

Knowledge-Based Economic Services Supported by Digital Experiments

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Abstract. Successful knowledge-based strategies for organizations require to build digital experiments which combine the power of networked information technologies like the Internet and the Web with the creativity and competencies of their own staff. This paper presents such an experiment which refers to the services of German economic development agencies. The presented work is carried out within a German project supported by the Federal Ministry of Education and Research (bmb+f). The development of required economic, social and technical competencies of the agencies staff by using Web-based qualification processes and virtual learning communities has a key role within the digital experiment.

1 Introduction

Discussing knowledge based economies has resulted in an increasing awareness of knowledge as a key factor for economic growth and performance. Technical advances in digital communications support new applications based on structuring of a variety of information and knowledge. Results of research studies (VDI Nachrichten 06.04.01) and of international conferences, e.g. 11th Annual Conference "Strategic Uses of Information Technology", Seattle 2000, show that in Germany there are many technical developments also in networked technologies, but referring to applications, Germany is still a "digital country in development".

In order to improve this situation, there are some initiatives of the German government, e.g. "Bund online 2005", and some national programs on this topic. In this paper, we start with a brief presentation of the use of knowledge management and of networked technologies like the Internet for the development of digital experiments, among others within economic development agencies (part 2). Then, we discuss the role of communities and of regions as nodes in a global network (part 3). In the rest of the paper we describe the objectives of the on-going project "Wirtschaftsförderung als wissensbasierte Dienstleistung" (Economic development as a knowledge based service activity) coordinated by the IAT in Gelsenkirchen, Germany, and supported by the Federal Ministry of Education and Research (bmb+f) (part 4).

The idea of this project is to improve the performance of economic development agencies, which play the role of a spider in nodding global networks, by taking into consideration two main aspects: the building of a vision of the future of the city or the

region in a globally open economy, and the building of competencies to realize this vision. These aspects should be supported by the use of networked information technologies, by knowledge aiming at an intensification of internal as well as external communication, and by building virtual communities of life and learning.

Figure 1 gives an overview about the key issues of the project. The starting point concerns the question of a shared vision. In this first phase of the project research and face-to-face-communication is basic, and digital communication can support it. The core of the project concerns the digital infrastructure, as a tool to make knowledge sharing and effective project management work in a way that we call *learning organization*. Of course there is a need of improved competencies, related strategies and organizational structures. Web-based learning and a learning environment aim at improving the competencies. The aim is to strengthen networking and communication on the local as well as on the global level.

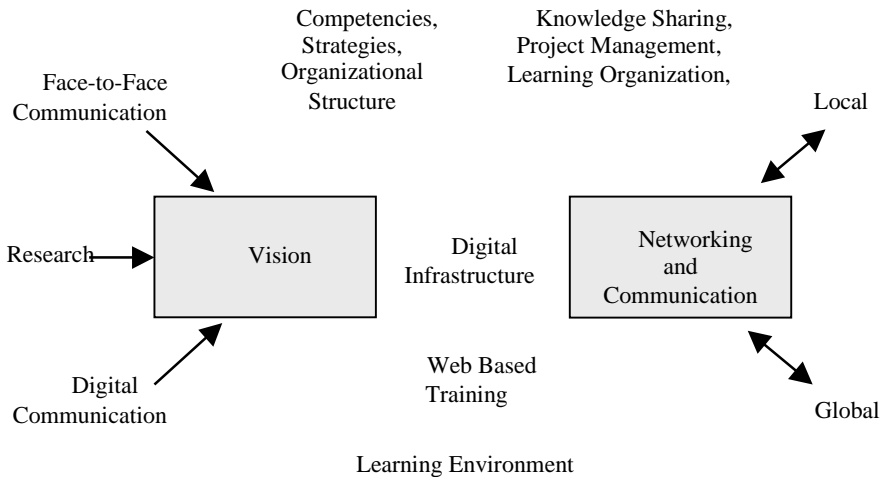


Fig. 1. Digital experiments to improve knowledge based economic development – the project

2 Knowledge Management and the Use of Networked Information Technologies

The concept of knowledge management is not new in information systems practice and research, but nowadays business environment, which is characterized by dynamics, a high level of uncertainty, and inability to predict the future, requires changes in the traditional view of knowledge management.

