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ICT and Teachers in Higher Education

A Case Study on Adopting Web Based Training

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Julkaisun nimike
TVT ja opettajat yliopisto-opetuksessa: Tapaustutkimus verkko-opetuksen käyttöönotosta

Tiivistelmä

Tutkimuksessa on keskitytty tutkimaan verkkopohjaisen tieto- ja viestintäteknologian käyttöönoton syitä yliopisto-opetuksessa, sekä käyttöön liittyvää ongelmakenttää. Käytetty tutkimusote on induktiivinen, eksploratiivinen teoriaa muodostava tapaustutkimus. Tutkimuksen tavoitteena on tuottaa uutta teoriaa teknologian vaikutuksista korkeakouluopettajan työhön ja tapaan organisoida työtään.

Tutkimuksen empiirinen aineisto on kerätty haastattelujen avulla ja se on analysoitu laadullisesti. Tutkimuksen kontribuutio tapahtuu kolmella tasolla; 1) tutkimus tarjoaa yksityiskohtaisen kuvauksen asioiden tilasta tutkimushetkellä verkkopohjaisen opetuksen suhteen; 2) tutkimus tuottaa aineistolähtöisesti johdetun teoreettisen viitekehyksen joka auttaa ymmärtämään tieto- ja viestintäteknologian käyttöönottoa ja vaikutuksia yliopisto-organisaatioissa, ja; 3) tutkimus tarjoaa suosituksia hyviksi käytännöiksi organisaatioille, jotka tarjoavat opetusta hyödyntäen ICT:tä.

Aineistolähtöistä teoreettista tietojärjestelmien käyttöönottomallia varten tunnistettiin kahdeksaa vaikuttavaa tekijää, jotka olivat Vapaus, ICT kokemus, Havaittu hyödyllisyys, Käytön halukkuus, Resurssit, Pedagoginen näkemys, Immateriaalikysymykset, sekä Käytön monipuolisuus. Lisäksi tunnistettiin näiden välisiä suhteita, joita löytyi yksitoista. Kirjallisuuskatsauksen jälkeen mallia täydennettiin vielä kahdella käsitteellä, jotka olivat Teknologian rajoittuvuus ja Organisatorinen rajoittuvuus. Lisäksi malliin sisällytettiin oppimista kuvaava palautesilmukka.

ICT vaikutukset ovat moniulotteisia ja teknologian vuoksi myös opettajan rooli on muuttumassa. Tulosten mukaan onnistunut käyttöönotto tapahtuu sekä henkilökohtaisella, että organisatorisella tasolla. Organisaatioissa uuteen teknologiaan liittyvät muutokset tapahtuvat niin alhaalta ylös kuin ylhäältä alas. Myös miesten ja naisten välillä löytyi eroja ICT:n hyödyntämisen osalta.

Asiasanat
Sosiotekninen vaikuttavuustutkimus, verkko-opetus, IT käyttöönotto, Tapaustutkimus, Induktiivinen analyysi

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ICT and Teachers in Higher Education: A Case Study on Adopting Web Based Training

Abstract

This study investigates the adoption and impacts new educational technology has on teacher's work and organization. In the context of this study, new educational ICT applications cover primarily tools for web based training (WBT). This study focuses on developing a new theoretical framework for understanding consequences of new educational technologies in organizations and for educational staff. Methodologically this is an inductive, explorative case study, where a new data-driven theory is being derived based on empirical evidence, thus exercising theory creating approach. Empirical data for this study was collected using interviews, and it was analyzed using qualitative, interpretative approach.

The main contributions of the study are three fold, first; to provide in-depth descriptions of "how things are" in everyday work with web based training, second; the presentation of new, empirically based theoretical framework for understanding impacts of web based training in educational organizations, and, third; providing recommendations for good practice to teachers and organizations engaged in offering higher education using ICT.

In this study eight constructs for theoretical IT adoption model for higher education were recognized. These were *Freedom, ICT Experience, Perceived Usefulness, Intention to Use, Resources, Pedagogical Insight, Immaterial Issues* and *Versatile System Use*. Also eleven relations between these constructs were recognized. After comprehensive literature review the model was enhanced with two more constructs; *Technological Inscription* and *Organizational Inscription*. *IT adoption loop* was also included in the model for learning in IT adoption.

Impacts of ICT are diverse, and because of advanced technology, teacher's role in virtual context appears be changing. Findings of this study also suggest that circumstances supporting successful ICT adoption can be tracked down to two levels; personal and organizatorial. Changes related to new technology happen in organizations both from top-down as well as bottom-up. There were also differences between genders in the utilization of ICT.

Keywords

Socio-technical impact research, eLearning, IT adoption, Case study, Inductivism

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In Mustasaari, 22nd of October 2009

Jyri Naarmala

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1 INTRODUCTION

In this chapter the background and motivation for this study are discussed. The research problem and research questions are presented and the organization of the study is described and motivated. Research strategy and chosen research methods are also discussed.

1.1 Studying Impacts of ICT on University Teacher's Work

Early studies of computing, between 1950 and 1969, were concerned primarily with the potential new uses of computing. During this time the major research studies were either speculative analyses or experimental development of prototype systems. Studies in the 1970s were markedly more empirical and developed more sophisticated conceptualizations of the social features of computing. Between 1970 and 1979 studies of computing in organizations began to emerge. Likewise studies on social and public policy issues of computing started to emerge between 1970 and 1980. (Kling 1980: 69-72, 93)

Since the 1960s, at the beginning of the computer revolution, there have been many hypotheses about the impact the computer would have on organizational life. Since the first computer applications in industry, there has been widespread agreement that there would be revolutionary effects on organizational life. Early speculators, however, came to very different conclusions about the nature of the revolution. They can be divided into optimists and pessimists. These contradictory predictions inspired many programmes of impact research in the 1970s and 1980s. There was evidence to support nearly every prediction even when it flatly contradicted other predictions. (Eason 2001: 323)

Web based education platforms and eLearning have become an unseparable part of today’s education. An educational institution that does not have online courses to offer is seen as very old-fashioned. Although computer mediated education is seen as a very popular topic, the impact it has on individuals or organizations in general has not achieved as much attention as pedagogical or technical issues. This study focuses on studying effects of new educational technology, particularly web based technologies in educational organizations and on individual work. The goal is to find out what kinds of consequences new educational technology mediates upon implementation from the viewpoint of educational staff as well as from organizational viewpoint, and to offer a new theoretical framework to be used when implementing new technology into organizations.

Organizations are increasingly investing in the use of information technology (IT) to support all aspects of organizational work from group work to individual teaching, training and learning (Isakowitz, Bieber & Vitali 1998), thus practical motivation for this study rests not alone on the fact that annually a lot of money is being spent on virtualizing education in higher education, but also because the practices in providing online and/or distance courses using high technology are still evolving. The opportunities for continuous improvement and lifelong learning suggest that web based training (WBT) could be very important both to organizations and to individuals (Chan & Ngai 2007: 289)

Kling (1980: 105) commented rapidly expanding computer use as follows: "*It is hard to believe that the public could best be served by rapid development of a poorly understood technology*". This viewpoint is today even more relevant than when it was presented — nearly three decades ago. It is important to get a clear picture of impacts on both macro and micro level (see Markus & Robey 1988) in order to understand both easily perceivable changes as well as underlying, often unnoticed but yet costly effects. In the long run this is useful in designing cost effective ways of delivering education or when implementing new technology. This information is necessary for both organizations and individuals taking part in developing online education one step further. The significance of information and communication technology (ICT) at university level education can not be underestimated. For teachers ICT serves as both subject matter and instrument. The same applies for students and other parties involved. Ability to provide students with up-to-date computer skills is of huge importance when considering present labor market.

Despite numerous studies on the implementation of WBT, there is a lack of qualitative research on the underlying factors behind the decision to adopt WBT (Chan & Ngai 2007: 289). Also the actual implementation might prove to be problematic. Motivation for the resaerch in this study rests on creating a new data-driven theory, using impact research approach in higher education. This resulting theory will both challenge and supplement existing theories on impacts of technology in organizations, in this case in the context of higher education.

Laurillard (1993: 8) comments that implementation of a new medium or method cannot be expected to work perfectly, but probably provides some benefits along with its disadvantages. In addition to this she notes that we need to learn lessons from each implementation, and use those lessons learned. Laurillard (ibid.) also points out, that this is the way we can slowly build a body of knowledge of how to best use educational media, and a teaching profession that knows what it is doing and why.

The Council of Ministers and the European Parliament adopted European Community's Sixth Framework Programme for Research and Technological Development (FP6) in September 2002. It had an overall budget of € 17.5 billion until the end of 2006. One of the seven thematic priorities was Information Society Technologies (IST), with an indicative budget of € 3.6 billion for the five year period. As regards the technical content, FP6 focused on specific themes that are strategically important to Europe's future and one of these is technology-enhanced learning research, which aims at improving knowledge about how learning can be supported by information and communication technologies. Focus is on intelligent solutions tailored to individual learners, motivating and supporting people who learn on their own or collaboratively with others. Making technology-enhanced learning more relevant to different needs and contexts will help underpin widespread adoption and turn it into a benefit for society. Better learning opportunities for individuals and organizations can improve competitiveness, productivity and well being, according to the European Community discourse. (ISCT 2007: 4)

Computers have been used in learning for almost as long as there have been computers available. Computer- and network-based learning is a very popular issue in Finnish educational life. The main goal stated by the Finnish Ministry of Education is that ICT technology shall be used widely in education and teaching to elaborate effective and correct ways of using IT within education into everyday routine (Opetusministeriö 2004: 21-23). Also the government has made considerable investments into development of this type of education as well as citizens' IT skills (see Opetusministeriö 2002). Some see that ICT mediated education is a way for enhancing education to a level never seen before. Unfortunately, too often computer-based learning fails.

According to Hodas (1996: 199), when bringing technology into educational organization, what appears to outsiders as a straightforward improvement can to those within an organization be felt as undesirably disruptive if it means that the culture must change its values and habits in order to implement it. Hodas (ibid.) also notes that schools are profoundly hierarchical, as well as normative, institutions as a working environment. Most obviously, schools are often actors in and venues for the performance of significant shifts in social moves and policy.

For at least the last hundred years, schools have been elaborated as machines set up to convert raw materials (new students) into finished products (graduates, citizens, workers) through the application of certain processes (pedagogy, discipline, curricular materials, gym). It is this processing function that drives the rationalist assumption that schools can be tuned well or poorly, can be made more or less efficient in their operation. (Hodas 1996: 204)

Hodas (1996: 205-206) suggests that there are at least two impetus for wanting to bring machines into schools. The first is to have these social crucibles be as modern as the world of tomorrow they help conjure into being. The second concern is standardization. This is to say that regardless of how well they succeed, schools are intended to produce the same outputs year after year. For this reason educational technologists have tended to produce solutions designed not to aid teachers, but to recast, or replace them, either with machines or through the introduction of "teacher proof" curricula.

There are many reasons why the use of Internet in higher education might prove to be difficult. When organizing online seminars, technical issues are quite common, especially when there are attendees from many different organizations (Neal 2005). There are also other practical problems to deal with. For example, Gill (2006) lists the following items as being very difficult ones to tackle: 1) the lack of models from our own experience; 2) constant disruptions precipitated by evolving technologies; 3) explaining our courses to others; 4) adjusting to a new rhythm of life and 5) adjusting to our new role. Problems can also originate from economical issues. Gill (ibid.) also states that in reality online education comes in many forms, and costs and quality can vary dramatically according to one's educational objectives. Unfortunately this can mean that a faculty member may face the unenviable task of both justifying the resource requirements for his or her design to an administrator and explaining why such requirements are so much greater than the administrator's original expectations. According to Gill (2006), operating on the bleeding edge of technology in education does have its compensations though. This is to say that as the technologies we employ become more adept, we will find more and more things that we can do better by using the Internet.

ICT mediated education is being offered, along with more traditional forms of education, by several different actors. Software designers have also noticed that there really is a market for this type of products. eLearning has became very serious business. When implementing new technology into organization, it mediates many changes (Iacono & Kling 1996). Some of these are easy to see, some are not. Changes are not limited to changes in technological infrastructure alone, but take form on many different levels. Within the profession of IT, it is a well known fact that implementing new innovative technology is not always a very easy process. The change process affects organizational structure, work processes, teaching methods, learning, as well as technological infrastructure, to name a few. This study will point out problems encountered and how these were solved, in order to make things run smoothly.

According to Carr (2003), while information technology's power and ubiquity have grown, its strategic importance has diminished. This means that the way to approach IT investment and management needs to change dramatically. Carr (ibid.) also notes that when a resource becomes essential to competition but inconsequential to strategy, the risks it creates become more important than the advantages it provides. This claim is based on studies of corporate IT spending, which consistently show that greater expenditures rarely translate into superior financial results. Carr (2005) also points out, that IT is shifting from being an asset companies own to a service they purchase. According to him, this process will take years to unfold, but the technological building blocks are already moving into place. When studying IT projects gone wrong, it seems that neglecting the significance of the role of IT in contemporary business environment is not only careless, but hazardous as well. The main lesson learned from IT project management failures is that IT really matters (Avison, Gregor & Wilkinson 2006). It is to be noted though, that technology alone will not increase productivity, nor improve everyday routines, unless taken into use effectively and used correctly.

The contribution of this study is threefold. First, it continues the approach commonly used in IT adoption studies by combining both technical and social dimensions in order to fully understand the implementation and work processes by providing descriptions about how things are. Second, it contributes a well founded, empirically based theoretical framework to be used primarily in educational contexts, and possibly with adjustments in other contexts as well. Third, it will provide recommendations for practice to those engaged in providing higher education using ICT technology.

1.2 Research Objectives

The focus of this study is on studying the impacts new educational technology has on teachers' work and on organizing individual work processes. New technology has brought changes upon implementation; the question is what the changes are and how to cope with these. Because this is affecting also the organizational level, this viewpoint is discussed too. In the context of this study, new educational ICT applications cover primarily tools for web based training (WBT).

In this study a theoretical framework is crafted to better understand implementation of ICT technology in organizations, particularly in higher education. The focus is primarily on individuals, but through generalization and widened perspective the organizational level can be discussed to a certain degree as well. As

such, this study continues the tradition of information systems, covering softer human centered issues, as well as organizational and technological issues.

The nature of this study is exploratory due to two reasons. First, this is a field study, where circumstances enabling IT adoption and impacts of ICT on work are studied. Here a new data driven theory is being derived based on empirical evidence, thus the approach is theory creating (Järvinen 2004a: 11). Second, although it has been argued that when implementing new IT in an organization one can hardly predict all consequences it will produce (Eason 2001: 324), the goal of this study is to provide a theoretical framework for making prediction easier, especially in the context of higher education. In addition, this study aims to study unpredicted consequences and to reflect on these findings compared to existing IT adoption literature, thus giving the endeavor an exploratory flavor.

Impacts of ICT are seen as interplay (a) between the users of technology; (b) between users and technology, and (c) between the technology itself. On a general level, the goal of this study is to discover what kinds of changes implementation of new ICT mediates upon implementation in an educational organization. Virtual education and distance education are currently topics of very great interest, and great efforts are made to improve services of this type (Chan & Ngai 2007; Gilbert, Morton & Rowley 2007; Wang 2007; Zhang, Zhao, Zhou & Nunamaker 2004)

The original research problem for this study was outlined as: "*What impacts does ICT have on individual work and organization in higher education?*" During the research process the research problem was reformatted, and three new research questions were derived from the research problem. In this refining process the research problem was reformatted as follows: "*Under what circumstances is the adoption of ICT successful (in higher education) and what impact does it have on individual work and organization?*" This appeared to fit better the research questions, which were not altered. These three research questions are as follows:

1. *What are the circumstances which enable the adoption of new ICT into use in higher education?*

2. *How is the new ICT utilized on an individual level in higher education?*

3. *What are the effects (changes) new ICT has upon individual work processes and on organizational context in higher education?*

For analysis, a methodology is required that is sensible enough to fit the exploratory nature of this study. Although the applied methodological approach is a theory creating one (Järvinen 2004a), it still needs to have a firm grounding in empirical data. Lee & Hubona (2009: 246) argue, that for a theory to have formative validity in grounded-theory research, the theory's variables or constructs must emerge from, or be 'grounded' in, the data rather than be taken entirely from a previously published theory and imposed on the current set of data. This is the reason why induction, sometimes called inductive reasoning or – logic, was chosen as the research approach to be used. Due to the nature of inductive reasoning, it is suitable for theory creating research. An empirical field study presents a very good starting point for this type of study.

1.3 Research Strategy and Methods

The case study was carried out at a very early stage, before conducting comprehensive library research, as Jenkins (1985) used the concept. There were three main reasons for choosing this approach. First, the research literature is scattered, e.g. covered partially by several disciplines, all having their own viewpoints and values. Empirical findings would give more precise implications for literature review. Second, the author was very familiar with WBT technologies beforehand and was working at the university during that time. Third, the research setting was exceptionally favorable, and the goal was not to waste precious time before entering the field. The organization of this study is illustrated in Figure 1.

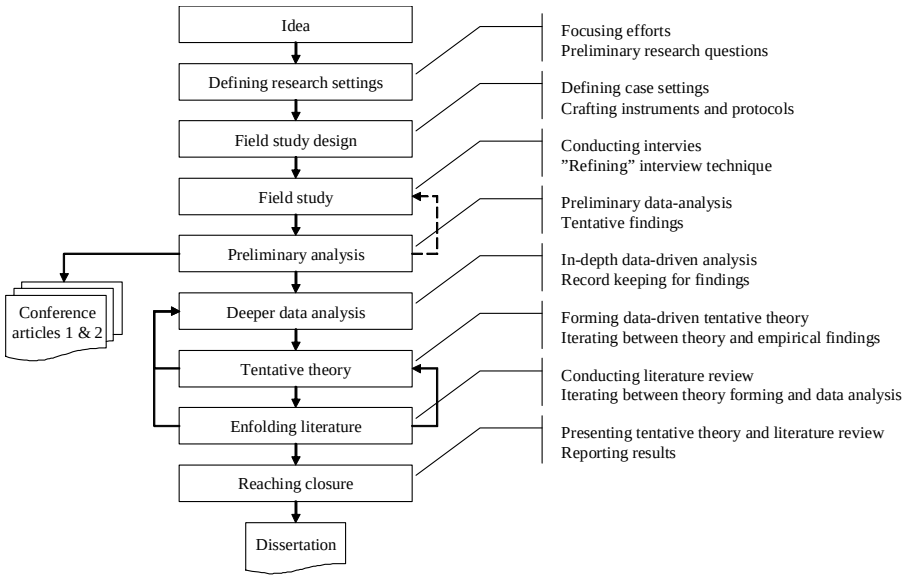

Figure 1. Flowchart Describing Research Process.

The whole research process started with an idea, which was then nurtured into a more concretely defined research setting. This included focusing efforts for the study and research problem definition as well as forming preliminary research questions. This study is exploratory by nature, and thus research setting with a priori thesis to be tested would not have been a durable solution. Therefore a theory creating approach and a suitable data gathering technique, in this case interviews, were chosen as tools to be used. It is to be noted, that this research setting was eventually adjusted while research proceeded, thus it could be said that it worked as a starting point for the actual research process. These points cover Eisenhardt (1989) *step one.*

The following step was field study design, where proper case study settings were defined along with designing interviews, testing interview technique and choosing data collection methods. Selecting cases was eventually quite one forward process. The study was conducted in one organization, where all relevant actors were first tracked down for this study and later interviewed. After all there were no other as sensible data gathering techniques available, as themed interviews. Interview technique was tested making one test interview, which was not included in the analysis. The reason was that the interviewee was not a part of the target group, although also working at the university. These points cover Eisenhardt (1989) *steps two and three*.

