THE VIRTUAL OFFICE

A framework for the virtual office

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Abstract: In this paper, a Virtual Office is defined as one in which working and learning methods are enabled by information technology facilities, systems and services. Work in a Virtual Office is based on HyperPoint networks. A HyperPoint can be an information system, the Internet, a human being, another HyperPoint Network or generally a point that contains knowledge. In the future, most work will be done in such knowledge intensive HyperPoint Networks. HyperPoints contain tacit as well as explicit knowledge. The strength of a HyperPoint Network depends on how well it can utilise tacit knowledge. The authors also present an idea of multi-sensitive knowledge base. The results of virtual office research and earlier research are being put into practice in a regional case — Loimaa eWork.

Key words: Knowledge management, information handling, tacit knowledge, on-the-job training

1. INTRODUCTION

This paper describes the authors' theoretical research and its application in practice. Their research focuses on new ways of working and on formulating the concept of the Virtual Office. They first introduce their theoretical framework and then describe its application to the Loimaa eWork case — a training and development project that includes consulting the personnel in the enterprises and communities in the Loimaa region in the South West of Finland.

Knowledge intensive work can be described by a framework that consists of different simultaneous processes and techniques that are accessed through multi-view user interfaces. Working in a virtual office is network-based and can be defined as comprising a HyperPoint network because a HyperPoint

can be a human being, an information system, the Internet, another HyperPoint Network or (generally) a point which contains knowledge. In a HyperPoint network, human knowledge and actions are simply another HyperPoint.

The authors also present the idea of a multi-sensitive knowledge base. The gathering of tacit knowledge can be speeded up by an active query system to a HyperPoint Network. By the means of the query system, the existing explicit and tacit knowledge gradually forms a multi-sensitive knowledge base. The results of virtual office research and earlier researches are being put into practice in a regional Loimaa eWork case.

2. THE VIRTUAL OFFICE

In this paper the term 'Virtual Office' refers to the working and learning methods and processes that information technologies make possible. In addition, the concept includes the facilities, systems and services that are based on introducing an office-like solution in the workplace. The conditions for working consist of virtual, social and physical working spaces, of organising the work, and of technical systems. The working spaces encompass both individual and group work such as knowledge production and thinking. By networking and increasing connections, the emphasis of work will move from traditional physical working spaces towards virtual and larger social working spaces. (Pekkola, 2002). *'The doubts that virtual environments gather tacit knowledge, or that it is difficult to explicate the knowledge, are exaggerated. The facts which make it possible to produce tacit knowledge and visible mutual interaction are clearly linked to virtual environments and combining functions in different environments.'* (Pekkola, 2002). The operations of a virtual office are based on a mutual agreement about how the virtual office should be used. The suitability of a virtual office to support a group depends on how well the working methods of each member suit the common agreed mode of working (Kuusinen, 2001). Research has shown that there are many factors and complex interactions which affect the nature of a virtual office and its suitability for a particular role. For example, Vartiainen and Hakonen (2002) employ Actor-Network theory to define virtuality through four dimensions: *'The relationships of any actors, be they individuals, dyads, teams, projects, organizations or networks can be characterized by four dimensions:*

- space (same place vs. different, dispersed place; fixed vs. mobile);
- time (same, synchronous vs. different, asynchronous; permanent vs. temporary);
- mode of interaction (face-to-face vs. mediated);

- diversity of actors (similar vs. different);

The aspects of the virtual office dealt with in this paper focus on the nature and role of knowledge as a key element of the virtual office based on their experience with virtual offices in the USIX project ‘The Value Chains in Distance Technology for Small Businesses and Education’, which was financed by TEKES in 1998-2002 in Tampere University of Technology, Pori.

2.1 A framework of knowledge intensive work

The present systems consist of different applications, all of which have individual user interfaces. The studies on usability have shown that user friendliness is very important. The problems are due to the fact that applications and systems are often closed and their user interfaces are planned taking into account only the technology, not the user. At present the problem of the whole framework is that even though we have numerous solutions to each part and process, the solutions are fragmented and they do not communicate with each other. Though a huge number of studies have been carried out concerning each part, the authors have not found a holistic approach as in Figure 1 — the framework of virtual work.

Figure 1. A framework of virtual work. (Holmström & Leppänen, 2002)

Figure 1 illustrates the author's framework of virtual work. In the picture, the value-chain in the middle is the value-chain of content-producing information technology. It can be replaced with the appropriate value chain of any branch in question.

2.2 Multi-view user interfaces

The aim of a multi-view interface is to combine the needs, knowledge, roles and tasks of each user into a single user interface. While the usable applications communicate with each other, data transfer will be kept secret both between applications and between the user and the system. Virtual working makes both remote working and split applications possible. The main problem for the user is to gather the knowledge that is needed, in an appropriate form, by using background systems which utilise metadata securely. This means that the knowledge which the user needs has to be collected from the sub-applications which function independently.

2.3 Hyperpoint networks

A traditional office workplace has all requisite knowledge in one physical place; a virtual office must provide the same accessibility to knowledge, both explicit and tacit. Working in a virtual office means working in the place where you are when you decide to work. This is possible if the knowledge needed for your work can accompany you. When connected to the Internet one can easily reach remote information sources. However, nowadays you cannot always be online, which makes offline services very important as well. Working in a virtual office is network-based in many ways — you can be simultaneously connected to many kinds of networks which could be human networks, the Internet, extranets, intranets, local area networks, etc. The working environment can be defined as a HyperPoint Network — a network of hyperpoints, which all contain data or knowledge. A hyperpoint can be for example, an information system, the Internet or a human being, another HyperPoint Network and more generally, any point which contains knowledge. People working in a virtual office communicate with these hyperpoints. The strength of a HyperPoint Network depends on how well it can utilise its tacit knowledge.