As figure 2 shows, knowledge means not only what a person knows but also what the organization knows – gathered from internal and external sources for years or even decades (Rosenberg, 2001).

Knowledge can be explicit or implicit (tacit). The explicit knowledge can easily be structured, codified and saved in printed or on-line documents, in databases and in

knowledge bases, etc., and can be used for practices and training. It is more difficult to record implicit, tacit knowledge (e.g. heuristics which are often embedded in peoples' experiences of life and work), to document it, and to teach it to others. A combination of factors that are hard to describe or to teach give an inner quality to the implicit knowledge which, in many cases, is more valuable than the existing explicit knowledge. These different types of knowledge require different approaches to knowledge management, and each of them represents unique challenges and opportunities.

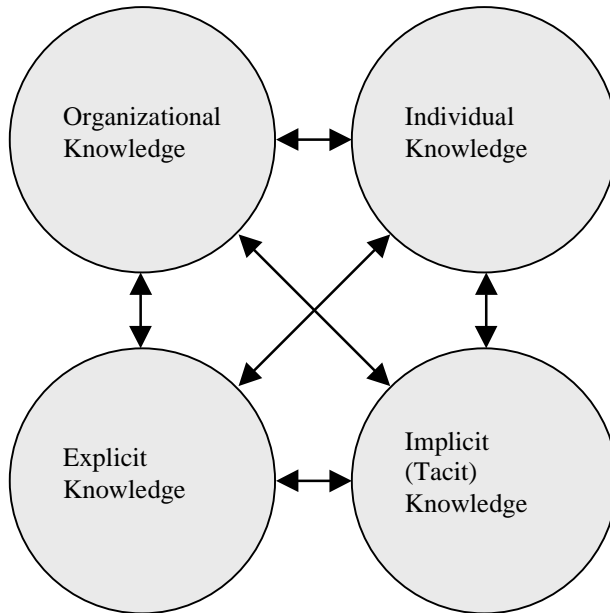


Fig. 2. Different types of knowledge

In order to perform business activities successfully, all organizations, particularly economic development agencies, have to use a mix of tacit and explicit knowledge of individuals and organizations. So they need adaptable and flexible knowledge-based services based on networked information technologies that support the management of this mix of knowledge, and combine those with competencies and creativity of their staff.

The Internet is one of the most promising networked technologies because it allows two-way communications, e.g., audience as well as the possibility of feedback. It is built around open standards, which means interoperability and the advantage of a large market, and the possibility to integrate one product or process with another.

Intranet and Web technologies facilitate the building of closed, organizational virtual networks like the Intranets or private ones like the extranets (e.g., for the communication with customers).

Learning over the Internet (Web-based training) enables instant updating, storage/retrieval, distribution and sharing of instructions. Therefore, it is one of the "most promising" forms of learning, which can be applied in all kinds of training

programs, like in vocational training. Distributed software tools based on Internet and the Web should be developed which facilitate the delivery of right information to the right person at the right time, the acquisition and storing of explicit and implicit knowledge in organizational knowledge bases, and the distribution of it.

Institutionalization of "best practices" by embedding those in information systems might facilitate efficient handling of routine, "linear" and predictable situations in stable as well as in changing environments of an organization. But when these changes are discontinuous, then continuous renewal is required of the best practices stored in organizational knowledge bases.

