flexible use of hyperlinks. In interfaces power is broadly distributed. Because of the intensive feedback loops from and to the interface, every person can be the reason for massive change

and transformation.

(2) **Blurred boundaries**

Interfaces can be both exo and endo. So depending on where you are you will either look inside out or outside in. With more people developing an endo perspective, not only the endo-world, but also the exo-world will change. Because it makes a difference from where you look at the world. When you look at the world from an endo perspective, you develop other technologies that transform our exo-worlds, too. The central theorem of Rössler's endophysics (Rössler, 1992: 131) is that "the endo-world can change the exo-world". This theorem is the key to the future economy. For example, if we use the technology of virtual prototyping, we can simulate a complete airplane before we manufacture a prototype. This knowledge production by simulation can lead to a profounder understanding and a better exo-product.

(3) **Respect for a greater individual independence**

Interfaces provide greater autonomy for participants to de-couple from actual power structures. This makes them a driving force for liberty and freedom in cyberspace. With the emergence of new interfaces, developing countries, whose economies have always been dependent on developed nations, have new chances for independence. They can overcome economic barriers and be integrated into the new endo-worlds. They are no longer observers and recipients, but interactive participants in a new world order. This order is not based on the accumulation of money but on sharing of knowledge. This can be equally said for other individuals, too, who have been excluded from or deprived of successful participation in economic processes. endo-management consequently can only convince but not command.

(4) **interface design**

Because every product, service and process has to be integrated into interfaces, interface design "is everything" (Bonsiepe, 1996: 74 & 134). Hence, to be successful they have to be designed in accordance with certain design principles: (a) adaptability, i.e. is a service flexible enough to accommodate for different needs? (b) reversibility, i.e. can a process be reversed within a different context? (c) replicability, i.e. can a product be easily replicated to be used in other interfaces?

The New Endo-Economy: Simulation of a Simulation

How could economies look like, functioning according to interface principles and not market and hierarchy principles? Endo-economies, based on interfaces of virtual reality and simulations, undermine the principles that organize the production and distribution of goods in a capitalistic market economy. The market system is focused on an exo-perspective, where money determines who is inside or outside a market. It is based on competition of participants and on self-interest. However, in cyber economies "markets" will be more dependent on an endo-perspective. Instead of exclusion, inclusion of participants will be the driving force. In the endo-economy, the owner of a commodity will have difficulties to exclude others from using a commodity, because a virtual commodity can easily be copied, and the transaction costs to use a commodity are becoming increasingly cheaper.

In an endo-perspective the economy of producers and consumers will be much more of a gift-economy than a purchase-and-sale economy. In an endo-economy the use of a commodity will no longer necessarily involve competition. If goods are non-competitive charging a price per unit does not make sense because it restricts the distribution of a product. If the marginal cost of reproduction of a virtual good is near zero, everyone can have it for almost free. The problem is that a producer who cannot make

profit similar to the market system will go bankrupt. Competition has been the standard way of controlling buyers through sellers. But with non-competitive goods appearing in endo-economies, the whole market systems can be challenged. The shift of power from producers to clients and to non-rivalry products and services will lead to a new way of thinking about markets.

In a world of increasing data and complexity the elementary characteristic will be a lack of transparency. The market for virtual and complex products and services is anything but transparent. Therefore the most important growing market of the future will not be products and services but interfaces which make the endo-economy more transparent like intelligent agents and knowledge-navigators. Consumers' failure to acquire full information about the software they need led to the shareware market, to beta-versions free to public and to free Netscape browsers.

The rise of CommodityBots such as DataWarehousing of Living Systems offers an opportunity for consumers to aggregate their preferences on worldwide scale. As it becomes increasingly easy for consumers to communicate their individualized preferences to participants DataWarehousing allows not only to bring manufactures nearer to buyers it does bring customers together, too, who want to sell or exchange second hand goods. The potential of these second-hand markets is tremendous because not everything has to be recycled but can be in use on other places of this planet.