After preparations, it was time to proceed to the field. This included conducting data gathering using interviews and "refining" the interview technique along the way. This was done during spring and autumn 2003. While conducting the interviews, the analysis process on a general level was going on at the same time, both refining the interview technique and allowing the researcher a more insightful view on the studied phenomenon in focus. Although it is possible to reach the saturation point already after 15 interviews where no new concepts emerge, recommendation is around 20 interviews (Sandberg 2000: 13). The saturation point was reached around 20 interviews as expected and after this preliminary analysis was started. This point covers Eisenhardt (1989) *step four*.

Based on the preliminary data analysis two conference papers were written and presented in ECIS 2004 (Naarmala 2004a) and in IADIS 2004 (Naarmala 2004b). After this, there was a break in the research process, because in autumn 2005 the author had to move from university to business life and was able to return to research no sooner than in autumn 2006, when he was granted a one year scholarship. This made it possible to conduct a proper, deeper data analysis. Here inductive, data-driven approach was used. First, the data analysis was done using an iterative, analytic approach, where a large data matrix of state of affairs and

events was constructed for analysis. This was done using field notes which were supported by taped interviews. While the researcher was going through first interview, he would write down all interesting issues emerging from the notes and at the same time reflect on what was the interview situation like in order to interpret discussion that had taken place as correctly as possible. Results of this analysis were used for deeper analysis, in order to find out the state of affairs and events, and suggest relations between these. Data analysis covers Eisenhardt (1989) *step five*.

According to Yin (1994: 31-32), in case studies one should aim to make analytical generalizations. During the analysis process the shaping hypotheses (Eisenhardt 1989), or with a more general term, emergent theory (Strauss & Corbin 1990) started to take shape. This is referred to as forming a tentative theory. This too, is an iterative process, which eventually leads to emergent theory, grounded in data. The iterative process refers to having a dialogue with findings from data analysis while forming tentative theory. This step is equivalent to Eisenhardt (ibid.) *step six*.

Next an enfolding literature review took place. This comprehensive literature review was guided by findings from the data-analysis as well as the tentative theory taking form. Data-driven theory was compared with similar literature and, maybe even more importantly, it was also compared with conflicting literature. During this time, the research process was again interrupted in the beginning of 2007, because the author had to move back to business life before the whole scholarship was used. The research continued while working full time at the same time, with the exception of two one month long periods off work, which were financed with remaining scholarship. During these two months in 2007 it was again possible to continue to finish the study. Unfortunately both happy and tragic events in author's private life took place, and these affected the progress of the research process.

The final step of this study was reaching closure, where results of the study are reported when the analysis and theory formulation has reached a critical point, where there was no need to continue further in this study. This final point covers Eisenhardt (1989) *eight and last step*. Results and research description were then written into the form of a dissertation.

1.4 Outline of the Study

The structure of this study follows the storyline of the research process. The main purpose of the dissertation is to communicate findings and a detailed description of the research process to the reader. The approach used here provides the reader with a more detailed and richer description about the learning process the author has undergone while conducting this research in addition to presenting results of the study.

Chapter 1 introduces the research domain, research settings, the background of the study and a detailed description of the structure of this study. Chapter 2 covers methodological choices and chosen techniques for the study. Chapter 3 covers data analysis, discussing the actual data collection and results ot the analysis. Chapter 4 discusses findings from the empirical study, and compares these with theories of development and change in organizations, IT adoption studies, impacts of computing, approaches to work design and IT in higher education. It also presents a comparison of results and adjusted tentative theory. Chapter 5 draws together previous chapters and summarizes findings and contributions as well as presents suggestions for practice and for further research.

2 RESEARCH PROCESS AND METHODOLOGY

In this chapter, the chosen research field within the information systems (IS) discipline and the research approach are discussed in Section 2.1. the chosen research approach, case study, is presented in Section 2.2. Induction and hermeneutics, which are used in the analysis process, are described in Section 2.3. The use of interviews for data gathering and benefits it provides are discussed in Section 2.4. The final Section, 2.5, presents research conditions while conducting the study.

2.1 Research Field within IS and Research Approach

This dissertation deals with impact research related issues, and belongs to the discipline of information systems (IS). Although some argue, that the core discipline of IS should be outlined and focused very tightly (Benbasat & Zmud 2003), others argue that too strict of an approach would direct IS research into merely micro focus while macro focus is the one most needed (Agarwall & Lucas 2005; Alter 2003)

Within Computing Curricula 2001, a Computer Science distinction between computer science, computer engineering, software engineering and information systems has been made (ACM/IEEE-CS 2001). This dissertation belongs to the IS category — not only because of chosen research subjects, but also because of chosen research methods. Basically, this study focuses on studying a specific type of information technology in a specific organizational context.

Davis (2003: 274) states that information systems in organizational contexts refer to two things; the systems that deliver information and communication services, and to the organization of function that plans, develops, and manages the information systems. Thus the operating environment covers a wide scale — from artifacts, through organizational structures to people — thus creating a very complex and rich research environment. Davis also notes (ibid, 274) that the name for the academic discipline mirrors more or less the organizational use of the concept, thus using names such as: Information Systems; Management Information Systems; Information Management; Management of Information Systems or Informatics (usually modified by organization, administration, or similar terms).

Baskerville and Myers (2002: 1-2) find it surprising that conventional wisdom presumes IS to have many reference disciplines, but not its own research tradition. Baskerville and Myers (ibid, 11) even claim that although the domain defined by the development, use and application of information systems by individ-

uals, organizations and society as a whole is far too large for the IS research community alone, IS scholars should take a more visible and active leadership role within this large community of scholars.

According to Gregor (2006) a characteristic that distinguishes IS from other fields is that it concerns the use of artifacts in human-machine systems. Gregor (ibid.) points out, that IS is a discipline that is at the intersection of knowledge of the properties of physical objects (machines) and knowledge of human behavior. According to her, IS can be seen to have commonalities with other design disciplines, which also concern both people and artifacts, or with other applied disciplines, where the products of scientific knowledge are used with people. She also suggests that theory required for understanding IS links the natural world, the social world, and the artificial world of human constructions.

In a rather similar fashion, Lee (2001: iii) describes the research perspective of IS as follows: "*…research in the information systems field examines more than just the technological systems, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact. This embodies both a research perspective and a subject matter that differentiate the academic field of information systems from other disciplines. In this regard, our field's so called "reference disciplines" are actually poor models for our own field. They focus on the behavioral or the technological, but not on the emergent sociotechnical phenomena that set our field apart. For this reason, I no longer refer them as reference disciplines, but as "contributing disciplines" at best.*"

When applying a taxonomy of research approaches within IS research, created by Järvinen (2004a: 9-11), this research can be seen as theory creating, qualitative research. Figure 2 illustrates this taxonomy in detail. The chosen method for analysis is an inductive research approach, which has its grounding in empirical data, although the framework for this study is adapted from case study research. Both approaches, inductively forming a theory and case study, fit naturally with the theory creating category in the taxonomy by Järvinen (ibid.). The reason for adopting grounded approach as a method is simple; when studying previously unknown and sensitive issues, sensitive and flexible tools are needed. The reason for using a case study approach with an inductive approach is also simple; both methods are used for theory creating research, and there are more similarities, than there are differences.

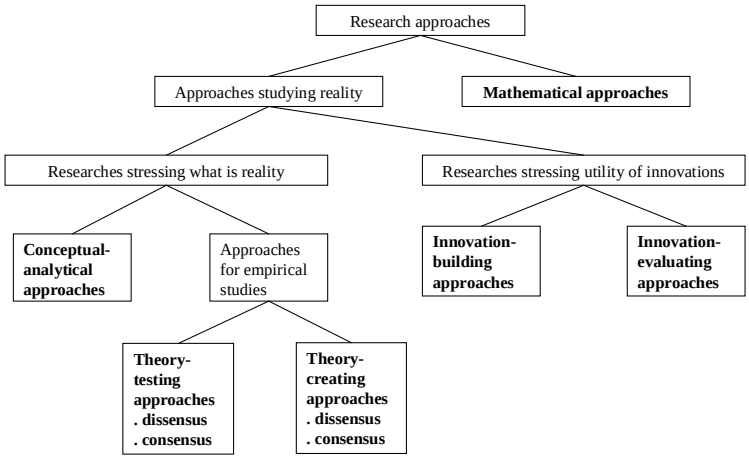

Figure 2. Taxonomy of Research Methods (Järvinen 2004a: 10).

From these settings, this particular study at hand justifies its categorization into Information Systems, although the focus of this study does require support from contributing disciplines too. When studying information systems, focus should not be only on technical details — information systems in organizations do cover also other dimensions.

2.2 Theory Creating Case Study Approach

The research process of this study does not blindly follow any method book; instead it combines elements from several approaches. Common guidelines for this study are based on the approach used in case study research (Yin 1994; Eisenhardt 1989). The approach used in data-analysis is based on inductive reasoning used for theory creating, inspired by ideas from Glaser & Strauss (1979) and Strauss & Corbin (1998). This study gets its inspiration for choices and structure for organization from a case study approach, where the approach introduced by Eisenhardt (1989) for a theory creating case study approach, appeared to offer the most suitable frame for work of this kind.

A common way for presenting (and reporting) research usually follows Jenkins' (1985) model of the research process, which contains 8 sequential steps, which are: 1. idea; 2. library research; 3. research topic; 4. research strategy; 5. experimental design; 6. data capture; 7. data analysis; 8. publish results. According to Jenkins, this kind of model is an over-simplification, because the research process often is iterative. On the other hand, Jenkin's model is designed for theory testing research, while this study is a theory creating one. Eisenhardt (1989) provides an approach for theory creating case studies and divides the process into eight steps. These originally presented steps are as follows:

1. *Getting started*. In the beginning an initial definition of the research question, is important in creating theory from case studies. Research needs a focus; otherwise it is easy to become overwhelmed by the volume of data. A priori specification of constructs can be helpful in shaping the initial design of theory-creating research. This is valuable because it permits researchers to measure constructs more accurately. It is very important, that theory-creating research is begun as close as possible to the ideal of no theory under consideration and no hypotheses to test. Although it is impossible to achieve this ideal, an attempt is important because preordained theoretical perspectives or propositions may bias and limit the findings. (Eisenhardt 1989: 536)

2. *Selecting cases*. The concept of a population is crucial, because the population defines the set of entities from which the research sample is to be drawn. Selection of an appropriate population controls also extraneous variation and helps to define the limits for generalizing the findings. Theory-creating research relies on theoretical sampling. The cases may be chosen to replicate previous cases or extend emergent theory, or they may be chosen to fill theoretical categories and provide examples of polar types. (Eisenhardt 1989: 537)

3. *Crafting instruments and protocols*. Researchers creating theory typically combine multiple data collection techniques. The rationale is the same as in theory-testing research, to enable triangulation by multiple data collection techniques, which provides stronger substantiation of constructs and hypotheses. Although terms qualitative and case study are often used interchangeably, both qualitative and quantitative data are recommended to be used. (Eisenhardt 1989: 537-538)

4. *Entering the field*. In case studies where a theory is created, a striking feature is the frequent overlap of data analysis with data collection. To accomplish this overlap, field notes, a running commentary to one self and/or research team, are an important means. Overlapping data analysis with data collection does not only give the researcher a head start in analysis, it also allows researchers to take advantage of flexible data collection. A key feature of theory-building case research is the freedom to make adjustments during the data collection process, e.g. additional ad-

justments can be made to data collection instruments. These adjustments allow the researcher to probe emergent themes or to take advantage of special opportunities which may be present in a given situation, but raise a very profound question: Is it legitimate to alter and even add data collection methods during a study? In the case of theory-building research, the answer is simply "yes", because investigators are trying to understand each case individually and in as much as is feasible. (Eisenhardt 1989: 538-539)

5. *Analyzing within-Case data*. The heart of creating theory from case studies is the analysis of data, but it is both the most difficult and the least codified part of the process. Within-case analysis is seen as a key step in analysis. A characteristic feature of within-case analysis is the staggering volume of data. The volume of data is all the more daunting because the research problem is often open ended. Within-case typically involves detailed case study write-ups for each site. An overall idea of analysis is to become intimately familiar with each case as a stand-alone entity. This allows the unique patterns of each case to emerge before investigators push to generalize patterns across cases. This also gives researchers a rich familiarity with each case which, in turn, accelerates cross-case comparison. Cross-case tactics are driven by the fact that people are notoriously poor processors of information. One tactic is to select categories or dimensions, and then to look for within-group similarities coupled with intergroup differences. A second tactic is to select pairs of cases and then list the similarities and differences between each pair. A third tactic is to divide the data by data source. The idea behind these cross-case searching tactics is to force researchers to go beyond initial impressions, especially through the use of structured and diverse lenses on the data. These tactics improve the likelihood of accurate and reliable theory, that is, a theory with a close fit with data. Also, cross-case searching tactics enhance the probability that the investigators will capture the novel findings, which may exist in the data. (Eisenhardt 1989: 539-541)

6. *Shaping hypotheses*. The next step in this iterative process is to compare systematically the emergent frame with the evidence from each case in order to assess how well or poorly it fits with case data. The fundamental idea is, that researchers constantly compare theory and data – iterating toward a theory which closely

fits the data. One step in shaping hypotheses is the sharpening of constructs, which is a two-part process involving (1) refining the definition of the construct and (2) building evidence, which measures the construct in each case. This is done through constant comparison between data and constructs so that accumulating evidence from different sources converges on a simple, well-defined construct. A second step in shaping hypotheses is verifying that the emergent relationships between constructs fit with the evidence in each case. Occasionally a relationship is confirmed by the case evidence, while other times it is revised, disconfirmed, or thrown out because of insufficient evidence. Traditional hypothesis testing research is similar to this verification process. The key difference is that each hypothesis is examined for each case, not for the aggregate cases. In replication logic, cases, which confirm emergent relationships, enhance confidence in the validity of the relationships. On the other hand, cases which disconfirm the relationships often can provide an opportunity to refine and extend the theory. The qualitative data are particularly useful for understanding why or why not emergent relationships hold. Overall, shaping hypotheses in theory-creating research involves measuring constructs and verifying relationships. These processes are similar to traditional hypothesis-testing research, but these processes are more judgmental in theory-creating research because researchers cannot apply statistical tests. The research team must judge the strength and consistency of relationships within and across cases and also fully display the evidence and procedures when the findings are published, so that readers may apply their own standards. (Eisenhardt 1989: 541-544)

7. *Enfolding literature*. An essential feature of theory creating is comparison of the emergent concepts, theory or hypotheses with extant literature. This involves asking what is similar to, what does it contradict and why. A key to this process is to consider a broad range of literature. Examining literature, which conflicts with the emergent theory, is important for two reasons: (1) if researchers ignore conflicting findings, then confidence in the findings is reduced; (2) conflicting literature represents an opportunity. This translates into the fact that the juxtaposition of conflicting results forces researchers into a more creative, frame-breaking mode of thinking than they might otherwise be able to achieve. The result can be deeper insight into the emergent theory and the

> conflicting literature, as well as sharpening of the limits to generalizability of the focal research. Another reason, why literature discussing similar findings is important is because it ties together underlying similarities in phenomena normally not associated with each other. The result is often a theory with stronger internal validity, wider generalizability, and higher conceptual level. This is to say that tying the emergent theory to existing literature enhances the internal validity, generalizability, and theoretical level of theory building from case study research. (Eisenhardt 1989: 544-545)

8. *Reaching closure*. Two issues are important in reaching closure: when to stop adding cases, and when to stop iterating between theory and data. In the first, researchers should stop adding cases when theoretical saturation is reached. This idea is quite similar to ending the revision of a manuscript when the incremental improvement in its quality is minimal. In the second closure issue, saturation is the key idea. That is, the iteration process when the incremental improvement to theory is minimal. The final product of creating theory from case studies may be concepts, a conceptual framework, or propositions or possibly mid-range theory. But on the down side, the final product may be disappointing. The research may simply replicate prior theory, or there may be no clear pattern within data. (Eisenhardt 1989)

Theory creating case study research proceeds in a quite similar manner to any other theory creating qualitative research approach. There have also been discussions about case study method's strengths and weaknesses. According to Yin (1994: xiii) investigators who do case studies are regarded as having deviated from their academic disciplines, their investigations as having insufficient precision (that is, quantification), objectivity, and rigor. Today the case study method is in use among a great variety of disciplines, and thus one can state a well founded question, as Yin (ibid.) put it: "*If the case study method has serious weaknesses, why do investigators continue to use it?*" All eight steps of building a theory from case study are summarized in Table 1.

Table 1. Process of Building Theory from Case Study Research (Eisenhardt 1989: 533).

Step	Activity	Reason
Getting started	Definition of research question	Focuses efforts
	Possibly a priori constructs	Provides better grounding of construct measures
	Neither theory nor hypotheses	Retains theoretical flexibility
Selecting cases	Specified population	Constrains extraneous variation and sharpens external validity
	Theoretical, not random, sampling	Focuses efforts on theoretically useful cases - i.e., those that replicate or extend theory by filling conceptual categories
Crafting Instruments and Protocols	Multiple data collection methods	Strengthens grounding of theory by triangulation of evidence
	Qualitative and quantitative data combined	Synergistic view of evidence
	Multiple investigators	Fosters divergent perspectives and strengthens grounding
Entering the Field	Overlap data collection and analysis, including field notes	Speeds analyses and reveals helpful adjustments to data collection
	Flexible and opportunistic data collection methods	Allows investigators to take advantage of emergent themes and unique case features
Analyzing Data	Within-case analysis	Gains familiarity with data and preliminary theory generation
	Cross-case pattern search using divergent techniques	Forces investigators to look beyond initial impressions and see evidence thru multiple lenses
Shaping Hypotheses	Iterative tabulation of evidence for each construct	Sharpens construct definition, validity, and measurability
	Replication, not sampling, logic across cases	Confirms, extends, and sharpens theory
	Search evidence for "why" behind relationships	Builds internal validity
Enfolding Literature	Comparison with conflicting literature	Builds internal validity, raises theoretical level, and sharpens construct definitions
	Comparison with similar literature	Sharpens generalizability, improves construct definition, and raises theoretical level
Reaching Closure	Theoretical saturation when possible	Ends process when marginal improvement becomes small

As Järvinen (2004a: 66) states, theory-creating studies are very suitable for exploratory investigations, i.e. when there is little or no prior knowledge of a part of reality or a phenomenon. According to him (ibid.), these studies will consider past and contemporary realities. There are many approaches where the goal is to produce theory that is grounded on empirical data, such as the grounded theory method (Glaser & Strauss 1979), phenomenography, ethnography, discourse analy-

sis, etc. Creating theory from empirical data is an inductive process. It requires interpretation and sensitivity from the researcher.

2.3 Hermeneutics and Inductive Reasoning

Because the approach is theory creating, beginning research questions work as a starting point for an iterative process, which eventually leads to refined questions and theoretical contribution. The actual methodology followed in this study is case study methodology, although very strongly inspired primarily by inductive logic. Because the study includes also an interpretative dimension, the suggested seven principles for conducting and evaluating interpretative field studies in IS by Klein & Myers (1999) deserve proper attention as well. These seven principles are as follows:

1. *The Fundamental Principle of the Hermeneutic Circle*. According to this principle all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.

2. *The Principle of Contextualization*. This principle requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.

3. *The Principle of Interaction between the Researchers and the Subjects*. This principle requires critical reflection on how the research materials (or "data") were socially constructed through the interaction between the researchers and participants.

4. *The Principle of Abstraction and Generalization*. This principle requires relating the ideographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action.

5. *The Principle of Dialogical Reasoning*. This principle requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings ("the story which the data tell") with subsequent cycles of revision.

6. *The Principle of Multiple Interpretations*. This principle requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.

7. *The Principle of Suspicion*. This principle requires sensitivity to possible "biases" and systematic "distortions" in the narratives collected from the participants.