In literature there are different opinions about the consequences of the use of the networked technologies. Some authors as Rushkoff (as quoted by Graham and Marvin) predict that the diffusion of interactive technologies, such as Web and e-mails "will be used to enhance the individual and to break down the walls between individuals". Opposite to these "utopists", the "distopians" (Postman, 1992) stress that the use of new media will cause a growing social polarization, and that the wealth of information does not necessarily mean that people have more knowledge. The directions of changes due to the Internet and to other new technologies are still uncertain, they have to be discovered yet. But based on the abilities of these technologies, new kinds of social places and services in virtual reality (cyberspace) by can be developed, like the virtual cities and virtual communities, where people can meet, work, exchange experience, acquire new knowledge, and learn without ever seeing each other in the physical world (Ishida, 1998).

One of the main questions to be answered when using the Internet, the Web and virtual spaces remains "how to build digital experiments which bring virtual and real spaces together?"

3 Building Digital Experiments to Link Virtual and Real Spaces

Digitalization is one of the economic driving forces compressing time and space (Sassen, 1999). Nevertheless, the Internet is a social space, too. And because of this, it is helpful to ask for communities that make the Internet a working room where people can collaborate in creation and use of knowledge.

With the advent of computer-mediated communication (CMC) and virtual reality it has become difficult to determine exactly what is meant by the word community. People associate the environment where they work, live and cooperate with other people with the notion of community. This environment is not static: it changes almost every day, it is alive. A community can be understood as "a social group of any size whose members reside in a specific locality, share government, and have a common cultural and historical heritage a social group sharing common characteristics and interests..." (Rheingold, 1994).

Knowledge management fosters the growth of knowledge communities, learning communities or communities of practice. Eric Vogt and Diane Hessian from Communispace Corp. give the following definition:

"A learning community is a trusting group of professionals united by a common concern or purpose, dedicated to support each other in increasing their knowledge,

creating new insights, and enhancing performance is a particular domain" (Rosenberg, 2001).

Communities can be built around content or disciplines; they can be also project, process or product specific. Although people within a community have similar interests, and are focused on closely related goals, they may not have the same level of experience or expertise, and they may have different needs for digital experiments supporting knowledge management.

In case of a virtual community, based on CMC and the Internet, the limitations of the geographic and temporal dimensions does not exist. The exchange of information, and the communication within virtual communities are independent of place and time. This leads to an increasing potential of the community members, and to better information sources, both quantitative and qualitative.

Rheingold (1994) says that "Virtual communities are social aggregations that emerge from the Net when enough people carry out those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace. This is the conceptual space where words, human relationships, data, wealth and power are manifested by people using Internet technology". It has the potential to change humans, communities, and democracies. Therefore, it is important to understand the nature of Internet-based communication, of the cyberspace, and of virtual communities in every context: politically, economically, socially, cognitively. The use of the Internet adds dimensions to the communities that otherwise would not be present (Pallof, 1999).

The building of learning communities within cyberspaces, which connect tutors, experts and participants in a common course, is of eminent importance, also for economic agencies. This aspect is the essence of Web-based training (see part 4), which we use in our project. There is a great deal of research on the value of communities in support of learning. At many institutes (e.g. at the Institute for Research on Learning in Palo Alto, California) researchers work to reinforce the social nature of learning. People learn best when they can interact with other people as full members in communities of shared interest. Covey (1989) affirms that the collaboration involved in learning in communities creates a sense of synergy, an atmosphere of excitement and passion for learning, for working together, supporting the process of knowledge acquisition. In the traditional model of training, the tutor imparts knowledge to participants, who are expected to absorb it. In the learning processes in virtual communities, the relationships and interactions among people are the main channels for generating knowledge.

Some authors underline characteristics of virtual communities and virtual spaces: "we have to keep in mind, that each community is dependent on a net of responsibility. Without any commitment a community would disintegrate, real as well as virtual ones. To keep a community alive, we need shared visions and joint projects" (Weinstein, 2000). Castells (1997) points out that „Space is the material support of time-sharing social practices." From this point of view, electronic networks are social spaces, too. The space of flows is not placeless, although its structural logic has these characteristics. The electronic networks links up specific places. These places have well-defined characteristics that can be viewed as a profile. Some places are playing the role of coordination for the interaction of all players in the network. Other places are the nodes in the network.. „Location in the node links up the locality with the whole network" (Castells, 1997), or in other words, nodes are linking the local and the

global. These aspects referring to nets and nodes constitute a good starting point to discuss the fundamental shift in political and social, as well as in economic terms.