2.4 Multi-sensitive knowledge bases

In the future, work will be done in knowledge-intensive HyperPoint Networks in which there is an abundance of both tacit and explicit

knowledge. Depending on the matter and circumstances, moment of time and so on, the tacit knowledge can be attached to explicit knowledge elements. The gathering of tacit knowledge (done by humans) can be speeded up by an active query system to a HyperPoint Network. By the means of the query system the existing explicit knowledge and the tacit knowledge attached to it gradually forms a multi-sensitive knowledge base.

To achieve the same or better level of gathering and producing knowledge than in traditional office surroundings one needs an efficient way to make queries over the Hyperpoint Network. The authors describe the idea of an operations model of an active query system, where queries can be made to any hyperpoint, regardless of whether they are information systems or human hyperpoints. Queries made to information systems are widely studied in general, and more specifically, queries to the Internet are studied within the research on the semantic web and sensitive links. For example in TUT Pori (Finland), there is very interesting research conducted on time dependant links. (Heimbürger, 2003)

The additional value of the idea is a query made to a human. In its most simple form it consists of a question made by a human (or by information system triggered by an event) and the background information supplied with the question. In such systems a query made by email to a human holds an address to database entry, where the information needed can be found concerning the question, and the answer can be put to the same database. Generally, if a human has the adequate amount of background knowledge supplied with the query, he or she can combine both explicit and tacit knowledge in their answer. Thus the benefit of a common working place — traditionally asking someone in the same office — is achieved.

3. THE LOIMAA EWORK CASE

The Loimaa eWork case is a training and development project that includes the personnel consulting in enterprises and communities participating in the project. The project serves also as a research case. The main goal is to train key personnel who can transfer and utilise the results of research on virtual office in the target companies. The results of the study will be integrated with the existing solutions of business world and communities, giving a chance to create totally new patterns of work. We can improve their readiness to take the methods and wireless technology of teleworking into use, and furthermore, we can include meta-data based (additional data in accordance with the contents of information) handling and utilising of information in the company's own processes. One of the most important ideas is to find real applications for the idea of the multi-

sensitive knowledge base, as many of the companies are working with a distributed network. The target is to duplicate the results of this project and subsequently apply them to other companies. Also, research and business hyperpoints will be connected to the network, and then the flow of information will be faster and accordingly, the transfer and adoption of technology will be more effective. Other targets of the Loimaa eWork case involve integrating the study results and technology so that we get solutions which are useful in practice, in developing the information society, and in creating and utilising new working methods which take individuals into consideration.

An example of the new possibilities is the xTask working environment (Ketamo, 2002) which has been developed in TUT Pori. Another example is shown by the results of virtual office study (USIX part project of Tekes), with the definition of the virtual office as described in the section 2 above. The target of the Loimaa eWork case is to share the understandings of its operation with the participants to show how the new systems and methods can make possible cost savings.

3.1 Future results of the project

The project is currently being conducted and most of the initial analysis has been carried out. The results of the study will be integrated with the existing solutions of the business world and communities, which will give us totally new patterns of work which can be used to better connect the methods and wireless technology of teleworking and meta-data based processing of information, as well as providing more information on the research of the concepts of hyperpoint networks and multi-sensitive knowledge bases.

The companies and communities working in the Loimaa eWork case can plan and carry out the development steps, which are offered by the developing technology in the future. In this way we can achieve competitive benefits and cost savings.

The authors have used analysis methods that give each person the possibility of participating. Due to these methods, a mutual understanding of the present stage of the firms' development has been established in a very short time. Whatever the problems have been, the process has been able to create a mutual understanding of the wholeness. This makes it easy to construct a plan for the future, i.e. how to use mobility or other modern technology. The final results will show how the goals are achieved, but so far the project seems to be on the right path.

4. CONCLUSIONS AND CHALLENGES

In order to define the virtual office, it is very important to understand the essence of the surroundings where virtual office is put in practise. This can be done by using the framework of knowledge intensive work. Furthermore it is important to understand the way end users want to use computer systems that enables virtual work. This is done by multi-view user interfaces that gives different user views to systems depending on the role and needs of the user. The hyperpoint network and multi-sensitive knowledgebase are means to understand large amounts of knowledge in order to work more efficiently.

As telecommunications services are not available everywhere at a reasonable price, the systems also have to support offline usage, in which case the synchronizing of knowledge between different systems is an absolute condition of successful working. You should be able to find the same up-to-date knowledge with any data terminal equipment from any location. The researchers do not find it necessary that all services are available in the same way in all different terminal devices, but the services can be applied according to the equipment and the mode of action. The equipment, which makes the virtual working possible, must support learning by working.

The biggest challenge derived from the authors' virtual office research is to study the definitions presented in this paper, the Hyperpoint Network and the multi-sensitive knowledge base and the query system enabling the gathering of multi-sensitive knowledge base. The ongoing Loimaa eWork case makes it possible to observe the implementation of these concepts in practice.

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BIOGRAPHY

John Holmström has experience in human-based development processes both in the academic world and in private companies. His research interests concern interfaces between human processes and technology in future work. Veli-Jukka Leppänen has experience of distributed organizations and ICT solutions. His research interests concern working and activity process environments in the future.