Klein & Myers (1999) suggest that the principle of the hermeneutic circle is the over-arching principle upon which the other six principles expand. For instance, a researcher's deciding on what relevant context(s) should be explored (principle two) depends upon the following: how the researcher "creates data" in interaction with the subjects (principle three); the theory or concepts to which the researcher will be abstracting and generalizing (principle four); the researcher's own intellectual history (principle five); the different versions of "the story" the research unearths (principle six); and the aspects of the "reality presented" that he or she questions critically (principle seven).

Induction, as used in data-driven studies, has certain similarities with other research approaches, such as grounded theory (e.g. Glaser & Strauss 1979 or Strauss & Corbin 1990; Strauss & Corbin 1998). Suddaby (2006) summarizes the grounded theory approaches of Glaser and Strauss, where a scientific truth results from both the act of observation and the emerging consensus within a community of observers as they make sense of what they have observed. Here empirical 'reality' is seen as the ongoing interpretation of meaning produced by individuals engaged in a common project of observation. Suddaby (ibid) also outlines seven common misconceptions of grounded theory. According to Suddaby (1) grounded theory is not an excuse to ignore the literature; (2) Grounded theory is not presentation of raw data; (3) Grounded theory is not theory testing, content analysis, or word counts; (4) Grounded theory is not simply routine application of formulaic technique to data; (5) Grounded theory is not perfect; (6) Grounded theory is not easy; (7) Grounded theory is not an excuse for the absence of a methodology.

The interpretative method is a hermeneutical one. The researcher is in continuous dialogue with the empirical data. Here the beginning hypothesis does not play that crucial role in interpretative research, because it can be quite easily corrected while following the hermeneutic circle. Finally a supported hypothesis is reached. Basically, when following this approach, only the first hypothesis is based on pure intuition, and the last one is actual interpretation. (Ehrnrooth 1995: 36-37)

Induction or inductive reasoning is the process of reasoning in which the conclusion of an argument is very likely to be true, but not certain, given the premises. According to the Oxford English Dictionary, induction in logic is (OED 2007a) "*the process of inferring a general law or principle from the observation of particular instances*", where inductive in logic is (OED 2007b) *"Of the nature of, based upon, or characterized by the use of induction, or reasoning from particular facts to general principles.*" According to Kant (1974, 29, as quoted in Niiniluoto 1983, 29) induction broadens what is given empirically from private to general in relation to many objects. A research process using an inductive approach emphasizes the importance of continuous dialogue between theory in progress and empirical data. Figure 3 illustrates this type of continuous dialogue (Ragin 1994: 57). The process is very iterative in nature, and requires a researcher to spend a long time with collected data in order to allow it to present underlying factors.

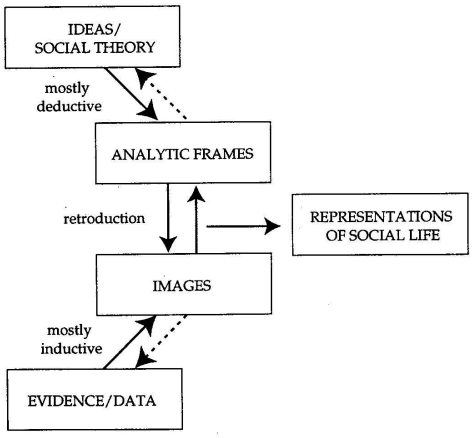

Figure 3. A Simple Model of Social Research (Ragin 1994: 57).

Glaser and Strauss argue (1979: 3), that the interrelated jobs of sociology are: a) to enable prediction and explanation of behavior; b) to be useful in theoretical advance in sociology; c) to be usable in practical applications — prediction and explanation should be able to give the practitioner understanding and some control of situations; d) to provide a perspective on behavior — a stance to be taken toward data; and e) to guide and provide a style for research on particular areas of behavior. This is to say, that a theory in sociology is a strategy for handling data in research, providing modes of conceptualizations for describing and explaining (ibid.).

Inductive reasoning is one formal way of conducting research that is firmly grounded on empirical data. The process and results are indeed grounded on data, although the use of the word grounded is a problematic one, due to the strong

connotation to grounded theory, or more precisely, to grounded theory method. This is not to say, that there are no other methods that have their grounding in empirical data. Quite contrary, there are many, but it appears that grounded theory method has gained dominating role in the methodological discussion. In this study, resulting generalizations, or hypotheses produced using inductive approach are produced following case study setting in order to constitute a firm structure for the study. The goal is to combine these two approaches in order to be able to follow rigor in the research process — as well as to be able to exercise creativity in theory formulation.

2.4 Using Interviews as a Technique for Gathering Data

Myers & Newman (2007) noticed, that although qualitative interviews are an important tool for IS researchers, it is very rarely used and often inadequately described in research reports. Because of this, Myers & Newman (ibid.) suggest that authors should describe the actual interview process in a more detailed manner, because qualitative interviewing is not as simple and straightforward process as often assumed. This guideline is given high priority, because it is practically impossible to grasp the very idea of impacts or changes certain particular technology has over organization or individual work, unless studied under a certain period of time. There is obviously a problem when studying change and collecting empirical data during a relatively short period of time. In order to be able to grasp a comprehensive picture of the phenomenon, interview technique was used, where interviewees were asked about past and present, but also about how they see the near future. Using this technique, it was possible to sketch a picture of a change process.

According to Järvinen (2004a: 140) an interview can be described as a conversation between interviewer and respondent with the purpose of eliciting certain information from the respondent. Depending on the used research approach the type of the interview differs. For a theory-testing approach Bell (1993: 93) recommended completely formalized interviews where the interviewer behaves as much like a machine as possible. The completely informal interview, in which individual respondents determine the shape, suits a theory-creating approach in order to present as all-round views as possible (Järvinen 2004a: 140).

Interviews can be used also for a constructive approach, and there the role of the interview differs depending on whether the study is for building or an evaluation case. In the building case, a developer of the new artifact is not only interviewing

coming users to find out their requirements, but also telling the opportunities she sees concerning the new artifact. In the evaluation case, if the criteria to be used in evaluation are known and predetermined, the formalized interview can be used, but if criteria are still sought for, the informalized interview is recommended. (Järvinen 2004a: 140)

Hirsjärvi & Hurme (1993: 29, 30, 36) argue that based on the way interviews are handled it is possible to divide these into form based interviews, themed interviews and open ended interviews. In form based interviews the form and order of questions is predefined. In themes based interviews it is typical that the interview is focused on certain themes which are discusses in detail. In the open ended interview the actual interview is very free in nature, which makes it different than the two former types.

In the formalized or structured interview the interviewer tries to stay as neutral as possible and interact with all the respondents in a similar way. Based on his/her research framework and hypotheses the interviewer carefully plans and formulates her questions. An interview is always social interaction between two persons, and therefore it is important to try to establish an easy relationship by warming up before the interviewing session; by ordering questions in the logical way, by refraining from both saying and with facial expressions and gestures showing any comment on responses. (Järvinen 2004a: 141)

In the informalized interview, the interviewer tries to gather descriptions of the life-world of the interviewee with respect to interpretation of the meaning of the described phenomena (Kvale 1983). Technically this interview is to a certain extent ‘semi-structured’, it is neither a free discussion nor a very structured questionnaire. It is carried through following an interview-guide, which rather than containing exact questions focuses on certain themes. The interview is recorded on tape or videotape and transcribed word for word. The typed out version together with the (video) tape constitute the material for the subsequent interpretation of meaning.

Kvale (1983) outlined 12 main aspects to understand the qualitative research interview. It is 1) centered on the interviewee's life-world; 2) seeks to understand the meaning of phenomena in his life-world; it is 3) qualitative, 4) descriptive, and 5) specific; it is 6) presuppositionless; it is 7) focused on certain themes; it is open for 8) ambiguities, and 9) changes; it depends upon the 10) sensitivity of the interviewer; it takes place in 11) an interpersonal interaction, and it may be 12) a positive experience.

It is quite common that interviews are the main technique for data gathering in qualitative research. The interview as a technique has one major advantage over other methods, it offers a possibility to adjust the collection of data based on the situation or interviewed. Flexibility of the technique follows from the fact that it allows for readjusting the interview process while interviewing and it also makes possible a more subtle analysis of answers than in ordinary survey. (Hirsjärvi, Remes & Sajavaara 1997: 201)

Form based interviews are suitable for a theory testing research approach (Järvinen 2004a: 36), while open ended interviews are suitable for theory creating studies (Järvinen 2004a: 66). Themed interviews fit somewhere in between these two research approaches. Hirsjärvi, Remes & Sajavaara (1997: 201-202) list reasons why interviewing is usually selected as a data collection method: a) when a researcher wants to emphasize that human must be seen as a subject in the research process, and must be allowed to bring up matters which may have some concern for him or her; b) in a situation where the area of interest is somewhat unknown; c) and it is difficult to predict answers beforehand; d) interviewing works also in situations where there is a need to set results into a larger context, because the interviewed person can tell about him- or herself and about their subject under study more than the researcher could have predicted; e) if beforehand is known that answers might be complex and when there is a need to clarify received answers; f) if there is a need to deepen received information, which can be done by using focusing extra questions; g) when studying sensitive or difficult topics, although this is a somewhat controversial viewpoint among researchers. Some argue that questionnaires might be a more suitable method in this type of situations, because it allows anonymity and it is possible to stay distant from researchers.

One major benefit that interviewing as a data gathering technique has, is the fact that persons whom are planned to be interviewed are often easy to persuade to participate in the research. It is also possible to reach interviewed persons afterwards, if there is a need for supplementary questions or if there is a need to make a follow-up research. Unfortunately, interviewing also has some drawbacks. Some of the things seen as advantages of the method do contain some problems. Interviewing takes time. For example, an interview that takes half an hour, is quite unlikely to be useful from a research point of view. If a problem can be solved that easily, it should be possible to choose questionnaire instead. Making interviews requires careful planning and requires getting acquainted with interviewer's role and tasks, which is very time consuming. Interviews contain many disturbance factors, which originate either from the interviewer, the interviewee or from the ensemble of the situation. (Hirsjärvi, Remes & Sajavaara 1997: 202)

One thing that compromises the reliability of interviews is the very human feature to give answers which are socially acceptable. There might be great cultural differences between different countries, and even between sub-cultures within one country. People interpret their own situation and protect themselves against others in many ways. In the interview process it is crucially important how the interviewer can interpret the interviewee's answers and take cultural differences and different shades of meanings into account. (Hirsjärvi, Remes & Sajavaara 1997: 202-203)

Interview material is bounded into a context as well as into a situation. This raises another problem, interviewees might say things differently in an interview situation than what they might say in another situation. It is possible to take this into account when analyzing results; one should not exaggerate while generalizing results (Hirsjärvi, Remes & Sajavaara 1997: 203)

2.5 Research Conditions

2.5.1 Finnish Education System

The Finnish education system is composed of nine-year basic education (comprehensive school), preceded by one year of voluntary pre-primary education; upper secondary education, comprising vocational and general education; and higher education, provided by universities and polytechnics, as illustrated in Figure 4. Adult education is available at all levels. In Finland, pre-primary education, basic education and upper secondary education and training, complemented by early childhood education and before- and after-school activities, form a coherent learning pathway that supports children's growth, development and well-being. (Education system in Finland, Ministry of Education).

Pre-school education is provided in a day care centre or a comprehensive school in the year preceding the beginning of school. Comprehensive school is a nine-year system providing education for all children of compulsory school age. Although being a nine year system, there is also a possibility for a voluntary 10th form. The school starting age is seven and every Finnish citizen is required to complete this education. General upper secondary schools and vocational schools provide post-comprehensive school education. The general upper secondary schools offer a three-year general education curriculum, where at the end the pupil takes the national matriculation examination. (Ministry of Education 2000: 13)

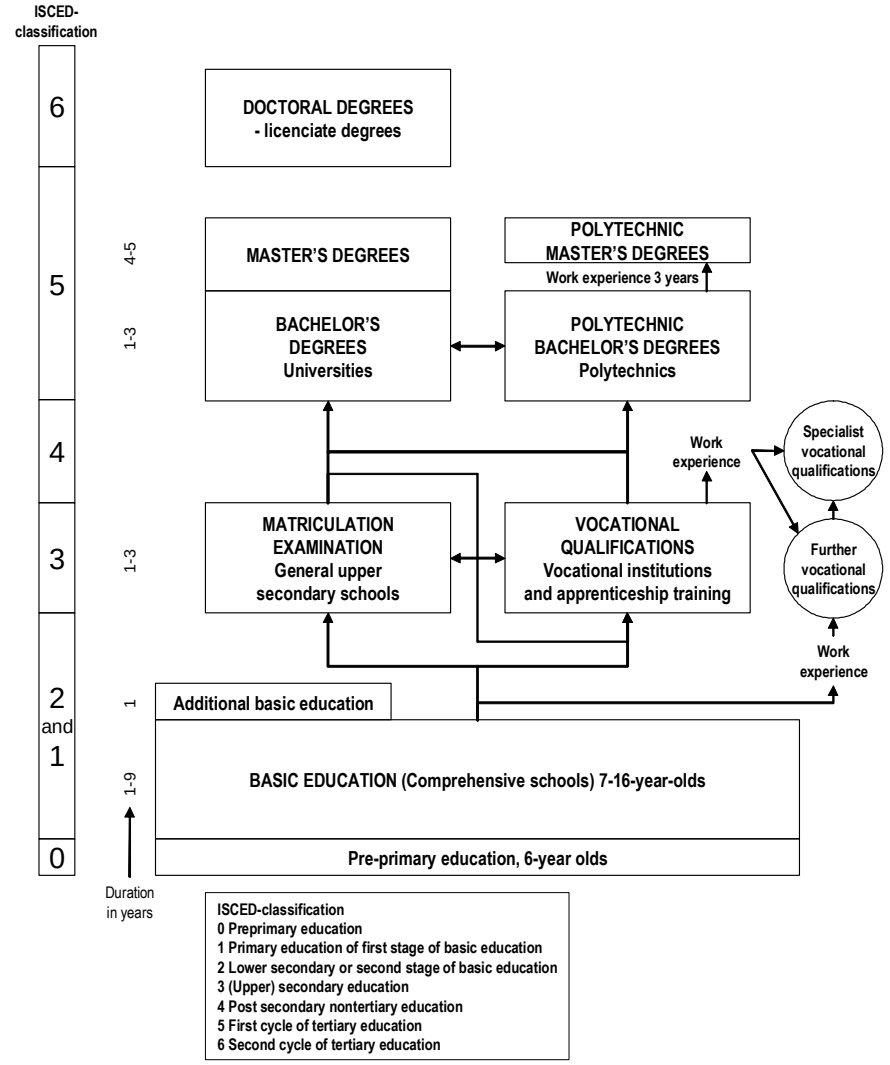

Figure 4. The Structure of the Finnish Education System (Adapted from The Finnish education system, cited June 30, 2008).

Adult education is provided at all levels of education; Adults can study for a general education certificate or for a vocational qualification, or modules included in them, take other courses developing citizenship and work skills, or pursue recreational studies (Education system in Finland, Ministry of Education). Although traditionally Finnish vocational education and training has been institution-based to a very large extent, it is also possible to complete an initial vocational qualification through apprenticeship training. In addition to these, a vocational qualification can also be taken as a competence based examination evaluated by an examination board. (Ministry of Education 2000: 13)

The Finnish higher education system covers universities and polytechnics. The admission requirement is a secondary general or vocational diploma. The poly-

technics were established during the reform process of the 1990's, thus being quite new. Universities, which are academic or artistic institutions, focus on research and education based on research. They confer Bachelor's, Master's, licentiate and doctoral degrees. Polytechnics offer work-related education in response to labour market needs. A polytechnic degree requires 3.5 - 4.5 years of full-time study. The requirement for polytechnic Master's programmes is a polytechnic degree or equivalent, plus a minimum of three years of work experience in the field concerned. (Ministry of Education 2000: 15; Education system in Finland, Ministry of Education)

All Finnish universities have the right to award doctorates and engage in both education and research. The first university degree (which roughly corresponds to a Bachelor's) can be attained in three years of full-time study in general, and the higher Master's degree, in five years, which practically means further two years following the Bachelor's degree. In the Finnish education system there is also an optional pre-doctoral postgraduate degree of licentiate, which can be completed in two years of full-time study after the Master's degree. Full-time studies for a doctorate take approximately four years, following the Master's degree. Adult education has expanded rapidly in the past few years. It is designed for the entire working-age population, and at universities comprises further education and Open University courses. Each university has a centre for continuing education. (Ministry of Education 2000: 15)

The objective of Finnish education policy has been to raise the general standard of education and to promote educational equality. The comprehensive school system, the vocational education reform, the regionalization of universities and the polytechnic reform have all been consistent with this approach (Ministry of Education 2000: 13). In addition, students' opportunities to progress from one level of education to the next are safeguarded by legislation (Education system in Finland, Ministry of Education.); Both general and vocational upper secondary certificates provide eligibility for further studies in universities and polytechnics. A student completing one level is always eligible for the next level studies. The qualifications of each level are governed by a separate Act of Parliament. This assures harmonized qualifications and their quality and guarantees students' rights.

Today special attention is being paid to the content of education and the methods of instruction, as well as educational standards and equality. Increasing overall flexibility and the opportunities for individual choice are also considered important and internationalization has also emerged as a key objective. (Ministry of Education 2000: 13)

The welfare of Finnish society is built on education, culture and knowledge. All children are guaranteed opportunities for study and self-development according to their abilities, irrespective of their place of residence, language or financial status. All pupils are entitled to competent and high-quality education and guidance and to a safe learning environment and well-being. The flexible education system and basic educational security make for equity and consistency in results. (Education system in Finland, Ministry of Education)

2.5.2 Case Study Settings

Phenomena in focus are studied from the viewpoint of educational staff (e.g. lecturers, professors etc.) using interviews. Because of the scope of this study, it appears that this study has aspects from both — organization research and information systems research. Orlikowski & Barley (2001: 158) point out that combining information technology, and organization research in areas, where these have mutual interests, might prove out to be very productive. This study offers one example of this type of approach.

During the time when this study was carried out at the University of Vaasa, the situation was exceptionally favorable for the study. Virtual education was a new emerging possibility available for teaching personnel. Practices for taking different forms of online education into use were taking form and IT infrastructure, favorable university policy and know-how were present. In addition, following the policy of virtual university of Finland, WebCT was chosen as the official platform for online courses provided at the University of Vaasa. There was a need for research on these issues.

When applying for permission for conducting a study on the use and impacts of WBT, the permission was granted easily. This research appeared to fit in the university policy to favor efforts on developing virtual education further. During that time, the author was working at the university and was also involved in utilizing and developing virtual education. When potential candidates for interviews were tracked down and they were approached, practically all active users were reached and interviewed. These circumstances made the research setting unique and exceptional. In other words; there was a strong practical motivation for conducting a field study on WBT related issues; research settings were optimal because all target users were included in the study; the researcher was coming from the inside organization and was experienced with this type of information technology; and university administration was favorable for this type of research.

3 DATA ANALYSIS

In this chapter details of the data collection process are presented in Section 3.1. the data analysis process is discussed in detail in Section 3.2. Findings are reported in Section 3.3, where these are presented following the organization of seven interview themes (Sub sections 3.3.1 to 3.3.7, and summary in Sub section 3.3.8). Data-driven preliminary theory is presented in Section 3.4, where constructs are presented in Sub section 3.4.1, relations between constructs in Sub section 3.4.2 and tentative theoretical framework for WBT adoption is verified in Sub section 3.4.3.

3.1 Data Collection

The study is based on interviews which took place during spring and autumn 2003. Interviews were conducted within the University of Vaasa. For this study, all interviewed persons were chosen based on their background as a former or present user of web based course tools and because they were working for the same organization. The goal was to try to reach as heterogenic a group as possible to be able to gain as rich a picture of the state of affairs as possible.