"Telematics and globalization have emerged as fundamental forces in the reorganization of economic space. This reorganization ranges from the spatial virtualization of a growing number of economic activities to the reconfiguration of the geography of the built environment for economy activity. Whether in electronic space or in the geography of the built environment, this reorganization involves institutional and structural changes." (Sassen, 1999)

In her analysis, Sassen is concentrating on global cities and global value chains. But our analysis shows that global change is a more fragmented process in functional as well as in sectoral terms (Rehfeld, 2001). There are different economic flows becoming more and more global and each of these flows has specific geographical dimensions, specific hubs and nodes, specific kinds of networks.

From the local or regional point of view, the key question is how to drag the anchor and to avoid to become subordinated to the flows of a global network. That is the question cities and regions have to answer. The opening of global flows, maybe communication flows or maybe economic flows like products and services, needs a strong local basis. In terms of communication, this needs a high density of internal communication, and in terms of economy it refers to an innovative "milieu" (Camagni 1991). To bring these spaces together is the main topic of our project.

Of course, the future of economy is a network economy. Nevertheless, economic activities remain social activities, and social activities need direct social communication: Trust in order to reduce insecurity, the generation and diffusion of implicit knowledge, especially when intercultural communication takes place, common learning and other social activities are limited in its virtualizing capacity. So there exists a chance for local and regional networking, especially in a world that becomes more and more global.

4 The Project

4.1 Starting Points

In order to use the Internet and CMC for effective digital experiments like virtual cities and virtual communities, it is important to build a "vision" of the space to be transformed, in a globally acting network, and to choose the suitable techniques to collect the data and to process the needed knowledge in order to develop the experiment based on this vision.

In our project we don't look at the hubs, but at the nodes. The regions of our project are not global cities, they are more normal regions that can be found all over the world. Gelsenkirchen is an old industrial city in the core of the Ruhr Area. It is a city in ongoing restructuring and with an unemployment rate up to 18 percent. The Rheinisch-Bergische Kreis is a small and medium companies based location with a high degree in sectoral differentiation.

This is not the place to discuss a vision for these two locations. A vision like this can only be articulated by the people living inside a region. But to make a vision work two aspects are important:

First aspect is to focus the activities on shared projects, innovation projects aiming at sustainability, symbolic architecture perhaps in the built environment. It is important that visions like this include images and symbols which people can see and feel. It is not only a by-side aspect that the articulation of visions because this strengthens internal communication.

Second aspect is to give a profile to a location, a city or a region. A location is not really interesting when it claims to be better, bigger or faster – nearly all locations all over the world try to be attractive in this way. But the crucial point is to become different. In the course of globalization all regions run danger to become identical and that means to become banal. Therefore, the challenge is to improve the difference, because the difference has good chances to be recognized from outside.

In Gelsenkirchen we have started a process to bring out a vision by spring 2001. 40 years ago, Gelsenkirchen had been a booming city. Based on mining, steel generating and steel processing Gelsenkirchen has been known as „city of thousand fires.“ Today, mines have run empty, steel processing has been relocated, and steel processing has become fragmented in very different companies and markets. Gelsenkirchen runs danger to become a very simple place like a lot of other old industrial places all over the world. Nevertheless, there is some innovative potential left and some new companies had been founded. But the industrial basis is very fragmented, yet. Facing this situation, the key issue of the project aims at connecting local nodes to build a stable basis for global networking. The first step is to improve local networking, aiming at common projects like mentioned above. This is a starting point, and in the long run the hope is to bring a new identity into life.