References

Argyris, C. Overcoming Organizational Defenses, Boston, 1990

Argyris, C./Schön, D. Organizational Learning - A Theory of Action Perspective, Reading, 1978

Barnatt, C.: Cyber Business - Mindsets for a Wired Age, Chichester, West Sussex 1996

Berger, P./ Luckmann, T.: The social construction of reality, Garden City, NY 1967

Blackler, F.: Knowledge and the Theory of Organizations: Organizations as Activity Systems and the Reframing of Management. In: Journal of Management Studies, 30, November, 863-884, 1993

Bonsiepe, G.: Interface, Mannheim 1996

Callon, M.: The Sociology of an Actor-Network: The Case of the Electric Vehicle, in: Callon, M./Law, J./Rip, A. (Eds.) Mapping the Dynamics of Science and Technology, London, 1986, 19-34

Casti, J. L.: Woulde-be-worlds, New York 1997

Daft, R./Weick, K.: Toward a Model of Organizations as Interpretation Systems, in: Academy of Management Review, Vol. 9, No. 2, 284-295, 1984

Davidow, W./Malone, M.: The virtual corporation, London, 1992

Dörner, D.: Die Logik des Mißlingens: Strategisches Denken in komplexen Situationen, Hamburg 1989

Drucker, P.: Postcapitalistic Society, New York 1994.

Flusser, V.: Vom Subjekt zum Projekt, Düsseldorf 1994.

Handy, C.: Trust and the Virtual Organization, in: Harvard Business Review, pp. 41-50, 1995 qq. Harris, M.: Rethinking the virtual organization, in: Jackson, P./Van der Wielen, J. (eds.): Teleworking: International Perspectives - From Telecommuting to the Virtual Organization, 74-92, London, 1998

Kim, D.: The Link between Individual and Organizational Learning, in: Sloan Management Review, Fall, 37-50, 1993

Klimecki, R./Laßleben, H./Altehage, M.: Zur empirischen Analyse organisationaler Lernprozesse im öffentlichen Sektor - Teil 2: Methoden und Ergebnisse, in: Management Forschung und Praxis, Universität Konstanz, Hrsg. R. Klimecki, Diskussionsbeitrag Nr. 13, 1995

Klimecki, R./Thomae, M.: Zwischen Differenzierung und Internalisierung: Neuere Trends in der Erforschung organisationalen Lernen, in: Management Forschung und Praxis, Universität Konstanz, Hrsg. R. Klimecki, Diskussionsbeitrag Nr. 11, 1995

Klimecki, R./Thomae, M.: Organisationales Lernen: Eine Bestandsaufnahme der Forschung, in: Management Forschung und Praxis, Universität Konstanz, Hrsg. R. Klimecki, Diskussionsbeitrag Nr. 18, 1996

Sims, H. /Gioia, D. (eds.): The Thinking Organization: Dynamics of Organizational Social Cognition, San Francisco 1986

March, J.G./Olsen, J.P. Organizational Learning and the Ambiguity of the Past, in: March, J.G. /Olsen, J.P. (eds.): Ambiguity and Choice in Organizations. Bergen, 54-67 (1976)

McDaniel Johnson, B.: Communication: The Process of Organizing, Boston 1977 Morath, F.: Virtuelle Organisationen: Szenarien an der Schnittstelle Mensch-Maschine (Virtual Organizations: Scenarios of the human-machine interface), in: documentation of the 19th Alcatel Symposium (theme: virtual enterprises), Zürich 1998

Negroponte, N.: Being Digital, New York 1996.

Nohria, N./Eccles, R.: Face-to-Face: Making network organizations work, in: Nohria, N./Eccles, R. (eds.): Networks and Organizations, Boston, MA, 1992, pp. 288-308

Nonaka, I./Takeuchi, H.: The Knowledge-Creating Company, 1995

Pedler, M./Burgoyne, J./Boydell, T.: The Learning Company, 1991

Picot, A./Reichwald, R./Wigand, R. T.: Die grenzenlose Unternehmung, 2nd edition, 1996

Rheingold, H.: The Virtual Community, 1993

Russell, P.: Die erwachende Erde, München 1995

Schmidt, A. P.: Endo-Management, Bern 1998.

Senge, P.: The Fifth Discipline - The Art and Practice of Learning Organizations, 1990

Sims, H. /Gioia, D. (eds.): The Thinking Organization: Dynamics of Organizational Social Cognition,

San Francisco 1986

Starkey, K. (Ed.) How Organizations Learn, 1996

Toffler, A.: The Third Wave, London 1981.

Turkle, S.: Life on the Screen 1995

Watzlawick, P.: How real is real? New York 1976

von Foerster, H.: Sicht und Einsicht, Braunschweig 1985.

Weick, K.: The social psychology of organizing, Reading, MA 1979

Weick, K.: Sensemaking in Organizations, Thousand Oaks, CA 1995

Wüthrich, H./Philipp, A./Frentz, M.: Vorsprung durch Virtualisierung: Lernen von virtuellen Pionierunternehmen, Wiesbaden, 1997

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