When selecting persons for interview and tracking them down, it turned out that there was simply no need for discarding potential interviewees due to their small number. In the beginning the list of all persons having access to, or using web based course tools, appeared to be a very extensive one. After a profound analysis, the list was reduced to twenty persons, which in turn, appeared all to be suitable for intensive, in-depth type of interviews. Before entering the field, a test interview was conducted to measure how well the interview setting worked and to get familiar with the research setting. This test interview is not included in the analysis, due to its instrumental nature.

In total 20 persons were interviewed, out of which twelve were women and eight were men. All 20 interviews were needed, although it is possible to reach saturation already after 15 interviews where no new concepts emerge, recommendation being around 20 interviews (Sandberg 2000: 13). The original interviews consist of six different themes. Themes discussed were as follows:

1. Personal user history of web based course tools
2. Ways of using web based course tools
3. User experiences of web based course tools

4. Web based course tools influence on individual work
5. Changes caused by web based course tools
6. Future

Focused themes were discussed quite freely during the interviews. Each interview was recorded, with permission from the interviewee. Also notes were made during the interview, which were later used as a primary data source for analysis, supported by recordings. The relation between interview themes and research questions, as well as research questions and research problem, are illustrated in Figure 5.

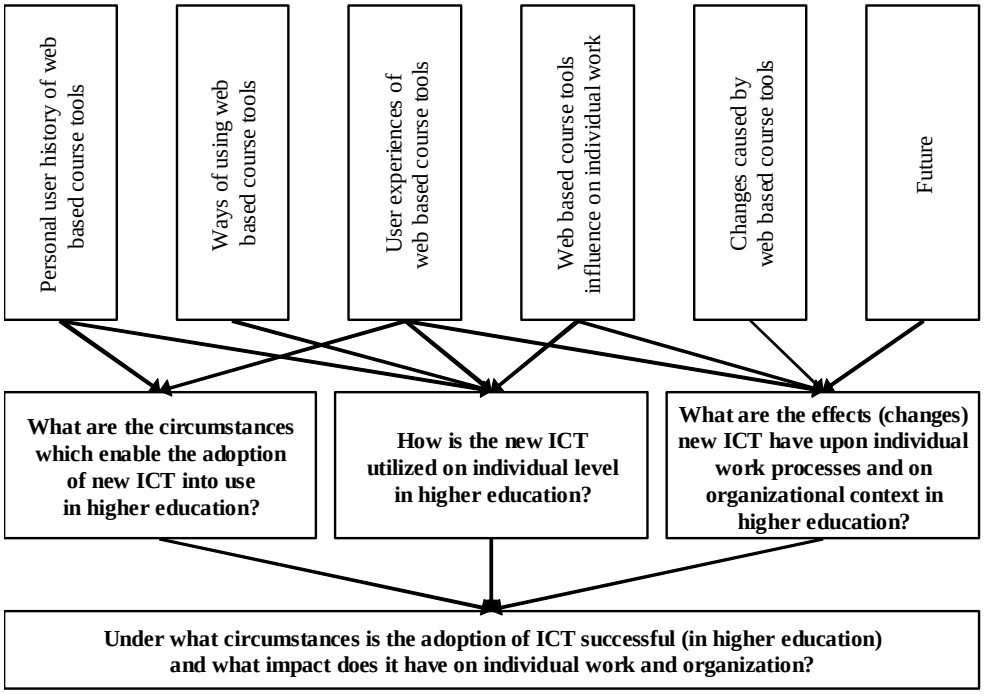

Figure 5. Connections Between Interview Setting and Research Problem.

Figure 5 presents the data driven approach on data analysis and how the used interview themes were likely to contribute answers to research questions. In addition, it also presents how the research questions contribute to research problem.

3.2 Analysis Process

The data analysis was conducted in two stages. In first stage analysis the focus was primarily on details and in second stage analysis the focus was on forming a general data-driven theory. First stage data analysis was conducted using an itera-

tive, analytic approach, where one discussed theme after another was analyzed. Whenever an interesting concept or detail surfaced, it was written down into a large data matrix and compared with other interviews in order to find out whether it was brought up also in other interviews. This process continued until all interviews and themes were analyzed. Here the basic data for analysis was hand written notes made during the interview and each interviewee was dealt with as a unique case, e.g. as a unit of observation. Whenever issues that appeared relevant to the researcher were encountered, these were transcribed from digitalized interview records using Transana[1], qualitative analysis software for video and audio data to support written notes. Sub sections 3.3.1 – 3.3.8 are based on analysis of this data.

While proceeding to deeper analysis of data, several viewpoints were used in analysis. Both micro and macro levels (see Markus & Robey 1988) were used, e.g. weight was put on individual and on organizational level in analysis. In addition, technical and social viewpoints were used in analysis. Here an analytic approach, largely inspired by the grounded theory method, was used.

Later in research process Transana was replaced with NVivo[2]. This took place in second stage analysis. In second stage analysis used approach was inductive reasoning inspired by grounded theory. Here interview notes were coded loosely following approach commonly used in grounded theory analysis. This started from open coding and continued all the way into forming emerging, data driven theoretical framework. This is presented in Section 3.4, where detailed analysis, reasoning and resulting theoretical framework are presented in Sub sections 3.4.1 – 3.4.3.

Finally resulting theory was presented and compared with previous impact research, IT adoption, and organization change literature. This discussion takes place in Chapter 4. In addition an expanded theory was presented, which was supplemented using previous theories.

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1 http://www.transana.org
2 http://www.qsrinternational.com/

3.3 Results

3.3.1 About the Interviewed People

During the time of the interview, the average age of the interviewees was 42 years, the youngest being 25 years and the oldest 57 years old. The group of interviewed people consisted of eight men and twelve women. When the interviewees were asked about how they would rate their own IT skills, nearly half of them addressed themselves as having excellent skills (n=11), while the rest addressed themselves as having good skills (n=9). None addressed themselves as having poor or no skills at all.

Nearly all of the interviewees had a university degree, except one person. Ten out of nineteen also had a licenciate, or doctoral degree. Eighteen out of twenty had previous studies in pedagogy, at least to some degree. The level varied from a few separate courses to having a major in pedagogy. There were no real borders between different disciplines in adapting new technology into use, although there might have been some special requirements for the actual ways of technology use in teaching.

3.3.2 Personal User History of Web Based Course Tools

The first theme covered during an interview was the interviewee's personal user history of web based course tools. This part of the interview was started with a question: *"Would you tell me how did you start using web based course tools in your work and what has happened since then?*"[3]

When tracing down the individual user history of each interviewee, also the first contact with the Internet and IT in general was often covered. The earliest use of the Internet in teaching mentioned in interviews took place in 1988, while the latest first time use apparently happened in year 2000. Virtually nearly all of the interviewed addressed that they use IT to support teaching. The tools (software or hardware) mentioned did vary depending on their disciplines' special requirements though.

When asked about the first time taking web based course tools into use, there was not that much difference. Earliest adopter had started using this type of systems in

[3] "Kertoisitko miten aloitit verkko-oppimisympäristöjen käytön työssäsi ja mitä aloituksesta tähän hetkeen on tapahtunut?"

1993 while staying in Sweden, while earliest adopters in local university had taken these tools into use in 1998. Latest adopters had taken the system into use in 2003.

Although there are several competing systems on the market (see EduTools.info, cited July 24, 2007), most of the interviewed did not have any experience of alternative solutions of official course tool for web courses in University of Vaasa. This software product was during that time WebCT, which apparently was also the official choice for platform for virtual courses by the Finnish virtual university. At present WebCT as a separate product is about to become history, due to recent merging with Inc. BlackBoard (www.webct.com, cited July 24, 2007).

The most important reasons for adopting new technology and a new way of working appeared to be interest for subject matter, to try new things, to pursue new benefits, to solve a problem at hand and to utilize web resources in education. The basic motivation behind the decision for taking new technology into use was to use technology as a tool, except in one case, where interest was also on technology itself. For women the exploitation of highly developed interactive communication seemed to be the most crucial factor, while men seemed to be oriented to more technical details.

Eight out of twenty interviewees expressed new contacts and co-operative arrangements related to the use of new technology in the interview. Eight interviewees stated exactly the opposite. When discussing about the scale of the co-operation, answers varied from co-operation on local level all the way to co-operation taking place at national level.

When asked whether they aimed to continue to use web based course tools in their work, seventeen out of twenty clearly stated that they are going to continue using tools of this type, while three stated otherwise. When looking for the reasons for continuing the use of web based course tools, the interviewed people among other things gave the following reasons: received positive feedback, learning results have been very good, pilot course turned out fine, very easy to update course materials, makes teacher's job easier, flexibility versus time and place, one can concentrate more on content than technology and reflecting experiences through discussions. Reasons for not using web based course tools were uninterested students, wages were not adequate when compared to workload and teaching method is not suitable for courses with many students. Only four interviewees had themselves attended virtual courses in a role of student.

Findings here do imply that there were no situations, when web based education had been the easiest solution, but on the other hand it did offer other benefits and

was taken into use for this reason. It also seems that when being familiar with IT, it is a lot easier to adopt new technology and ways of work. Technology does not seem to replace old work processes with new ones, but instead it changes them. In one interview the argument "*it is more important to provide content than compare tools*"[4] was presented. In other words, tools have matured so that there are enough usable software products on the market and it is up to an individual to make good use of those.

There appears to be a clear connection between the willingness to continue the use of new technology and previous encounters with it. Based on the interviews it seems that if a person has previously been participating in a virtual course as a student, thus gaining the insight for real benefits and restraints of the system, it is more likely that this person will continue to use the system after the actual decision for taking it into use. Among the persons, who continued to use WBT were persons, who had been participating in a virtual course in a role of student as well as those who had not.

In addition, those who did not want to continue to use the system in question, were also a part of a group of those who had not themselves been attending any virtual courses in a role of student. According to this reasoning, one can gain a more realistic idea about the real possibilities of new technology as a student (perceived usefulness) and thus one is less likely to be disappointed when later on using it for real.

Another noteworthy factor that appears to influence the decision is the degree of freedom in decision making. All but one interviewee told that the decision for taking new technology into use was eventually based on one's own initiation. One person had involuntarily been ordered to start a pilot by a superior. In this case the pilot was not that successful, nor the decision eventually based on one's own initiation. In this case there was neither follow up nor any desire to continue the use of WBT at all. Based on this one could suggest that previous experiences do influence the willingness for continued use of target system, but indirectly, by influencing the perception of the perceived usability of the target system. In a sense, here based on empirical perceptions, the effect appears to be more likely mediating than direct influence.

It seems that if the first encounters with new technology are very bad there is a concrete risk for rejecting technology. It also seems that web based educational

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4 "Sisällön tuotanto on tärkeämpää kuin välineiden vertailu" (Male, 35).

tools are merely seen as tools for supporting tasks and making work easier. Thus the tool is not emphasized; the focus is instead on actual work process.

3.3.3 Ways of Using Web Based Course Tools

The second open ended theme in the interview covered how web based course tools were actually used by interviewees. This topic was started with a question: "*Would you like to tell me how you are using web based course tools and for what?*"[5] It turned out quite clearly, that all interviewed used these tools for supporting teaching in academic environment alone, which in turn does put certain requirements on chosen teaching methods, as well as practices. According to interviews, this type of tool works best when used as an information channel, or as a medium for delivering course materials or exercises. This tool was also used for many other types of purposes, but these mentioned ones were clearly expressed.

Only three of the interviewed had fully virtual courses. All others had more traditional education supporting web based education, or used the web based educational environment to support their more traditional education in different ways. This shows that the technology is quite flexible and it is possible to adapt it differently depending on situation.

The WBT system offers a great variety of features to be used. During the interview, among other things, focus was put on different features available in WBT systems and on ways each interviewee used WBT in his/her work. Apparently the most popular feature was the possibility for automated submission of assignments into a system, which in turn would keep record of deadlines as well as of returned works. Second highest ranking was given to the possibility for online discussion and third on ranking was the possibility for administering and monitoring users during the course. The list of features brought up in the interview is summarized in Table 2.

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[5] "Kertoisitko miten ja mihin tarkoitukseen käytät verkko-opetusympäristöjä?"

Table 2. List of Used Features of WBT System.

Used features	**N**
Assignment tool for returning assignments	13
Discussion tool	12
Administering and monitoring users	9
Giving feedback to students (evaluation)	8
Internet resources	7
Producing materials	6
Managing documents	6
Internal email	6
Collaborative tools for group work	5
Videoconferences	5
Interactive features	5
Chat	4
Calendar/time schedule	4
Producing documents	3
Informing (distributing information)	3
Collecting feedback	2
Tests	2
Internal FAQ	2
Surveys	1
Telephone meetings (provided by OPKE)	1
Communication	1

As Table 2 illustrates, some of the features mentioned conceptually overlap each other, such as the general term communication and the more precise concepts chat, internal email or discussion tools. This is due to the heterogeneity of interviewees, and as such needs a bit more interpretation. Occasionally important functions were referred to as being "communication", where in other cases this was dealt within great detail (whether using chat, internal email, etc.). Most of the features or tasks were concentrated on managing and administering courses and on communicative features. Collaborative, purely maintenatively, or resource centered functions were mentioned, but not so often. It appears that for the most part in focus in providing online education is on communicative functions, and not so much on pre-made materials, nor exercises which are behaviorist by nature.

When asked about what kind of media were used for online education, nearly all forms of digital media were covered (video, sound, pictures, animations, web pages, documents and pure text). Half of the interviewed clearly stated that they are using WBT for distributing course material to students, while the remaining half did not address them using WBT for that purpose. When asked whether or not other supporting tools are used along with WBT, just two examples were mentioned; concept maps and email lists, and the latter was taken into use for

replacing technology that did not work. These results suggest that WBT offers a very comprehensive toolbox for distance, as well as for multiform education. Because WBT includes a great variety of possibilities, interviewees were also asked what tools are most likely to be avoided, in order to get better understanding of used approaches on education. Here online tests were mentioned and the reason, as explained, was that tests of survey type are not a suitable method for evaluating skills at university level. Apart from this, there were others who were using tests, which suggests that WBT is quite flexible, allowing teachers as users to choose teaching methods that serve them best.

When interviewed described what kind of role they take (role meaning here relation between teacher and student in addition to other teacher's duties) in web based education, answers varied from describing one's role as invisible to instructive. It appears that the teacher is quite naturally seen as a dominant figure, but this does not seem to apply similarly in online environment. A comment stated by one interviewee defined the teacher's role as being more like a tutor instead of an authority, which seems to apply for most cases, depending on what is being taught.

According to interviewed, common problems related to students were related to the level of IT skills, which was not always adequate, or to motivation, which was seen as problematic especially in online discussions. Problems concerning technology were surprisingly few. Firewalls had caused problems for students, while the monitoring of student's performance during online course was seen as problematic (apparently due to the ease of plagiarism in the digital age). From a teacher's point of view practical problems were related to updating online course materials once a year, as well as the fast outdating of online materials (this is apparently due to the evolving Internet, where links get easily broken, unless continuously monitored). Copyright related problems were also addressed. When using WBT, emphasis is on teacher and student, and on peer-level communication (e.g. student-to-student). It was also stated, that the workload is by no means lighter in using WBT, than in more traditional education.

In several cases a supporting tool for keeping track of students' performance was not used, although this type of tool was available in the WBT system, e.g. record keeping was still done in some cases manually. Also, keeping contact with students was occasionally done using ordinary email, even though the system offers many tools for doing this. In some cases teachers were dealing simultaneously with ordinary email, as well as internal email in the WBT system. A very beneficial feature in WBT was the possibility for using features which allow simulating and illustrating processes otherwise impossible to illustrate to students.

In many cases the material production is done in collaboration in a closed virtual environment with participating students. This is shared expertise in action, as one interviewee stated. It was also stated that WBT is a tool for sharing knowledge, and that it also offers freedom of time for students who could not otherwise attend classes. Interestingly enough a great weight can be put on personal contacts when trying out new technology, namely in one case where a lot of collaboration was done with other teachers, it was stated that experimenting on these new systems had been based on personal contacts.

One interviewee told about one experience, where the WBT system was partially inoperative and an alternative solution was needed. In this case ordinary email was used for remedy. A suggestion for developing WBT support services was a system for submitting information about problems encountered, e.g. a ticketing system.

According to the interviews, there does not seem to be a noticeable association between the role the teacher assumes during an online course, and teaching methods used. In addition, although several interviewees were very keen on using several other teaching methods along with, or in addition to, virtual education — willingness for using interactive features did not clearly correlate with willingness for using multiform teaching methods. There seems to be a relation between willingness for applying multiform teaching methods and number of different features used in WBT though. Thus it could be said that if one is willing to utilize multiform teaching methods in ones work, this will lead to richer use of features available in WBT systems.

Twelve out of twenty did express that when teaching they are using several different teaching methods to support their teaching (such as lecturing, exercises, discussions, etc. which apparently are more or less related to the teachers personal preferences or teaching subject related special requirements, as in studying languages for example). When discussing about teaching and virtual courses, six out of twenty addressed that they are teaching pure virtual courses, where nine out of twenty stated totally the opposite. This indicates that many different types of approaches towards teaching can be effectively supported by WBT, and that WBT is flexible.

3.3.4 User Experiences of Web Based Course Tools

The third open ended theme in the interview covered experiences users have had in using WBT. This topic was started with a question: "*Would you like to tell me your experiences of what it is like to use web based course tools?*"[6] . Several of those interviewed felt that tools used for virtual education are easy to use, although there were a few who felt totally the opposite. The number of persons who had previously used some other WBT systems was nearly half of all those who were interviewed. The number of those who did not have any previous experience of WBT systems was slightly larger, though. In this context, four of the interviewed persons stated that the system used at the University of Vaasa was easy to use, where four of the interviewed did state otherwise. Apparently the persons, who did mention that the system used at the University of Vaasa was difficult to use, were the same persons, who found tools used in virtual education to be difficult to use in general, except one person. Here the system in use was seen as difficult to use, but on the other hand it was reported that in general, systems used in virtual education are easy to use.

When comparing systems in use with previously used systems, interviewees reported that contemporary systems were seen as easier to use, and it was also stated that there are limitless possibilities for improving these. One interviewed person did state that the previous systems were a lot simpler constructs, while newer systems are a lot more complex systems. When the discussion turned towards required workload from participants (e.g. students) during online courses, some teachers reported that according to students, web based education was seen as a very hard way of studying and occasionally students commented that the number of credit units acquired from a course did not correlate with the work required for passing the course.

It was also reported that the most difficult students to motivate on virtual courses are the young ones. Because online education is new to students there is a need to ground all claims and to motivate students carefully. This puts pressure on teachers every time when a new way of studying is introduced to students. Most of the interviewed (n=12) clearly stated that when using WBT in education, work requires more time than previously. Some of the interviewees saw no difference at all, but obviously WBT changes the way in which things are done. There are several reasons why the use of WBT is seen as time consuming. To name a few:

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6 "Kertoisitko millaista sinun verkko-opetusympäristön käyttäminen on?"

- Course material production (producing course materials is very time consuming)
- Taking the system into use for the first time (taking WBT into use for courses is very time consuming in the beginning and it requires several years in order to develop working routines which to follow)
- Unfamiliarity; it is difficult to estimate time consumption in advance.
- Course administration
- Discussions and feedback
- Routines (planning, preparing and distribution of exercises, downloading submissions, supervising newsgroups)
- Preparations and planning (because everything must be in order before course starts)
- Material and student motivation

During the interviews it was also noted, that the courses had grown, and in some cases there is a limit for the number of persons who are accepted for taking a course. Half of the interviewed teachers had the possibility of working from home, but only six out of ten said that they use this option. Reasons for not working from home varied from slow bandwidth to social networks available at working place.