Doing this, we have to organize communication on different levels (Fig. 1). In this first stage communication means first of all face-to-face-communication. The organizational core is a steering group, consisting of representatives of 15 companies and some members of the local industrial development agency. The companies belong to very different industrial sectors. Old ones, like water management, mechanical engineering, plant construction, and basic chemicals. New ones, like information and communication technologies, solar energy, and electronics. The common interest is to revitalize Gelsenkirchen. This group is in charge of the key decisions, like agenda setting and the selection of priorities. Because this group represents only a small part of the industrial basis of the city, another 50 companies are included through expert interviews. In these interviews we are discussing the company's vision and strategies, and its local integration, and we try to activate their local engagement. Commitment by local authorities is a further level of the project. Therefore the results of the project are presented and discussed with local authorities from time to time.

Finally, face-to-face-communication takes places in the context of workshops. These workshops are organized in order to give additional actors the chance to join the process, and to create a commitment to specific projects. In this context, support by digital communication is helpful. The problem is that we need professional, strategically oriented small workshops, to bring about concrete results, but that we also need new ideas to overcome the old discussions and to bring about synergies. Therefore, from time to time, we are opening the discussion by presenting ideas and results on the Internet, and we are organizing an open space (chat room) to bring in new ideas, and more.

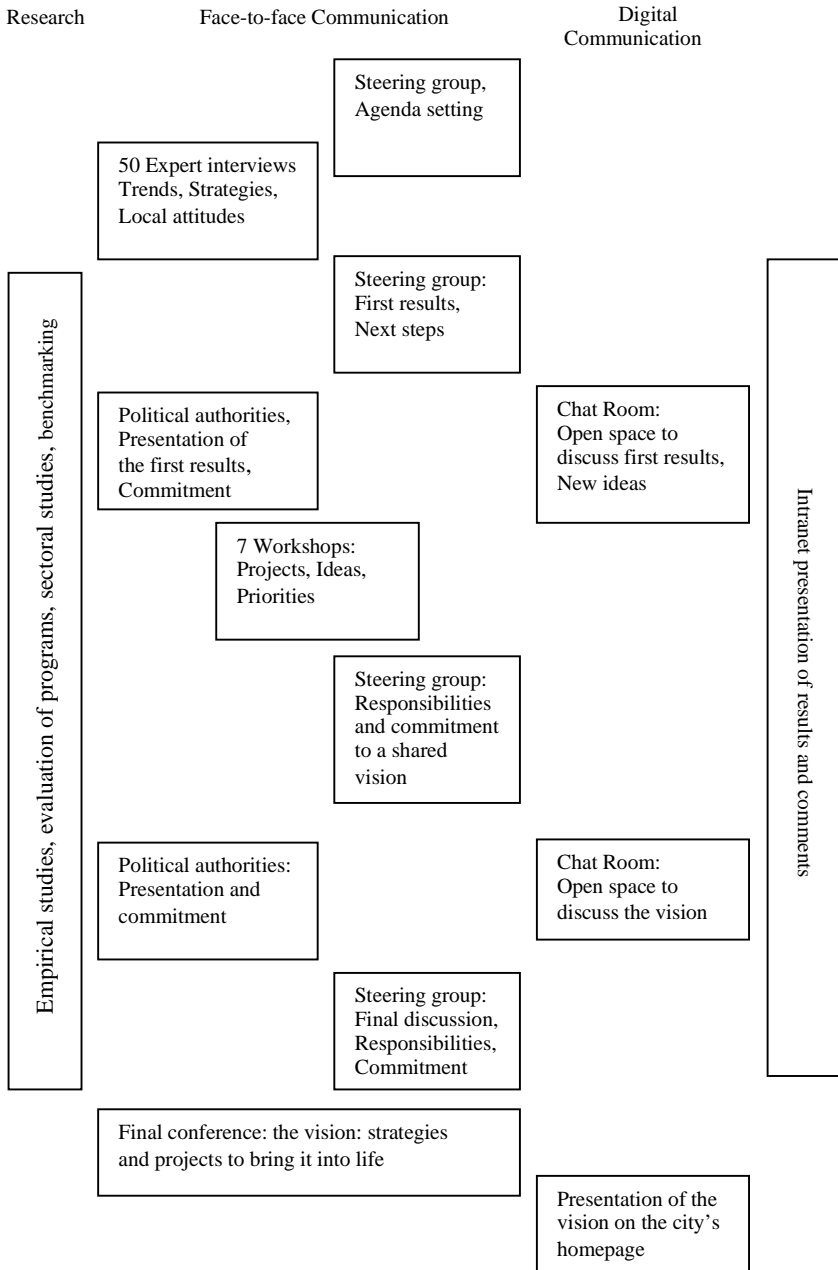


Fig. 3. In search of a shared vision

Our hope is, when the process of local networking has a solid social basis, and when we have an idea of a common vision, communication can be organized digitally. To support this, the members of the local industrial development agencies need further competencies, and an advanced technological basis.

4.2 Objectives of the Project

A lot of competencies are needed to implement visions like mentioned above, which are usually not available in economic development agencies. Up to the 1990s, local development agencies were concentrated on the acquisition of internal investments. But in the course of the last decades, competition for investments has become very strong on a global level. Therefore, the focus of the activities of economic development agencies has shifted to improve the local basis of innovation and economic strength. This is reflected in research by the use of terms like "network-economy", "cluster-development", "learning region", "reflexive urban development", and "knowledge based local infrastructure". Whatever the term refers to in detail, the common focus is to strengthen and improve the local potentials and competencies by networking, learning, and knowledge sharing.

Facing these new tasks, a lot of new competencies are needed, for instance strategic development, location marketing, human resource management, innovation and technology management, internal and external networking, knowledge management, conflict management, or controlling (Bratl & Trippel, 2001). Usually, all these competencies are available in a location, but they don't have a common focus. The function of a local development agency is not to build up all these competencies in house, but to make use of local competencies to improve the local industrial basis. Insofar, a local node in a global network is a potential, not a reality, yet (Appadurai, 1999). To make this potential work, the use of new telecommunication technology can be very helpful.

As pointed out, most of the knowledge that the economic development agencies need to manage their tasks is fragmented, and it is distributed over different economic agents. New strategic solutions for theoretical and practical concepts to improve the economic agencies services are needed by using digital support for these services including Internet-based procedures for an efficient management and for the use of implicit and explicit knowledge of individuals and organization and support for CMC.

The development and testing of such a concept, which includes also Web-based learning modules for the agencies' staff in order to acquire the needed competence for an efficient use of the digital experiment is the main objective of our project.

Interdisciplinary work is planned within the project, by constituting a project steering group. For the implementation and testing of the concept, two pilot agencies have been chosen: the municipal agency of the city Gelsenkirchen, and the regional agency Bergisch-Gladbach. The work within the project will be structured by questions about organizational aspects, management of knowledge resources, development of competencies, and the support of a digital infrastructure. This should strengthen "high quality" communication and information exchange both within the economic agencies as well as with their clients and cooperating partners. It should be supported by Web-based learning processes and the building of learning communities.

4.3 Digital Infrastructure Supporting Knowledge-Based Services

Tom Kelley, the Vice President of World-wide Training, Cisco Systems, Inc. says that "On the Internet, content may be king, but Infrastructure is God". In our project, the digital infrastructure supporting knowledge-based services will be based on Web and on the existing intranets of the agencies, in order to be easily integrated with existing computer facilities, and to assure low development costs. The functionality of the intranets will be extended with procedures for CMC, as well as for knowledge management, e.g., collecting, structuring, distribution, evaluation, using knowledge. Figure 4 shows such procedures for knowledge management and training.