According to half of the interviewed teachers, time used for virtual courses is taken into account when calculating working hours. Nearly one third of the interviewed teachers stated otherwise. In general, the question concerning compensation for work required for virtual courses seemed to be a difficult one. In some cases the solution was sought through yearly working hours and the possibility of negotiating how these hours are used in one's own work. In other cases this problem seems to remain unsolved. Nearly two thirds of the interviewees felt that hosting virtual courses is very laborious, while few had opposite experiences. Nearly all of those who felt that they need to educate themselves on their own time concerning new systems and features of WBT systems thought that hosting virtual courses is very laborious.

Nearly all interviewees stated, that they had adequate resources available for their work, while no one stated otherwise. It was also stated that teachers who are teaching just some courses at the university (e.g., they don't have a permanent

position) are a problem because they also need facilities and computers. Computers have made work easier, but because the transition has been happening during such a long period of time, it is hard to point out radical changes.

When discussing technical issues related to usage of WBT, one quarter of the interviewees did mention the need for upgrading related software in order to be able to use WBT tools properly. Half of the interviewees stated that there is no need for any sort of updates, while one quarter did not have any comments on this. There was even less perceived need for upgrading hardware, over two thirds of the interviewees said that there was no need for any kind of upgrades.

Very few reported having experienced technical problems. These were most likely related to firewall settings, user errors, or problems escalating due to slow network connections. One interviewee noted that in the beginning, the use of Macintosh did cause troubles. Problems mentioned concerning primarily teachers were:

- All features in a system do not work properly.
- Aging computers and software.
- The system in use has had interruptions, also upgrading the system has been problematic.
- Problems with network e.g. slow connections and temporary breakdowns (network problems date back to spring 2003, when a crucial component of university's network broke down).
- Incompatible file attachments.

It was also reported that there are other types of problems, which are not related to technology at all. Problems which were mostly related to students and their work were:

- Missing plug-ins in computer classrooms, that can not be installed due to restricted user rights
- Networking problems, which are caused by firewall configurations, basically blocking student access from outside.
- Missing plug-ins, but no necessary skills for obtaining and installing needed ones.
- Occasional problems which are due to allowing students to enroll for a course by themselves.

- More personal type of problems than technical ones.
- Problems with file attachments, especially with security and compatibility.
- Slow modem connections, or lacking access to computers.
- Occasional system breakdowns in WBT system.

When discussing about how the technical support had been organized, the practice seemed to vary greatly between departments. The university's Learning Center[7] seemed to play quite a strong role in both providing support for teachers as well as for students. It was also quite common practice to try to solve technical problems by themselves, although students have been encouraged to contact the University's Computer Center by themselves when encountering technical problems. All comments were not that favorable for the Computer Center, due to the negative attitude encountered when contacting them in problem situations. The Learning Center on the other hand did receive very positive comments in general for services it provides. In one case a separate IT support person was recruited for online course realization, although previously these things were done in collaboration with the Learning Center.

Several interviewees did have an opinion about the freedom virtual education provides. There was some sort of dispersion in the views though. Some of the interviewees clearly stated that contemporary tools provide a freedom of place and time, while according to others we gain only freedom of time or place, not both. If the course materials are kept simple enough, it seems that getting free of restrictions of both time and space are more likely. One interviewee on the other hand stated that one is not bound to schedule, it is possible to be flexible for real.

One interviewee, a language teacher, reported that the quality of learning during online courses is at the same level as it is while attending other types of courses, but in a different way, e.g. students gain skills which are both different and new. It was also noted that the use of WBT enhances the qualitative learning experience. Students' IT skills were seen as heterogeneous. During the last twenty years students' competence has changed when it comes to IT-, or language skills. Plagiarism was mentioned during the interviews, but it was skipped with a short comment about the nature of course works being such, that it is impossible to exercise plagiarism. Juridical problems concerning copyrights were experienced as difficult ones, and therefore all efforts are made for using one's own materials

[7] Oppimiskeskus (OPKE), URL: http://oppimiskeskus.tritonia.fi/

during courses. Course attendees, who are taking courses just in order to get access to course materials, were seen as a problem.

According to one interviewee, the beginning phase of every course is easy, but workload is extreme during examination weeks, and during the time of submitting course works. It was also noted, that the need for course administration is greater than in ordinary face-to-face teaching, which allows more room for improvisation. During a more traditional type of course it is possible that the course might change along the way, but concerning virtual courses, this is not possible.

Working routines have already been developed. The first version of an online course was very time consuming, but after that it is only necessary to update the course contents. The number of students taken on an online course is 20 persons. Workload is greatest before the course starts and in the end of the course. Observed attitudes from colleagues towards adopting WBT varied from feeling that this endeavor is indeed valued in interviewees home department, while it was also stated by one interviewee, that colleagues see no sense in this type of endeavor at all.

In a classroom the teacher is an authority, but while acting online, attitudes toward the teacher are no longer the same. The use of WBT has increased communication. The good thing here is the fact that material produced by students can be preserved and used later for teaching purposes. The reason for not being very willing to use WBT was principle of openness, and fluency. Both of these are values, which are available when using the Internet. One interviewee stated, that during one course discussion was very lame, and that it is not a very good idea to put everything on the web.

Extra work is required for producing materials (writing, scanning, etc.) for courses taking place online. As a benefit of using WBT, one interviewee reported that it would not have been possible to create as fine courses as he had done without the help of WebCT. Here the benefit comes from the uniformity of courses, so it appears that a well done ground work pays off in the long run. Benefits of WBT reported in the interviews were; the ease of managing larger user groups, freedom of time, flexibility, and better learning outcomes with reasonable costs.

Although there are courses provided by the University's Learning Center, that are directed for mastering tools needed for virtual education within the university, the content is quite often announced so that teachers can not get the real idea about the actual course content. This was seen as problematic, because there is really a need to gain comprehensive skills for mastering the tools in use.

It appears that versatile system usage of WBT requires flexibility from the system in use. This translates into a substantial selection of features to choose from, depending on one's taste and preferences, and a possibility for customizing working environment in question. In addition, another feature related to this is the need to be able to choose between tools that offer possibility for synchronous or asynchronous communication, thus offering a freedom of time or place — or both.

3.3.5 Web Based Course Tools' Influence on Individual Work

The fourth open ended theme was started with a question: "*Would you like to tell me how the use of WBT systems has influenced your work in the past and now?*" [8] Nearly one third of the interviewees reported that along with adoption of new technology, new tasks had also emerged. When asked about these tasks, the answers were as follows:

- There are more virtual contacts, i.e. students do not contact university personnel face-to-face as often as they used to, but instead use email. Apparently the threshold for taking contact has been lowered, which means that while the number of face-to-face contacts has decreased, the number of virtual contacts has increased.

- In the beginning all efforts put on virtual education were basically lonesome work, because others were not interested. At present, teaching methods and solutions developed back then have grown to be an interesting topic for others, and they are willing to hear about these experiences.

- A lot more time is being spent in front of a computer. In addition there have become more tasks on the Learning Center level.

- There has been a need to develop routines for work. Students require "presence", and while following essential discussion topics simultaneously on several discussion forums in order to stay updated, it is also necessary to asses the quality of students' work.

- There are efforts for increasing virtual education, because there is a need for those. In addition it was reported that these tasks include further development of course content and development in general.

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[8] "Kertoisitko miten verkko-opetusympäristön käyttö on vaikuttanut työhösi ennen ja nyt?"

When discussing about the focus and organization of one's work, the scope varied from focusing clearly on teaching to planning, coordination and content production, or simply on virtual education. It was stated that thanks to the WBT system it is possible to concentrate on the quality of content. Three out of four interviewees clearly stated that they do not work in collaboration with their colleagues on virtual courses, which means that virtual education is still lonesome work.

When discussing whether there are any changes on one's daily routines due to the WBT system, it was reported, that thanks to virtual education, it is possible to plan in advance how to use one's time, although this requires more thorough planning. It was reported that time is spend on routines (such as planning, preparing exercises, uploading and downloading files and on supervision on newsgroups). It was also stated that one is now far more dependent on technology than previously, but on the other hand it also offers certain benefits, such as the possibility of taking one's work along and working using a laptop. This possibility for distance work was not in everybody's favor, for example one interviewee stated that work is done at the workplace, although it was possible to work from home using a modem. On the other hand, the Internet was seen as such an essential part of one's work, that it was very difficult to be able to separate it.

When discussing whether there are emerging new ways of working due to the new technology, it was quite clearly stated that freedom of time is one evident change, although we are still dependent of place. A lot of time was required for educating oneself in order to cope with new technology; the concept used in interviews was lifelong learning. A lot more time is being spent in front of a computer, where all the time more and more teaching is moving online. On an individual level there has been a change from using traditional overheads during lectures to presentation graphics and transferring course materials online to electronic form to be distributed to students. This has put certain requirements for the course material production too; material has to be produced in advance, while covering large unities at one time. It was also stated that in general virtual education appears to be an uncoordinated endeavor. This observation appears to be in line with other interviews, because apparently in many cases the online courses were in practice more or less individual efforts and practices between departments did vary. Also new positions have been founded and new personnel have been recruited, who are providing support on new technologies (such as video meetings or implementation of online surveys). There are also comments which support the use of online materials, but there are those who are resisting this. Interviewed teachers listed the following benefits and disadvantages related to WBT systems as listed in Table 3.

Table 3. Benefits and Disadvantages of WBT System.

Benefits	**Disadvantages**
• Communication is fast and it offers good possibilities for co-operation. The tool is very personal. • Freedom of place. • Communication with students has moved to the Internet, while volume has grown. Electronic tools make managing this process easier. • There is no paper waste, because everything is done using electronic files. • Course schedules are made by students. • Professional development on individual level has taken place due to WBT. • Systematic approach is required. • It is necessary to pay attention to students. • Social community as benefit • The ease of searching for information. • Producing exercises is not as time consuming as it used to be. • Working infrastructure (e.g. tools) provided by organization.	• When using WBT it is always necessary to book time for rehearsing actual use. • One should be able to use WBT continuously in order to maintain basic skill level. • In the beginning, user is very much occupied with WBT. • Occasional hardware updates are necessary. • No freedom of time.

According to interviewees, the main focus in using WBT varied from just using technology to suit one's personal interests to achieving flexibility in scheduling, or utilizing technology to improve communication. The role of pedagogy in the use of WBT was emphasized by one out of four of the interviewees, while half of the interviewees did refer to it either directly or indirectly as being a notable factor, but not the most important one. Pedagogy was not seen as playing that important role at all by one of four of the interviewees.

When asked whether the efforts put on virtual education are compensated in wage, most of the interviewees did see that they are compensated, while one out of four interviewees did state otherwise. Reasons for this appears to be the allocation of annual working hours (e.g. 1600 hours), which can in most cases be calculated so that there is room for teaching experiments or similar efforts, but whether this option is used — and to what extend — appears to vary between departments.

Over three out of four interviewees reported that they are using WBT as a closed virtual environment, e.g. access to course area (and to materials) is allowed only for course attendees. There were very few among interviewees who did not use these tools this way. The Majority of interviewees did also report that they do not share their materials with others, while there were few exceptions. There were only a few interviewees who clearly reported that they don't have any intentions of restricting access to their materials in any way.

When interviewees were asked about the variety of teaching methods used during their courses, answers were quite consistent. Nearly all reported using several different methods, usually depending on the course they are teaching. Most of the interviewees did teach also more "traditional" courses including lecturing and exercises, thus forcing them to adapt their pedagogical approach to courses they host. Just one quarter of the interviewees reported having noticed the heterogeneity of students, when it comes to computer literacy. Comments on observed skill level of students varied. Computer literacy was seen as being quite high among students of computer science, while in other disciplines there was noticeable variety between students' skills.

Interviewees reported that students' attitudes towards virtual education varied, from being mostly satisfied to being reluctant. Although students quite often seem to experience that the course requires hard work, in most cases they still seem to be satisfied. It was also noted, that the most difficult ones to motivate are the youngest students. Copyrights were seen as a problem of significance by most interviewees. Immaterial rights are a question that requires everyone to take a stand. It is not only a problem concerning teachers' right to products of their minds but it is also a question related to the Internet plagiarism, and as such a problem creeping into educational institutions. For most of the interviewees pedagogical approach does play a role when making decisions about technologies to be used. Teaching materials belong to teachers, and there are about to come models of written agreements concerning copyrights, but teachers are free to choose whether to use these or not.

A general note concerning the present situation was that the driving force should not be technology, e.g. there appears to be a noticeable concern for technological determinism. Also the Internet plagiarism was seen as a problem, but it is possible to offer a remedy for this. Exercises should be designed so that plagiarism simply does not pay off. It was also noted that on a personal level the control over personal time management has become more important. Teachers' work is lonesome and therefore making of a virtual course can easily become far too hard. Therefore the core analysis of a course while planning it is important.

There is virtually "much a do about nothing" when it comes down to virtual education. The attitudes toward virtual education vary a lot. Also the use of teachers who don't work continually in the university was seen as a problem, because they do not have the time to develop courses further, like the teachers who have a permanent position can.

3.3.6 Changes Caused by Web Based Course Tools

The fifth open ended theme in the interview covered perceived changes caused by the use of web based course tools. This topic was started with a question: "*Would you like to tell me what kinds of other changes caused by the use of web based course tools have you noticed?*"[9] Perceived changes in IT literacy according to interviewees seemed to be favorable for both teachers and students alike. It was reported that teachers' IT skills had indeed improved, and it was even stated that nearly all teachers have at least some kind of online version of their courses. On the other hand, it was reported that students' IT skills had also improved when comparing it with the situation in the past. One interviewee even stated that *"..it feels so, that students should get familiar with the WebCT already during their first year at the University.."*[10] . In general, it seems that IT literacy has improved since the adoption of WBT tools, and it also seems that it is hoped that skills for this type of tools should be gained already in a very early phase, when beginning one's studies at university.

When discussing about perceived changes on a personal level, it was perceived, that working with virtual education is very lonesome work. Building social networks with other teachers, who are working on virtual education, does not seem to take place. It was also noted, that only certain individuals are really putting effort on this type of endeavor, namely the ones who are really inspired or who are willing to experiment. On the other hand, it was stated, that people are doing different things, and this creates openings for new possibilities. It was also stated that teachers in general are still considering virtual education a bit odd, e.g. after all there are not that many who are really involved.

Questions concerning copyrights were seen by most interviewees as difficult. Mostly this question was related to course materials, or materials produced during the course. There appears to be two approaches to this problem. Either it is seen as a difficult problem which needs further attention, at least sometimes in near future, or there is no problem at all. The latter approach means that the only materials used are the ones, which are produced by the teacher or the teacher and the course attendees together. In this case there is no copyright problem because copyrights are automatically issued to the ones who have produced the materials. When asked whether interviewees are producing materials for their courses themselves, a great majority, over three out of four reported that this indeed is what

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9 "Kertoisitko millaisia muita verkko-opetusympäristöstä aiheutuneita muutoksia olet havainnut?"

10 "Tuntuu että opiskelijoiden pitäisi jo ensimmäisellä vuosikurssilla tutustua WebCT:hen" (female, 31 years).

they do. The rest reported using their own materials and sometimes also materials or works made by students.

When discussing about perceived changes on a department level, it appears the perceived approaches can be divided into four different types of approaches on virtual education. These types are as follows: a) There are no noticeable changes, although the workload might be taken into account; b) "Laissez faire", e.g. there are no noticeable changes and efforts put on virtual education are very lonesome work; c) There are discussions taking place about practical issues and experiences concerning virtual education; d) There are virtual courses, and the policy is to develop and expand supply. Personnel are also encouraged to educate themselves on WBT systems. At faculty level the approaches could be categorized in three types, which are: a) there is no strategy nor policy, b) "Laissez faire" type of approach, where there are persons who have used WBT, and will use, but they are working by themselves and c) personnel is encouraged to take WBT into use.

Interviewees' comments on perceived changes at university level could be divided into three categories, which were: a) Management does not get involved; b) There are not that many involved, but the topic is under discussion; c) Management wants to get personnel involved and there are considerable efforts put on this. In general, interviewees had varying perceptions about the policy of university administration. It was stated that in reality, virtual education is a work of pioneers. It was also stated by some interviewees that the attitude at their department towards the endeavor in virtual education was positive. There were opposing views on this too, it was stated that there is a lot of "pseudo usage", e.g. much more talking than there actually is happening.

It was also noted that the amount of education provided online is increasing all the time. It was stated that there haves been considerable investments on virtual education and on collaborative arrangements. For example, teachers have been attending national training on ICT-technology in education (e.g. OPE.FI 1-2 training). It was also noted that there are many ways to use WBT systems. One interviewee noted, that in the past Finland was usually 5-10 years after Sweden in development, but this is not the case anymore. For example Virtual University in Finland was founded a year and three months before similar organization saw daylight in Sweden.

There are obvious differences in the utilization of ICT in the organization. For example, one interviewee explicitly stated that in their case there is no collaboration in virtual education, although they do have collaboration in research, while there were others who themselves had collaborative arrangements in education. Virtual education has been going on a low profile, and made people think about

different teaching methods. The importance of marketing virtual courses was expressed in the interviews, along with the necessity of staying up to date with new advances in virtual education and online materials. It was also brought up once again, that work can make the social relation between teachers and students more distant when using WBT.

The role of the University's administration concerning virtual education, as expressed in many interviews, was very committed and encouraging. The role of the rector was seen as committed to this, and it was seen as beneficial that he was also at that time working as a chair for Finnish Virtual University. The influence of the University's administration on virtual education was seen as consoling and encouraging. This was shown at practical level as possibilities for getting funding for projects and co-operating, improved facilities and resources on campus and as general atmosphere which encourages the use of virtual education. One interviewee did state a comment, which has later turned out to be very far sighted. According to him, "*…university had adopted technology it simply can not afford*"[11]. This comment was related to license policy of WebCT, which apparently had begun to turn out to be far too expensive.

When discussing about actors who are involved in virtual education at University level, most interviewees mentioned Learning Center right away. It was noted that there are not that many actors involved at that level though. Also the Computer Center was mentioned, but it appeared that the distribution of work between Learning Center and Computer Center was in some ways unclear. Nevertheless, Learning Center was seen as an active and valuable actor in this operational environment.

Some interviewees stated that virtual education is causing extra work; there has already been a well-established teaching practice at the university. The idea has not spread to a wider audience, but it is an option which is available for those willing to use it. On the other hand, it was also reported, that activity on virtual education has indeed become a lot more common practice. It was also stated that at the university, people are used to working on their own, as individuals.

It was also noted that along with the introduction of virtual education there has been a need for new positions, such as educational technologist, or planning officer for virtual courses, etc. The introduction of virtual education has improved the skills of teachers, although because of the bottlenecks of technology, one has to always have a backup plan. In the past it was necessary to seek help and guid-

[11] "…omaksuttu teknologia johon ei jatkossa varaa" (male, 41 years).

ance from others, but now the situation has improved so that others are coming here to learn. It was also reported that the significance of time and place is becoming a more flexible concept. This freedom is influencing the way people work. For example, a course arranged in collaboration with others was strictly dependent on both time and place.

It was reported that there are many projects going on, which are related to virtual education. It was noted that during the time when The Tritonia Academic Library was founded, necessary arrangements required for working in collaboration with other university units were done, and done well. Several interviewees reported that they are already involved, or are planning some kind of collaboration with other colleagues or parties. The expansion of the JOO-agreement[12] was seen as a factor which might affect the provision of virtual courses and possibly become a factor for competitive advantage in the future, because presumably there is going to be competition on the market over potential students.