As an example, collaborative services which support an asynchronous co-operation and communication by using discussion forums or News groups or a synchronous one by chat facilities are planned to be developed.

The procedures of communication and knowledge management will be accessible by using a Web portal with easy to use search engines. It is important to use the Web portal as a "gate" to the knowledge world, because often this constitutes the first contact with the clients and other partners. Additionally, the Web-sites which use multimedia and other technologies are a user-friendly media of communication.

Procedures for knowledge management and communication which we would like to develop in our project are important for the two economic agencies not only for their activities as consultant. In order to remain competitive within their area of business, the agencies have to be able to react quickly to world-wide processes of knowledge transfer, and to be able to create new individual and organizational knowledge.

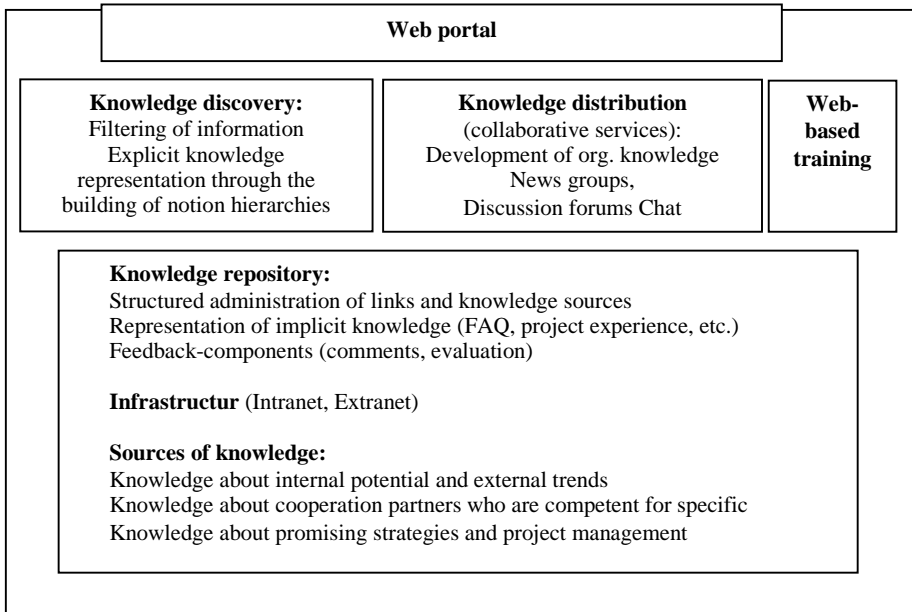


Fig. 4. Procedures accessible by using a Web portal

In our project we would like to facilitate that those processes of transfer and creating new individual and organizational knowledge take place directly at the shop floor.

4.4 The Learning Environment

The learning processes in the project are supported by a Web-based digital learning environment where self-directed learning is combined with collaborative learning, and sound "generic" know-how is linked with tightly fitting solutions for the economic agencies. As a basis for the environment we use the software developed within the German project FrauTelNet (Engert, 1999). The learning environment is accessible also by using the Web portal (Fig. 5).