During the interviews several things did emerge. It was noted that "virtual stuff" can be used as an excuse for collaboration, so that it is used only as a stalking horse instead of doing something actually useful. The distribution of work between the Learning Center and the Computer Center was seen as vaguely organized. In order to be able to overcome compatibility problems, it is necessary to discuss what technologies are in use. Virtual education has caused changes in job descriptions, for example study advisors work has changed due to new technology. The ones who once started to use WBT are still using it.

As a general note it was stated that virtual education has become very common at national level, e.g. there are a lot of courses available by several different actors (such as universities and polytechnics). It was also noted that several units which are focusing on developing education have launched in several places in Finland. Although there are several projects, it seems that these are not very coordinated, e.g. there are many separate projects. For example, in the case of the university network for communication sciences[13], the copyright issues were thoroughly discussed when planning the university network for communication sciences and after that the materials were put on the web. In addition, courses were made based on those materials (which are common to attending departments). On possibilities for funding, it was commented that it is not easy to finance projects on virtual

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12 "Joustava Opinto-Oikeus", URL: http://www.joopas.fi/index.php?node=Joopas_aloitussivu (29.10.2006). (An agreement, according to which a student can take defined courses from other national universities within the agreement).

13 Viestintätieteiden verkostoyliopisto, URL: http://www.uta.fi/viesverk/index.html (visited 29.10.2006).

education. Possible channels for getting funding were the Learning Center, the University (money for developing virtual education, originally funded by the Ministry of Education), EU projects or funding for endeavors for the Virtual University by the University.

It was noted that information concerning virtual education is available. It is just a question of one's interests whether or not to use it. Another issue of interest was that it is very possible that distance education will become more common in the future because of the two stage degree structure, which is due to the Bologna process. From the technical side the administration of WebCT user accounts was seen as a problem, because there are several different systems in use, and all require different passwords (Unix, WebCT, KILMO, HESSU). As a summary, virtual education has caused a lot of changes. More importantly, it appears that changes are taking place whether or not one is actively taking part of the process.

3.3.7 The Future

The sixth open ended theme in the interview covered expectations and plans for the future the interviewees had on virtual education in general. This topic was started with a question: *"Would you like to tell me what is happening in web based education in the near future at your work place?"*[14], and later when interview had evolved another question was stated: "*What expectations do you have for the development during the next 2-5 years?*"[15].

Near Future Insights on Virtual Education

Interviewees' endeavors concerning virtual education in the near future appeared to be an issue where polarization did take place. One out of four clearly stated that nothing new is going to happen, while over half of the interviewees had something going on in the near future, whether further development of courses or strategies, or larger scale projects, such as the wireless campus network or formation of organizational networks.

On a more concrete level, the near future outcomes described can be divided into four categories, which were: a) maintenance of one's own virtual courses and starting new ones; b) further development; c) collaboration with other organiza-

[14] "Kertoisitko mitä on tapahtumassa aivan lähitulevaisuudessa työpaikallasi verkko-opetuksen suhteen?"

[15] "Mitä toiveita sinulla on kehityksen suunnasta seuraavien 2-5 vuoden ajalle?"

tions; and d) knowledge (or know-how) dissemination. Most of the reported actions belong to the first category. There were several cases where new courses were about to take place in the near future. There were several projects also in the second category, mostly these were either concentrated on building ICT tools for teachers (for example online questionnaires for collecting feedback), or organizing supportive functions (such as EDUklinikka[16]). There was only one reported project which was about organizing collaboration with another organization (in this case another university unit). There were several projects which belong to the last category. These were mainly concentrated on providing training to teachers on ICT and WBT or about working as a tutor for teachers developing their own competence further in this area.

Several interviewees were engaged in adopting new technologies into their arsenal. These technologies covered video conferencing (Marratek), which was mentioned by quite many interviewees and multimedia streaming. Even tools directly designed for developing online courses were mentioned, such as Verkkovelho[17]. Other new technologies interviewees were working with were covered by more personal types of courses and support (such as Eduklinikka). Also new tools directed for researchers were mentioned. On a more general level interviewees were interested in services provided by the Finnish Virtual University. General note was also that the use of WebCT will be continued.

Concern over the future of the Learning Center was expressed, because it was a project under the open virtual university, and during the time of the interviews, the future of the Finnish Virtual University was still open. Obviously there was a need for a support function and tutoring on educational technology as well as on pedagogical issues.

When discussing about the development of one's own work, the interviewees reported that they are concentrating on developing one's own teaching, or online courses, or that they are about to continue in a similar manner as they have done so far. The development in these cases covered either course development and analysis or analysis of already existing campus-based courses in order to see whether these can be converted into virtual courses.

When discussing about the changes in work, the interviewees commented that the nature of the work has changed into a tutoring type of work. A concern about how these new tasks can be included into personal working plans was expressed. In-

[16] URL: http://oppimiskeskus.tritonia.fi/index.php?lang=fin&site=verkkoopetus (1.11.2006).
[17] URL: http://www.virtuaaliyliopisto.fi/velho/index.htm (1.11.2006).

terviewees reported that there were few other teachers attending national training on the use of ICT in education (TieVie[18]). It was also noted that people have a choice, the use of virtual education is not obligatory. There has risen interest among teachers on developing their courses increasingly to be more online-like. One teacher even had a collaborative arrangement with another university within a common study programme.

According to the interviewees, there were no big changes coming at the departments. Open University was providing a programme on marketing (15 cu) as an online course. It was noted that the main goal at the Open University is to move all marketing courses online. It was noted that a signal received from people around was that the development on behalf of the Learning Center is positive development. The importance of building networks in the Vaasa region was also expressed. A Department of Communication Sciences was involved in planning courses for university network for communication sciences. For the future, it was noted that many teachers are themselves planning virtual courses and that it is often a work which is done alone. One out of three interviewees told that there are new virtual courses to come.

It was expressed in the interviews that the practices concerning virtual education have already been established in such a manner, that this option is available but not obligatory. It also seems that there is a genuine interest in this type of endeavors, but depending on department or faculty level ICT strategy, actual outcomes do vary. It was noted that there already is an ICT strategy for both national and university level. According to interviewees the approach appears to favor attempts to use new technologies in everything possible (at national level). It was also clearly stated that not all courses are suitable to be moved online and this is to be learned by trial and error. New materials are being converted into online format using pedagogical insight, but this was seen as a question of resources. It was also noted that when working on this, different working methods as well as software tools, are required. Wireless technology was also mentioned as a highlight.

According to the interviewees, there are already many teachers who have been trained in using WBT, and they are willing to continue on this path. The approach on investing on IT infrastructure appeared to vary from practically nothing to remarkable investments. It was noted that computer networks are here to stay. Another interesting comment was that technology can be seen as a hindering fac-

[18] URL: http://tievie.oulu.fi/ (2.11.2006).

tor, where the problem is to create fast enough systems, so that they would satisfy users.

On a technical side, it was noted that there is a need for something faster than JavaScript. It was also noted that the situation does not look good for WebCT. Interviewees noted that all this requires resources, nothing happens by itself. A little bit better software and integration, for example with a course enrollment system, would make things a lot easier. It was also commented, that videoconference tools are used as a substitute for face-to-face presence in distance education.

Expectations Towards the Development of Virtual Education

When discussing about expectations for the future on virtual education, the interviewees brought up the following ideas. One should take students into account in a better way in the future. Teaching in this context and compensation should be included into yearly working hours (kokonaistyöaika). The need for including this type of activities into permanent practice was also expressed. Only one out of six interviewees clearly stated that they have concrete future plans for collaboration. These covered collaboration with Vaasa Hospital District on training doctors and dentists, participating in the university network for communication sciences and co-operation with the Learning Center.

A question concerning regional policy was stated by one interviewee, when questioning support (or lack of it) for materials produced in foreign languages. The way the quality control for provided education was organized was also a concern for some. It was noted, that there should be quality control on student evaluation, because this is done only once by the teacher.

When discussing hopes for the development during the next 2-5 years, interviewees presented the following ideas: one could here utilize teachers who are coming from elsewhere, the virtual university should become closer to the unit actually providing education, the courses should be permanent in order to be able to offer continuity, and it was also stated that because virtual education is just one teaching method among others, it should be used when suitable. Some interviewees also wanted to get more involved in the virtual education.

Several interviewees emphasized the importance of more conventional means of education. For example, it was stated that one should not forget traditional books. But when books can not offer something – only then it is time to think about something different. Some even went so far that they thought that when talking about online teaching, one should forget the word online all together. On the other

hand, one interviewee clearly stated that the best teaching method is simply interaction between students and teacher, which takes place in small groups. The stability of new educational program structure was also a concern for some.

Interviewees also listed some problems related to this field. Problems related to copyright problems were seen as very difficult problems to be faced in near future. Pedagogical models concerning virtual education were seen as a little bit too complicated. There were also perceived technical problems, which had caused troubles for students, basically these were problems related to the usability of the WBT system. One interviewee stated her concern over the rapid development in this era, which is problematic if one is absent from work for a longer period of time. Another real problem, which was emphasized, was the endangerment of knowledge dissemination due to specialization.

It was hoped that the practice concerning the allocation of yearly total working hours (kokonaistyöaika) would become clearer, because this was seen as an important factor when it comes to motivating teaching personnel. One interviewee commented that her superior had claimed that online courses are more expensive than more conventional ones, but she stated that actually it is the other way around, because there are more exercise groups in more conventional education. Another interviewee stated that there is a slight difference between costs, which is in favor for virtual education.

Goals expressed by interviewees were primarily related to making the role of virtual education more common. It was stated that basic skills should be provided to as many students and teachers as possible and that the Learning Center should get closer to faculties and departments. Another important factor was the pedagogical quality of virtual courses. It was stated that it will not automatically mean that a course is well designed in a pedagogical sense, if it is provided online. It was seen as very important to make already existing courses functional. Also the necessity for forming networks and collaboration was expressed, primarily because of economical reasons. Among expressed goals was also an ambition for forming a research like environment at student level.

Means for reaching these goals were quite simple. It was hoped that all these new experiments should not be left only as such, undocumented experiments. The exchange of ideas and experiences was seen as an important factor. The cooperation with the University's Library and between departments should be developed further. There is special know-how available, and it should be taken into use. The role of the Learning Center was mentioned also in this context. It was hoped that it should become a permanent part of campus. Possibility for specialization should be available for people. It was also emphasized that common sense

should be used when putting material and courses online; it simply does not fit every situation. Teacher training was also commented, teachers should gain pedagogical training in order to get the idea about students' role in the virtual environment. In some department even the layout for courses was made coherent. According to the interviewees, a real challenge is to get those along who do not have any idea about virtual education. Another critical factor is how permanent a phenomenon virtual education is (e.g., IT and economical questions).

Some suggestions for improving present technology were made during the interviews. WebCT as such appeared to be quite a satisfactory system on a general level for many users. Suggestions for improvements for infrastructure were made though. Interviewees hoped also that there would be other tools than just WebCT. Technology was seen as being at a good level already; the real need was more on marketing and training this technology to teachers. Technology was seen as a tool helping teachers in their work, to put it simply: technology as helper, not as the tool. The usability issues on WebCT were quite harshly criticized as was the compatibility of different systems and organizations.

Pedagogical issues were given high importance by interviewees. Pedagogical development (e.g. teachers skills) and course contents were seen as an issue which needs attention. The question about improving personnel's IT skills was seen as a question of attitudes. It was also noted that there are several different levels of virtual education. In general, it was seen that in the future all the time more tasks are done using computer networks. One suggested practical solution for making workload under virtual courses more bearable was the use of course assistants.

It was seen as a benifit for students if they could take even one virtual course during their studies. It was also noted that students do not always have the courage to report about technical problems they may face. Distance education provides changes and possibilities for students. It also appears that infrastructure is already at such a stage, that students have good possibilities for attending virtual courses. Teachers should specialize on what they do well, only those who are really interested in virtual education should be doing that.

Concerning available resources the interviewees commented about the Learning Center. Many saw that there is a need for making the Learning Center permanent. It was reported that it will become a part of The Tritonia Academic Library, which later did take place. There was also obvious need for further funding, because the facilities are already inadequate.

Interviewees commented the WBT system as follows. According to them the use has increased steadily, not dramatically. Best use appears to be for sharing routine

type of information. The motivation of students was noted here as a problem, a question posed was: how to motivate students to study eagerly. Some interviewees were also ready to try some other WBT system apart from WebCT. One interviewee assumed that problems related to WebCT are mostly due to person changes in the organization, e.g. valuable knowledge is lost every time this happens.

The content should be in focus. Technology hype has been a problem. On the other hand it was seen as very rewarding to teach virtual courses. Virtual courses require an experienced teacher; there should be both substance and pedagogical insight. Support should be secured so that it is not possible to buy it away. It should be spread and prioritized. Virtual education should be seen as a natural part of education, not as a separate thing. It is a good idea to remember common sense with virtual education.

Collaboration was seen as a reasonable approach because of economic questions. Some interviewees have had collaboration with other university units when becoming familiar with for what – and how WBT has been used on different courses. It was also reported that new types of feedback are given about ones work. The quality of students' learning experience was also emphasized. It was stated that virtual education should not be an issue just because there is new technology available. The reason why training provided by the Learning Center was inaccessible was overlapping time schedules.

In the end of the interview interviewees were asked how many other persons they knew, who were also involved in developing or hosting virtual courses. It was quite surprising, that interviewees did not always know about each other. This refers to the fact that teachers' work is indeed very lonesome work, although support is often sought through social networks. A well founded question to be presented here is: why don't these persons know each other, although they have similar interests?

3.3.8 Summary of Results

This study focuses on studying what kinds of impacts implementation of new ICT has on teachers' work and changes it mediates upon implementation in an educational organization. As a conclusion to the empirical part of this study, the main results are summarized and discussed. Other emerging issues and findings are also discussed in this sub section. The defining research problem of this study was: "Under what circumstances is the adoption of ICT successful (in higher education) and what impact does it have on individual work and organization?"

Based on the interviews, it appears that there are several prerequisites which are influencing the adoption of new ICT into use. At a personal level a conscious choice to use IT in education, better than average IT skills and familiarity with the Internet applications are favorable conditions for adoption of new ICT based technologies. Interviews suggest that there are some indications of the significance of previous encounters and experiences with new technology. On an organizational level it appears that functioning IT infrastructure is crucial along with organized IT support. Results indicate that on a general level WBT is a natural extension for those who are already using IT in education (whether it is the use of presentation graphics during lectures, the Internet resources or the use of personal email for interaction with students) as long as it is technically possible.

Based on the interviews, it appears that the WBT system is best used as an information channel, or as a medium for delivering course materials or exercises. Interviewees presented many other uses for the WBT system, but these mentioned ones were apparently the most important ones. The most popular feature among interviewees was the possibility for automated submission of assignments to a system, which in turn would keep record of deadlines as well as of returned works. Second highest ranking was given to possibility for online discussion and third on ranking was the possibility for administering and monitoring users during the course.

When dividing teachers' work into subtasks, and using these for analyzing the tools used in WBT it can be clearly seen, that most tools used are supporting communicative and administrative functions. Many other types of functions are also used, but obviously these appear to be tasks, which are seen as important ones. In general, the utilized functions were concentrated on the following tasks of teachers work: Communication (Discussion tool, Internal email, Videoconferences, Chat, Informing students and Telephone meetings (provided by OPKE)), Collaboration (Collaborative tools for group work), Management and administration (Assignment tool for returning assignments, Administering and monitoring users, Giving feedback to students (evaluation), Calendar/time schedule, Managing documents, Collecting feed-back), Tasks (Internet resources, Interactive features, Tests, Internal FAQ, Surveys), and Material production (Producing materials, Producing documents).

Most of the features or tasks were concentrated on managing and administering courses and on communicative features. Collaborative, pure maintenance, or resource centered functions were mentioned, but not so often. It appears that for the most part the focus in providing online education is on communicative functions, and not so much on pre-made materials, nor exercises. Interviews showed that

nearly all forms of digital media were covered (video, sound, pictures, animations, web pages, documents and pure text) in online education. Although WBT is very versatile in features, other supporting tools were used to support individual work. Here two examples were mentioned; concept maps and email lists, where the latter was taken into use for replacing technology that did not work. These results suggest that WBT does offer a very comprehensive toolbox for distance, as well as for multiform education. It also indicates that depending on the task in hand or user habits, other supportive ICT tools can be used in collaboration with WBT.

The teacher's role in a virtual context appears to have changed from traditional authority to be more like a tutor. Based on the findings of this study, this seems to apply in most cases. Problems concerning technology were surprisingly few, although both students and teachers had encountered some minor problems with technology. Copyright related problems were addressed during the interviews, as was the workload. In many cases the material production is done in collaboration in a closed virtual environment with participating students. This is shared expertise in action, as one interviewee stated. It was also stated that WBT is a tool for sharing knowledge, and that it also offers freedom of time for students who could not otherwise attend classes. Interestingly enough personal contacts can be very important when trying out new technology, namely in one case where a lot of collaboration was done with other teachers, it was stated that experimenting on these new systems had been based on personal contacts.

When analyzing interviews of this study, the way how women had made decision to adapt new technology seemed to be decision, which was made after very thorough thinking. The fact was that all women did have pedagogical studies behind them, and they were in many ways interested in improving their working and teaching methods. Such a simple and clear motive behind men's decision in taking new technology into use was not that clear but it implies that most significant factor is more concrete solution for a technical problem. Difference between men and women could be expressed in a form of question. Women could ask: "*What good for my work process could follow from using this technology?*" while men could ask: "*How do I resolve this problem using technology at hand?*" Although there do not seem to be major differences in a way how men and women actually use technology, there seems to be clear distinction in approaches toward technology. For women the exploitation of highly developed interactive communication seemed to be the most important factor, while men seemed to be oriented to more technical details.

Interviews showed that WBT is flexible and can be used to support many different types of approaches towards teaching. As a flexible technology, WBT can be used in many ways, thus offering either marginal support for traditional education or full toolbox for virtual education, or something in between. In general, interviews showed that people adapt and use the same technology in different ways.

Interviewees reported that on personal level there are now more virtual contacts, i.e., students do not contact university personnel face-to-face as often as they used to do, but instead use email. In the beginning all efforts put on virtual education were very lonesome work, but these days teaching methods and solutions developed back then have grown to be an interesting topic for others. It was also reported that when compared to past, a lot more time is being spent in front of a computer. Due to technological changes, there has been a need for developing working routines for everyday work. It was also reported that at present, there are efforts for increasing virtual education, which is seen as an important factor.

Concerning issues reported by interviewees were questions related to immaterial questions, especially copyright and plagiarism. It appears that for those who see copyright issues as a threatening problem, the choice of used technology in virtual education is not that easy. In the case of copyrights, the choice is done between open or closed WBT system. When regulations and practices become clearer, this issue is probably no longer that crucial. Concern of the Internet plagiarism was also issued. Present technology has made it possible for students to easily exercise plagiarism, which in turn forces teachers to re-evaluate the way how to design exercises and course works. Technological determinism was also seen as concerning matter along with hype around virtual education. It was also reported that the roles between the University's Computer Center and Learning Center were not at all as clear when it comes to WBT support, and on technical issues related to virtual education.

It was reported that computer literacy has improved among teachers as well as among students. Also the role of the university administration had become more visible on issues on virtual education. University's general policy and IT strategy clearly include virtual education among areas which are given high priority. Highly visible example of this is the Learning Center project, which was seen as a very important motor for promoting virtual education in the area. It was also reported that there are several projects going on, which are related to virtual education.

It was noted that funding for projects on virtual education is possible to get, but not that easy. This is to say, that the option is available for those willing to utilize it. The same thing applies to information concerning virtual education. Informa-

tion is available, but it is a question of one's personal interests whether or not to use it.