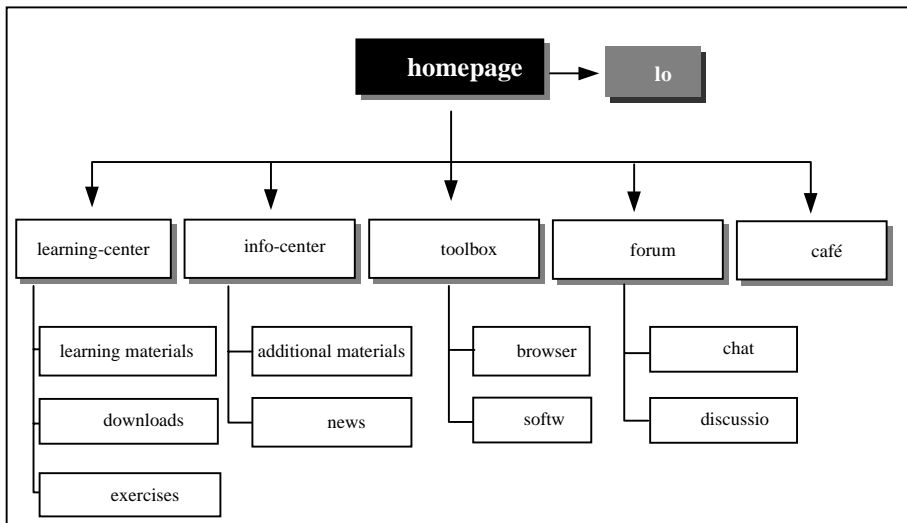


Fig. 5. A model for the learning environment

On the front-end of the environment, the users/learners need only to master basic Internet technologies and navigators. Concerning the technical service, it is a major objective of the project to keep the necessary equipment for the trainees at a minimum, in order to avoid technical discrimination. Within our project, the requirements are Internet access and a Web browser. Within the learning environment we are going to provide the following categories of learning resources and tools: courseware, email, chat, discussion forums, and feedback-forms. The learning-center contains the basic course materials and exercises. Within the info-center the trainees find additional information referring to the offered courses as well as daily news about the topics computer, Internet, economy. The toolbox provides the participants with tools like browsers, free software that will be needed within the modules. The forum functions as communication platform for trainees and tutors. So does the café, which is only used for "social" communication, not directly related to the content of the course.

The chat within the learning environment should be used to ask short questions about the courses and to assign working exercises. We offer a chat-room for every module and a meeting point. In general, the chat is open to the trainees at any time, but during prefixed hours it is accompanied by a tutor to structure the discussion process and to encourage trainees to participate.

The synchronous communication supported by chat rooms allows a fast and efficient exchange of comments on a topic. However, a disadvantage lies in the impossibility to follow different discussions at the same time, and the loss of remarks, which are forgotten along the discussion process.

For longer comments, the different discussion forums can be used. In addition to the advantage of being a structured discussion, the forum allows a certain flexibility concerning the working hours of the trainees. Within our previous projects, we experienced that a discussion forum which is open to all does not work very well. Many participants rather send an email or chat, than contribute to the discussion forum, which is readable for all trainees. Therefore, a strong tutor is needed to encourage the trainees to participate.

Within the training we would like to include sessions (not only on-line classrooms) where trainees and tutors meet face-to-face, unless this is completely unfeasible. These sessions are important to lower barriers, as IT-based learning is unfamiliar to most learners. In our project, the workshops play a significant role also in providing hands-on experience with the required technologies, especially the techniques needed to work with the Web-based learning environment. Furthermore, we would like to stress that it is very important to provide sufficient technical support throughout the course, i.e., to have a person in the team which is permanently accessible, also by telephone, to help with technical questions.

The development of a learning community and of a knowledge community is facilitated by the design of the learning environment described above, and by the delivery methods for the learning material. With respect to the first, the learning environment rests on a dialectic between knowledge which has been fixed in the textbook, supplementary materials provided beforehand, and the generation of knowledge in a guided, but open process of communication of equal partners. It can be done in chats and discussion forums offered by the environment and in the creation of original work by the trainees, e.g. in Web-based small projects during the training.

At the beginning of the training, the virtual learning community has to be stimulated by promoting small teams around the trainee's projects and the tasks. To stimulate the work, and the (electronic) communication, a very active role of the tutors is needed – a role which differs quite fundamentally from the traditional role. Needed are facilitators and moderators, and not traditional lecturers.

5 Conclusions

In this paper we present the first steps of a project about the development of knowledge-based digital experiments for German economic agencies. Because the two agencies have their own economic profile the project team works intensively with the corresponding staff in this early project phase in order to find the right vision for each of them. The experiments should be integrated into the business and cultural environment of the agencies and should contribute to create suitable competences for the staff.

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