As a concluding remark for empirical part it can be stated that the circumstances enabling the most efficient adoption of ICT can be traced to take place on two levels; personal and organizational. On personal level a conscious choice to use IT, better than average IT skills and familiarity with the Internet applications and make a good foundation for successful adoption of ICT. Also favorable previous encounters and experiences with new technology have some significance. On organizational level it appears that working IT infrastructure is crucial along with organized IT support. Impacts of ICT on personal level concentrated on communication, where contacts are increasingly taking virtual form and increasing amount of time is being spent in front of the computer. It also appears that in the beginning efforts put on virtual education are very lonesome work. Endeavors of this type require development of personal work routines for managing everyday work and emphasis on immaterial issues was reported. On organizational level the role of university's administration has become more visible on virtual education and both university's general policy and IT strategy clearly include virtual education among areas which are given high priority. There are also going on several projects which are related to virtual education and there is funding and information available about virtual education for those willing to utilize it. Because of the virtual education, the situation between certain organizational units had become a little bit confused because it was hoped that the roles need to be clearer.

3.4 Adoption of WBT System

Based on the empirical findings, a tentative model on certain factors related to successful adoption of new ICT system in higher education context can be outlined. Upon deeper analysis, certain concepts (later defined as constructs forming the theory) started to emerge from written interview notes. Constructs forming the tentative model were derived from interview data following the suggested logic for open coding (Strauss & Corbin 1998).

Empirical codes used in open coding were based on expressions found in text, usually several words long. First interesting expressions were coded, and recorded. Next codes from interviews were compared for similarity, in order to group these and to form categories. In some cases it was necessary to break categories hierarchically into additional sub categories, while in other cases it was necessary to merge categories together. Followed logic here applies the approach commonly used in open coding (Strauss & Corbin 1998).

Strauss & Corbin's (1998) paradigm recommends axial coding once a phenomenon (category) is identified and further explanation is desired. Similarly with the study by Volkoff et al. (2007), also here recommendations for open and axial coding by Strauss & Corbin (1998) were noticed, but were merely treated as a method through which to discover the relationships in the data, rather than as a restrictive set of rules.

In axial coding the relations between constructs were recognized. When an idea for a relation between constructs was recognized, it was very easy to see if there were empirical codes that would (or would not) support it. Relations were formed and analyzed for empirical support in a similar rigor as the constructs for theoretical model. In this study, the selective coding was not necessary stage, because the main category, WBT system adoption, was already known when entering the field.

For the suggested tentative model eight main constructs were recognized in this analysis process; *Freedom, ICT Experience, Perceived Usefulness, Intention to Use, Resources, Pedagogical Insight, Immaterial Issues* and *Versatile System Use*. Categories, sub categories and empirical code examples for these eight constructs are presented in section 3.4.1, and in details from Appendices 3 to 10. Relationships between these concepts were also recognized, and empirical codes for these eleven relations are presented in section 3.4.2, and in detail in Appendix 11.

The logic for drawing conclusions, starting from data all the way to abstract theoretical model, is presented in sections 3.4.1-3.4.2 in such a way that it is easy to follow. In addition to this, tentative theoretical framework is also validated using one case as a concrete example (interviewee #16), while other cases remain as implicit. For two cases the interpretation differs a little. This is presented in section 3.4.3.

Model in Figure 6 combines presented factors related to successful ICT adoption in higher education into one theoretical framework. Concepts in the model are presented in ellipses and relations are represented using black arrows. Here predeterminants for willingness for Intention to Use system are individual's Freedom (e.g. freedom to decide and make a choice), Resources, Pedagogical Insight and Perceived Usefulness of used technology. Perceived Usefulness is influenced also by ICT Experience and Pedagogical Insight. Versatile System Use is followed by Intention to Use, and is influenced by Resources, Immaterial Issues and Pedagogical Insight. In all cases previous experience did appear to have effect on decision, but this was not expressed clearly in some cases. It does have influence on decision and thus it is included in the framework.

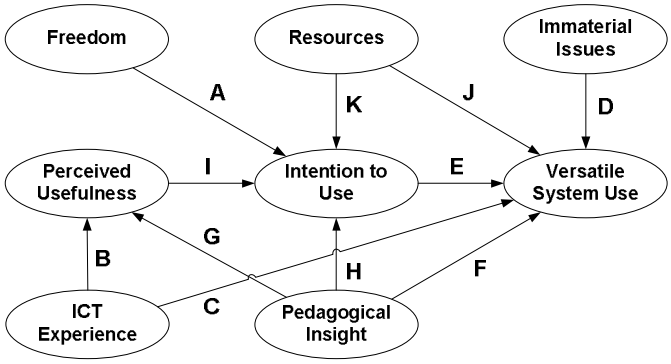

Figure 6. WBT Adoption Model for Higher Education.

When a person is willing to use system in educational context and uses it in a rich and versatile manner, it was presented in data-analysis as versatile system usage. Versatile system usage and perceived usefulness (as well as intention to continue the use) are affected by the diversity of teaching methods. This is quite natural, because a teacher who is skilled can choose from many options how to carry out actual teaching, and here WBT is just one option. This factor appears to have significance, but not that clearly. Actual use is also affected by another factor, namely immaterial issues. Immaterial issues refer to immaterial property rights (IPR) and this has significant influence on the versatility of system usage, because depending on users' view on this, choices on features used (and features left unused) are made.

3.4.1 Constructs in WBT Adoption

As an example how these constructs were derived from empirical data, first construct and its subcategories are presented. For following seven constructs, only constructs and subcategories are presented. Goal is to make the text easier to read. For the suggested tentative model eight main constructs were recognized; *Freedom, ICT Experience, Perceived Usefulness, Intention to Use, Resources, Pedagogical Insight, Immaterial Issues* and *Versatile System Use*.

Freedom

When interviewees were asked about initiation for the decision to take new technology into use, all except one person replied that the decision was eventually based on their own initiation. Only one person (interviewee 14) had involuntarily been ordered to start a pilot by superior. In this case the pilot was not that successful, nor the decision eventually based on one's own initiation. In this case there is neither follow up nor any desire to continue the use of WBT at all. This

suggests that the individual freedom in decision making has significance on IT adoption, and on continued or discontinued use.

In coding process empirical codes around this concept started to cumulate. It appears that the freedom a person has is limited by organizational or social rules or conventions. A common nominator appears to be rational choice, which is bounded by different rules and conventions. This category was named as *Bounded rationality*.

> *General education policy brings pressure on using virtual education, and results are a) "enthusiasm" and b) "fear"*[19] *-- Was asked by the department to make a pilot course … N.N was assigned for the task*[20] *-- I am not very interested about this topic, but I did the work because I was ordered to do so*[21] *-- One can not influence environment that much*[22]

In coding and analysis of empirical codes related to this concept, another common nominator emerged. It appears that it is a very common perception to think that individuals who are dealing with virtual education are pioneers, or persons who are independent, maybe even elite interest group. This category was named as *Individualism.*

> *There is no enthusiasm for it, but everyone can do it him/herself*[23] *-- Lonely work … one can do it, if one wants to do so*[24] *-- Lonesome work*[25] *-- No collaborative efforts … uncoordinated*[26] *-- N.N., N.N. and N.N. … not so many others are using WebCT … teachers shun virtual education*[27]

It appears that an opportunity for making a difference is important. Characteristic for an opportunity is an emerging possibility that is taken advantage not because one is forced to, but because one wants to do so. It represents an opportunity for making a difference. This category was named as *Opportunity*.

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19 "Yleinen koulutuspolitiikka "painostaa" V-O:n käyttöön, seuraus a) "innostus" ja b) "pelko" (Interviewee 07)

20 "Pyydettiin laitokselta joku tekemään pilottikurssi – N.N. määrättiin" (Interviewee 14)

21 "Ei ole itse kauhean innostunut aiheesta mutta teki työn koska määräys laitokselta" (Interviewee 14)

22 "ei pysty itse niin paljoa vaikuttamaan ympäristöön" (Interviewee 17)

23 "ei innostusta, mutta voi jokainen tehdä itsekseen" (Interviewee 14)

24 "Yksinäisen suden työtä … saa tehdä jos haluaa" (Interviewee 14)

25 "Yksinäistä työtä" (Interviewee 18)

26 "ei yhteisiä hankkeita .. koordinoimatonta" (Interviewee 18)

27 "NN., N.N., N.N. … ei hirveän moni muu käytä WebCT:tä … opettajakunta vierastaa virtuaaliopetusta" (Interviewee 20)

> *One can use it, but it is not required*[28] *-- There were no stress for making a course, despite previous course*[29]

All these categories had a common theme; all three were related to individual's freedom. These three categories were then grouped as sub categories under construct named *Freedom*. In a tentative framework this represents individual's freedom to decide and make a choice on adopting a chosen technology. Construct Freedom is based on these three subcategories and it is illustrated in detail in Appendix 3.

ICT Experience

In all cases the interviewees had previous ICT experience. In all cases previous experience did appear to have effect on decision, but this was not expressed clearly in some cases. All interviewees did have previous ICT experience to a various degree though. As such, there appears to be an association between the willingness to continue the use of new technology and previous encounters with it. Based on this, one could suggest that previous experiences do influence on the willingness for continued use of target system, but indirectly, by influencing the perception over the perceived usefulness of target system. In a sense, the effect here is more likely mediating than direct influence. This is referred as *ICT experience* in suggested tentative framework. Among the persons, who continued to use WBT were persons, who had been participating a virtual course in a role of student as well as those who had not. In addition, among those who did not want to continue to use the system in question were just those, who had not themselves been attending any virtual courses in a role of student. It appears that if the first experiences with new technology are very bad there is a concrete risk for rejecting technology. It also seems that web based educational tools are merely seen as a tools for completing tasks and making work easier. Thus the tool is not emphasized; the focus is instead on actual work process. For *ICT Experience* concept four subcategories were recognized. These were *Perception of ICT influence, Perception of personal ICT competence, Perception of students' ICT literacy* and *Perception of teachers' ICT literacy*. None of these had additional subcategories. This is illustrated in Appendix 4.

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[28] "voi käyttää, mutta pakkoa käytölle ei ole" (Interviewee 08)

[29] "Ei ollut paineita kurssin tekemiselle, huolimatta aiemmasta" (Interviewee 15)

Immaterial Issues

Immaterial issues (e.g. copyright related issues) were seen as a problem of significance by most interviewees. These indirectly influenced on the way how system was used. Immaterial rights are a question that requires everyone to take a stand. It is not only a problem concerning teachers' right to products of their minds but it is also a question related to the Internet plagiarism, and as such a unwelcome guest who has crept into educational institutions. Teaching materials belong to teachers, and there are to come models of written agreements concerning copyrights, but teachers are free to choose whether to use these or not. This is referred as *Immaterial issues* in the suggested tentative framework. For this concept four different subcategories were recognized, and three of those have yet additional subcategories. First subcategory was *Course materials*, and it had three second level sub categories; *Material production during course, Self produced course materials* and *Third party produced materials*. Second subcategory was *IPR issues*, and it had three second level subcategories; *Actions, Agreements* and *Conflicts*. Third subcategory was *Online learning environment*, and it has two second level subcategories; *Closed environment* and *Open environment*. Fourth subcategory was *Plagiarism*, and it had no additional subcategories. These are illustrated in Appendix 5.

Intention to Use

A crucial question for IT adoption in personal level is whether a person is willing to eventually use target system (see Davis 1986; Davis 1989; Davis et al. 1989). In the tentative framework this is referred as *Intention to use*. For this concept five different subcategories were recognized. These were *Continuity, Evolving practice and change, Perception of others attitudes, Professional Curiosity* and *Quest for excellence*. None of these had additional subcategories. This is illustrated in Appendix 6.

Pedagogical Insight

For the most interviewees used pedagogical approach (e.g. teaching methods followed) does play a role when making decisions about technologies to be used. General note concerning present situation was that the driving force should not be technology, e.g., there appears to be a noticeable concern for technological determinism. In tentative framework this is referred as *Pedagogical insight*. For this concept ten different subcategories were recognized. These were *Convenience, Critical insight on virtual education, Educational methods, Emphasizing content,*

Involving and encouraging students, Pedagogical interest, Perception of student workload, Personalization, Providing students important skills and *Social learning*. None of these had additional subcategories. This is illustrated in Appendix 7.

Perceived Usefulness

Perceived usefulness refers to the perception about how useful target system is seen for work by user (see Technology Acceptance Model (TAM) by Davis 1986; Davis 1989; Davis et al. 1989). The main difference is that in this model, the concept is derived and firmly grounded on empirical data. For this concept five different subcategories were recognized, and all of those have additional subcategories. First subcategory was *Cost effectiveness*, and it had four second level sub categories*; Better results, lesser investments, Transferring printing costs to students* and *Working from home*. Second subcategory was *Critical issues*, and it had three second level sub categories*; Challenges in teaching, Improvement requirements* and *Technological challenges*. Third subcategory was Professional self-development, and it had four second level sub categories; *Challenges, Networking and collaboration, Personal self-development, Professional self-development* and *Regulating own work*. Fourth subcategory was *Providing support to students*, and it had six second level sub categories; *Flexibility of studies, Freedom of place, Freedom of time, Freedom of time and place, Information retrieval of students* and *Making students work easier*. Fifth subcategory was *Useful IT*, and it had seven second level sub categories; *Established practice, IT as a tool for communication, IT makes life easier, Online resources, Perception of usefulness, Pragmatic insight on technology* and *Useful educational technology*. This is illustrated in Appendix 8.

Resources

Resources represent perception of both tangible and intangible entities necessary for working and living. It is characteristic for resources that they are of limited availability. For this concept six different subcategories were recognized, and all of those have additional subcategories. First subcategory was *Economical issues*, and it had three second level sub categories; *Compensation for work, Critical economical issues* and *Funding for development projects*. Second subcategory was *Encouragement*, and it had three second level sub categories; *Encouraging practice, Feedback* and *Peer support*. Third subcategory was *Support*, and it had five second level sub categories; *Critical technical issues, Organizational support, Pedagogical support, Supporting department* and *Technical support*. Fourth subcategory was *Technology resources*, and it had three second level sub catego-

ries; *Datacommunication, Role of technology, Supplementary IT solutions* and *Technical resources*. Fifth subcategory was *Time resources*, and it had two second level sub categories; *Allocated time resources* and *Required time resources*. Sixth subcategory was *Work management*, and it had three second level sub categories; *Personal work management, Stability* and *Workload*. This is illustrated in Appendix 9.

Versatile System Use

Empirical findings suggest, that there does not seem to be noticeable linkage between the reported role teacher assumes during online course, and teaching methods used. In addition, although several interviewees were very keen on using several other teaching methods along, or in addition to virtual education — willingness for using interactive features did not clearly correlate with willingness on using multiple teaching methods. There seems to be a connection between willingness on applying multiple teaching methods and number of different features used in WBT though. Thus it could be said that if one is willing to utilize multiple teaching methods in ones work, this will lead into richer use of features available in WBT systems. This is referred as *Versatile system usage* in the suggested tentative framework. For this concept nine different subcategories were recognized, and one of those had additional subcategories. First subcategory was *Blended learning*. Second subcategory was *Expectations for practice*. Third subcategory was *Expectations for technology*. Fourth subcategory was *Job development*, and it had four additional subcategories; *Changing role, Continuous development, New skills* and *Old traditions*. Fourth subcategory was *Mostly used system features*. Fifth subcategory was *New projects*. Sixth subcategory was *Personal solutions for supporting work*. Seventh subcategory was *Tools and methods to be avoided*. Eight subcategory was *Work management*. These are illustrated in appendix 10.

Constructs (see Huber 1990) used in the theory are (1) Freedom, e.g. whether a person can make decision independently or not; (2) ICT Experience, e.g. previous ICT experience or general computer literacy; (3) Immaterial issues, e.g. questions related to IPR from users viewpoint; (4) Intention to use, e.g whether a person is willing to eventually use target system (see Davis 1986; Davis 1989; Davis et al. 1989); (5) Pedagogical insight, e.g. perception diversity of used pedagogical methods of user; (6) Perceived usefulness, e.g. how useful target system is seen for work by user (see Technology Acceptance Model (TAM) by Davis 1986; Davis 1989; Davis et al. 1989); (7) Resources, e.g. tangible and intangible entities necessary for working and living, and; (8) Versatile system usage, e.g., versatile and feature rich system use.

3.4.2 Relations Between Constructs

Eleven different relations between empirically formed eight constructs were recognized. These were derived from empirical data in a similar manner as categories and sub categories for eight main constructs were derived. These relations are presented in Table 4.

Table 4. Relations Presented in a Tentative Framework.

Relation	From Name	Type	To Name
A	Freedom	Influences	Intention to use
B	ICT Experience	Influences	Perceived usefulness
C	ICT Experience	Influences	Versatile system use
D	Immaterial issues	Influences	Versatile system use
E	Intention to use	Influences	Versatile system use
F	Pedagogical insight	Influences	Versatile system use
G	Pedagogical insight	Influences	Perceived usefulness
H	Pedagogical insight	Influences	Intention to use
I	Perceived usefulness	Influences	Intention to use
J	Resources	Influences	Versatile system use
K	Resources	Influences	Intention to use

Relations and empirical codes are presented in this sub section. Relations were first defined, and then organized in alphabetical order, where these were named from A to K, so that these would be easier to present in graphical presentation of tentative framework (previously in Figure 6). These relations are presented in detail in Appendix 11.

Relation A (Freedom influence on Intention to use)

Relation between constructs Freedom and Intention to use is one way relation, where freedom influences Intention to use. It is apparent from interviewees' comments, that freedom to adopt or not to adopt chosen technology is important. It is also obvious, that if adoption is obligatory, and there is no interest on this, the attitude is naturally negative. In this case the adoption, especially continuation of use was not realized.

> *One can use, but it is not obligatory to use it*[30] *-- "Everything in WebCT is too far thought" it controls too much*[31] *-- Teachers should specialize into something … every-*

[30] "voi käyttää, mutta pakkoa käytölle ei ole" (Interviewee 08).
[31] "WebCT:ssä kaikki valmiiksi ajateltuna" liian ohjaava (Interviewee 10)

> *thing should not be put into Net, but only those who are really interested*[32] *-- If one does not want, virtual education is not required*[33]*-- Independent actors, there has been discussion at the department … about what makes sense*[34]*-- The use either is or is not*[35]*-- …was not very interested about the topic at all, but did the work because got orders from the department to do so*[36]*-- I do not continue to use it, because it appears that neither students were interested*[37] *-- For the first course "I just did it". Also Learning Center offered help, but it was only partially put into use. Resources from Learning Center were hardly used.*[38]

It is also obvious, that this is a work of pioneers. Although there are resources available, a true pioneer does not necessarily rely on those. It also appears that common sense guides the adoption.

Relation B (ICT Experience influence on Perceived usefulness)

Relation between constructs ICT Experience and Perceived usefulness is one way relation, where ICT Experience influences Perceived usefulness. Interviewees commented about the complexity of IS systems influencing the way how easy or difficult is the user's perception of target system.

> *Appropriateness, programs are far too complicated*[39] *-- Technology is suitable for some cases, but not all*[40] *-- It went all right, first time N.N. was helping*[41] *-- First experiment was successful*[42] *-- When used environment is simple enough, it will also work*[43] *-- It has been a good tool.*[44]

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32 "erikoistuminen kannattaisi opettajien osalta … ei kaikki verkkoon, vaan vain ne jotka kiinnostuneita." (Interviewee 10)

33 "Jos ei halua, virtuaaliopetusta ei pakko" (Interviewee 11)

34 "yksittäisiä toimijoita, myös laitoksen tasolla keskusteltu … mikä järkevää on." (Interviewee 12)

35 "käyttö joko/tai" (Interviewee 13)

36 "Ei ole itse kauhean innostunut aiheesta mutta teki työn koska määräys laitokselta" (Interviewee 14)

37 "Ei jatka käyttöä, koska: vaikutti siltä, että myös opiskelijat eivät olleet kiinnostuneita" (Interviewee 14)

38 "Ensimäisen kurssin osalta "lähdin vain tekemään". Myös OPKE tarjosi apuaan mutta sen hyödyntäminen vain päällisin puolin … OPKE:n resursseja ei juuri käytetty" (Interviewee 20)

39 "Tarkoituksenmukaisuus, Ohjelmat liian monimutkaisia" (Interviewee 06)

40 "Teknologia sopii joihinkin tapauksiin, muttei kaikkiin" (Interviewee 14)

41 "Sujui mukavasti, ekalla kerralla N.N. apuna" (Interviewee 16)

42 "Eka kokeilu meni hyvin" (Interviewee 17)

43 "Kun ympäristö tarpeeksi yksinkertainen, se myös toimii" (Interviewee 20)

44 "Ollut hyvä työväline" (Interviewee 20)

To be able to make judgments over usefulness of chosen technology certain experience is necessary. How would it be possible to make comparisons without anything to compare with? Another noteworthy issue is common sense approach for analyzing the suitability of technology to a particular situation, as noted by one of the interviewees.

Relation C (ICT Experience influence on Versatile system use)

Relation between constructs ICT Experience and Versatile system use is one way relation, where ICT Experience influence Versatile system use. ICT experience in the form of computer literacy will automatically affect the way how target systems are being used. For example, one interviewee was using WebCT, and noted that it feels OK, but one needs to learn to use the system. In addition, if one is skilled enough, they have means and knowledge to seek for ultimate solutions to support their work.

> *WebCT feels OK, I just should learn it myself*[45] *-- Basic technology skills are OK*[46] *-- Virtual education is at best for persons who want to be independent and free of restrictions of both time and place*[47] *-- …did not learn that much technology just to be able to work*[48] *-- …since then has always used new means when they emerge*[49] *-- Searches all the time for new possible IT tools, but does not know about other solutions*[50] *-- We discuss at the department and share experiences and ideas … virtual education has made us to think different teaching methods*[51]

On interviewee commented that he/she did not learn that much technology just to be able to work. This refers directly on how ICT skills influence on the way how versatile IT use is at best from utilitarian viewpoint. In addition, as skills improve, it will also influence on the way how possibilities are seen and used. This can be clearly seen from comment concerning the change of ideas and experiences at the department, and how it influences their thinking.

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45 ”WebCT tuntuu OK:lta, pitäisi vai itse oppia” (Interviewee 02)
46 “Teknologian hallinta pohjalla OK” (Interviewee 07)
47 ”Virtuaaliopetus on parhaimmillaan itsenäisen ajasta ja paikasta riippumattomuutta haluavan hlön kohdalla” (Interviewee 14)
48 ”Ei itse opetellut kauheasti tekniikkaa vain voidakseen tehdä työnsä” (Interviewee 15)
49 ”Jatkossa aina käyttänut uusia keinoja kun niitä on tullut” (Interviewee 17)
50 ”etsii koko ajan muita mahdollisia IT välineitä mutta ei tiedä muista ratkaisuista” (Interviewee 17)
51 ”keskustellaan laitoksella jaetaan kokemukset ja ideat … virtuaaliopetukset saaneet miettimään eril. opetustapoja” (Interviewee 17)

Relation D (Immaterial issues influence on Versatile system use)

Relation between constructs Immaterial issues and Versatile system use is one way relation, where Immaterial issues influences Versatile system use. Immaterial issues are a problem that has two domains, target users, e.g., students and system users, e.g., teachers/tutors/and alike. IPR issues influence versatile system use so that the way how system and its features are used, as well as how assignments are designed should prohibit plagiarism.

> *Internet plagiarism is a problem, unless assignments are designed so that plagiarism is not possible*[52] *-- There is always a possibility for plagiarism, but because of the nature of the assignments it is not possible*[53] *-- Students produce material (course related copyright)*[54] *-- There are no copyright issues to tackle with, when using closed learning environments, because all the materials are your own.*[55] *-- To put material available in the Net … the network is unprotected*[56]

Immaterial issues influence decision whether to use closed or open systems. While plagiarism is one reason, another issue is IPR rights – and this has two levels. First protecting one's own or student produced materials from others, and second making sure that there are no IPR problems material used during courses.

Relation E (Intention to use influence on Versatile system use)

Relation between constructs Intention to use and Versatile system use is one way relation, where Intention to use influence on Versatile system use. When a person is motivated, working practices will be adopted more easily. It also appears that when there exists real intention to use target system, it will be taken into use – even if it requires considerable efforts.

> *One can concentrate more on substance instead of technology*[57] *-- Only certain people are working with this, the enthusiasts*[58] *-- Blended learning for two years and based on feedback changed into 3 cu online course*[59] *-- Should be used, and work with it, so that it*

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52 ”Internet plagiointi ongelma, ellei tehtäviä ole laadittu sellaisiksi ettei plagiointi mahdollista” (Interviewee 04)

53 ”plagiointi mahdollisuus olemassa mutta tehtävien luonteen vuoksi ei mahd.” (Interviewee 07)

54 ”opisk. tuottavat aineistoa (kurssikohtainen – tekijänoik.)” (Interviewee 10)

55 ”Suljetuissa oppimisympäristöissä ei tekijänoikeuskysymyksiin törmää, koska materiaali on omaa” (Interviewee 11)

56 ”Materiaali tietoverkkoon … verkko suojaton” (Interviewee 20)

57 ”Voi keskittyä enemmän sisältöön kuin tekniikaan” (Interviewee 11)

58 ”Vain tietyt ihmiset puuhaavat, innostuneet” (Interviewee 11)

59 ”2 vuotta ”monimuotona” palautteen perusteella 3 ov:n verkkokurssiksi” (Interviewee 12)

> *is not forgotten*[60] *-- ..would like to be more involved with virtual education*[61] *--..have adopted it into use with considerable effort*[62] *-- When motivated – one learns certain working practices*[63] *-- Things are done faster*[64] *-- One hardly even spares a thought for that issue*[65]

In interviewee comments can be sensed some kind of enthusiasm for this particular way of work, because the ones who are involved are easily categorized as "enthusiasts". On the other hand, it is seen as natural thing that one does not even need to think about it – it comes so naturally.

Relation F (Pedagogical insight influence on Versatile system use)

Relation between constructs Pedagogical insight and Versatile system use is one way relation, where Pedagogical insight influence on Versatile system use. In general, interviewees saw the significance of pedagogical understanding very important, especially when planning and/or using WBT systems. Many interviewees were making judgment about IT adoption based on pragmatic pedagogical approach. This is to say, that decision whether to use blended learning, or pure online courses was not dictated by available technology — but by pragmatic issues, pedagogy in particular.

> *Pedagogy is quite often lacking and it is needed, especially for online courses*[66] *-- B.Sc. seminar, does not replace discussions … face-to-face teaching*[67] *-- How could a simulation be reproduced using computers*[68] *-- Has been following and studying what others are doing*[69] *-- For teaching courses, the Net is not just a material distribution channel*[70] *-- During the course personal email and excursions are used along with WebCT*[71] *-- More pedagogical than technological problem*[72] *-- Planning must be done carefully for virtual education*[73] *-- One is required to handle larger unities at one time*[74] *-- Even a person with*

60 "pitäisi käyttää ja tehdä, jottei unohdu" (Interviewee 12)
61 "haluaisi olla laajemmassa mittakaavassa mukana verkko-opetuksen parissa" (Interviewee 12)
62 "ottanut "kohtuullisella vaivalla" käyttöön" (Interviewee 16)
63 "Kun motivoituu – oppii tietyt työsk. tavat. " (Interviewee 20)
64 "asiat syntyvät nopeammin" (Interviewee 20)
65 "asiaa ei juuri edes mieti" (Interviewee 20)
66 "pedagogiikka on usein hukassa ja sitä tarvitaan erityisesti verkkokursseilla" (Interviewee 01)
67 "kand. seminaari; ei korvaa keskustelua … kontakti opetus" (Interviewee 05)
68 "miten simulaatio voidaan jälj. tietokoneavusteisesti" (Interviewee 08)
69 "Seurannut & opiskellut mitä muut tekevät" (Interviewee 10)
70 "Kurssien opettamiseen, verkko ei ole materiaalin jakeluympäristö" (Interviewee 10)
71 "kurssin aikana WebCT:n ohella käytössä myös henk. koht. email, vierailut.. " (Interviewee 10)
72 "enemmän pedagoginen kuin teknologinen ongelma" (Interviewee 10)
73 "Virtuaaliopetuksessa suunniteltava tarkasti" (Interviewee 10)

> *lesser skills can do it*[75] *-- WebCT requires special kind of thinking*[76] *-- Quality of content is on teacher's responsibility*[77] *-- Activating student, new points of view*[78] *-- Teaching methods are considered for the Internet use*[79] *-- It would be good to have face-to-face meetings for every virtual course*[80]

It was also obvious, that one should plan the use of WBT in advance, in order to prevent problems. On the other hand, it was stated, that technology will provide means even for persons with lesser IT skills, but pedagogical insight was obviously more important than chosen technology. This is due to the fact that substance in teaching is on teacher's responsibility. I was also interesting to note, that face-to-face meetings in the Internet era are still seen as important part of education.

Relation G (Pedagogical insight influence on Perceived usefulness)

Relation between constructs Pedagogical insight and Perceived usefulness is one way relation, where Pedagogical insight influence on Perceived usefulness. The usefulness of WBT system or ICT systems in general appears to be influences by pedagogical insight. This is due to understanding pedagogical value in education of chosen technologies. This could be put into a form of a question: If certain technology is not seen as useful from pedagogical viewpoint, why to use it in education?

> *Using [virtual] learning environment, it is possible to visualize processes that can not be shown using books*[81] *-- Continued use: positive feedback*[82] *-- It is difficult to avoid in this environment*[83] *-- Now one has to go deeper in substance*[84] *-- During 20 years student groups have become more heterogeneous … IT skills, English language skills*[85] *-- Will technology (video etc.) bring additional value? Because it does not, I have not used it*[86] *-- It is possible that distance education becomes more common in degrees of two levels*

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74 "joutuu käsittelemään suurempaa kokonaisuutta kerralla" (Interviewee 10)
75 "pienemmälläkin osaamisella onnistuu" (Interviewee 10)
76 "WebCT vaatii tietynlaisen ajatelun" (Interviewee 11)
77 "Sisällön laatu opettajan vastuulla" (Interviewee 11)
78 "Opiskelijoiden aktivointi, uusia näkökulmia" (Interviewee 12)
79 "opetus menetelmät pohditaan verkon käytön osalta" (Interviewee 17)
80 "jokaisella verkkokurssilla olisi hyvä että olisi "oikeita" kokoontumisia." (Interviewee 20)
81 "oppimisympäristön kautta voi näyttää prosesseja joita ei voi kirjan kautta näyttää. " (Interviewee 04)
82 "Jatko: positiivinen palaute" (Interviewee 05)
83 "Ympäristöissä "vaikea välttyä" " (Interviewee 10)
84 "nyt joutuu menemään syvemmälle substanssiin" (Interviewee 10)
85 "20 v. aikana opisk. ryhmät muuttuneet heterogeenisemmiksi: IT-taidot, engl. kielen taito" (Interviewee 16)
86 "Tuoko tekn (video yms) lisäarvoa, koska ei, niin ei käyttänyt" (Interviewee 16)

> *[B.Sc. and M.Sc.[87]] -- I have been considering, for example videoconferencing as a tool[88] -- Students have not commented issues they have not understood during the course, but only after the course[89] -- All courses are not suitable for the Net … one must try and find out[90] -- Is it to be taken seriously?[91] -- Work can make students and teacher more distant from each others, unless the work is self paced. It restricts social interaction for virtual courses[92] -- It makes people socially more distant[93]*

Virtual learning environment do provide obvious benefits over more traditional learning environments. While the potential benefits are noted, they are not necessarily taken into use in a most efficient manner, and for this pedagogical insight on perceived usefulness is necessary.

Relation H (Pedagogical insight influence on Intention to use)

Relation between constructs Pedagogical insight and Intention to use is one way relation, where Pedagogical insight influence on Intention to use. While the technology is available, there must be a real need for using it. New teaching methods (e.g. virtual education, online courses) might be seen as attracting, but there exists very different courses, and these methods are not suitable for everyone.

> *There must be a need to communicate using the Internet, possibility for it is not enough[94] -- I was attracted by new teaching methods[95] -- Pedagogical interest, testing[96] -- There is bigger difference in moving from lecturing into the Internet than from blended learning into the Internet[97] -- There are very different courses .. one bad experience will be remembered for a long time[98] -- Course XX was too compact and challenging, so the following courses were made easier[99] -- Learning results have been so good[100] -- It would be better to be able to evaluate it as a whole[101]*

87 ”kaksiportaisissa tutkinnoissa mahdollisesti lisääntyy etäopiskelu” (Interviewee 16)
88 ”Miettinyt esim. videoneuvottelua välineenä” (Interviewee 17)
89 ”opiskelijat eivät kommentoineet kurssin aikana asioita, joita eivät ymmärtäneet tms. vaan vasta kurssin jälkeen. ” (Interviewee 17)
90 ”ei kaikki kurssit sovi verkkoon … pitää kokeilla” (Interviewee 17)
91 ”Vakavasti otettava? ” (Interviewee 19)
92 ”Työ (ellei itse jaksota) voi etäännyttää opiskelijoita ja opettajia. Rajoittaa verkkokurssien osalta sosiaalista puolta asioissa” (Interviewee 20)
93 ”Etäännyttää sosiaalisesti” (Interviewee 20)
94 ”Täytyy olla tarve verkon kautta komunikointiin, pelkkä mahdollisuus ei riitä” (Interviewee 03)
95 ”Viehätti uudet opetusmenetelmät” (Interviewee 03)
96 ”pedagoginen mielenkiinto, testaus” (Interviewee 10)
97 ”Luento opetuksesta verkkoon suurempi ero kuin monimuoto-opetuksesta verkkoon” (Interviewee 10)
98 ”Kurssseja hyvin erilaisia … yksi huono kokemus muistuu pitkään” (Interviewee 12)
99 ”XX oli liian tiivis ja raskas, joten seuraavista kursseista tehtiin kevyempiä” (Interviewee 15)

Intention to use is influenced by several constructs, but pedagogical insight is significant influencing factor for judging whether to proceed from intention to use into actual use (or into continued use) of WBT system. Bad experiences or good learning results are naturally issues to be noticed in WBT adoption.

Relation I (Perceived usefulness influence on Intention to use)

Relation between constructs Perceived usefulness and Intention to use is one way relation, where Perceived usefulness influence on Intention to use. Perceived usefulness is a predeterminant for intention to use target system. Basic question here is; if the system is not seen useful, why to use it?

> *These days I earn my living with virtual education[102] -- Idea has not spread (not as common as it could be) time/skills[103] -- Practice has become common practice[104] -- Students are from different areas around the country, they think that personal guidance would be necessary[105] -- There has been changes[106] -- I am satisfied with the [virtual learning] environment[107] -- Virtual education is just one method among others, and to be used when it is suitable[108] -- Goal is that there should be more virtual education, need for it exists[109] -- Organizations do not take enough advantage of IT[110] -- Those teachers who are willing to try, will also do it[111] -- Like my other arm[112]*

Most interviewees used words describing the usefulness of WBT system in a very clear manner. On the other hand, while interviewee themselves might think that the system is useful, their perception of others might suggest that this is not the case for others. For example, when commenting that virtual education is just one method among others, and to be used only when suitable, one interviewee suggests that perceived usefulness is dependent on situation. Then again, when interviewees criticize organizations for not utilizing IT to a best possible degree, they

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100 ”oppimistulokset olleet niin hyviä” (Interviewee 15)
101 ”parempi olisi kun voisi arvioida kokonaisuus” (Interviewee 17)
102 ”V-O:t tuovat nykyisin ”leivän” ” (Interviewee 07)
103 ”aate ei levinnyt (ei niin yleistä kuin voisi olla) aika/osaaminen” (Interviewee 08)
104 ”toiminta vakiintunut” (Interviewee 08)
105 ”Opiskelijoita eri puolilla maata, henkilökohtainen ohjaus olisi heidän mielestään tarpeen” (Interviewee 11)
106 ”muutoksia on näkynyt” (Interviewee 12)
107 ”ympäristöön tyytyväinen” (Interviewee 13)
108 ”Virtuaaliopetus on yksi menetelmä muiden joukossa ja sen käyttö silloin kun se sopii” (Interviewee 14)
109 ”pyritään siihen, että olisi enemmän virtuaaliopetusta, tarve olemassa” (Interviewee 15)
110 ”organisaatiot eivät osaa vielä hyödyntää IT:tä riittävästi” (Interviewee 15)
111 ”opettajat, jotka kokeilunhaluisia kokeilevat myös. ” (Interviewee 16)
112 ”kuin toinen käsi” (Interviewee 20)

are actually suggesting that more could be done, and all opportunities are not being recognized.

Relation J (Resources influence on Versatile system use)

Relation between constructs Resources and Versatile system use is one way relation, where Resources influence on Versatile system use. When the system is adopted into use, the versatility of system use is partially dependant of available resources. One very essential resource appears to be time, and how the use of it is influencing (as well influences) by WBT systems. Technical resources are naturally important in ICT context, but because this is work done by humans, other work related issues emerged. The situation is not always very clear about work required (or done) during online courses, and economical compensation provided. These issues naturally influence system use; virtual education is not always seen as the easiest way of doing things.

> *Personal use of time can be planned better*[113] *-- More careful planning is required from teacher*[114] *-- Technology is good now, there is more likely a need to sell and train the technology to teachers*[115] *-- In the past there were long queues during reception hours … now contacts are online*[116] *-- Video editing software had to be acquired, video camera is acquired, Dreamweaver, image processing software*[117] *-- Network connections were previously very slow … this hindered versatile use of multimedia*[118] *-- In the past overhead and pens were used … now materials have to be prepared in a different manner in advance*[119] *-- Problem has been part-time teachers who have other teaching outside university*[120] *-- When virtual education is organized as part-time teaching, it is not entirely compensated economically*[121] *-- Using virtual education is laborious*[122] *-- Economical compensation based on workload during virtual course is a problem*[123] *-- Routines must*

113 ”oman ajankäytön voi paremmin valita” (Interviewee 02)
114 ”Vaatii huolellisempaa suunnittelua opettajalta” (Interviewee 02)
115 ”Tekniikka on nyt hyvä, enemmänkin tarve markkinoida & kouluttaa tekniikkaa opettajille. ” (Interviewee 04)
116 ”ennen pitkät jonot vastaanoton aikana … nyt kontaktit sähköisesti” (Interviewee 06)
117 ”Videon käsittely ohjelmisto ollut hankittava, verkkokamera hankittu, Dreamweaver, kuvank. ohj. ” (Interviewee 07)
118 ”Tietoverkkoyhteydet aiemmin hyvin hitaita ”este multimedian monipuoliselle käytölle” ” (Interviewee 09)
119 ”ennen käytti kalvoja ja kalvotusseja … nyt eri aineistot tehtävä toisella tavalla etukäteen” (Interviewee 10)
120 ”Ongelmana on ollut tuntiopettajat, joilla muutakin opetusta yliopiston ulkopuolella” (Interviewee 11)
121 ”Verkko-opetus ei tule tuntiopetuksena täysin korvatuksi” (Interviewee 11)
122 ”virtuaaliopetuksen käyttö työllistävää” (Interviewee 11)
123 ”palkkaus verkko-kurssin työmäärän perusteella ongelma” (Interviewee 11)

> *be developed*[124] *-- It requires resources, nothing will happens by itself*[125] *-- Personnel's computers and software systems have been updated recently*[126] *-- There has not been any investments on technology*[127] *-- We started planning course three or four weeks in advance. We had already an existing course structure*[128] *-- All the time was not used on this, because I had a full time assistant employed*[129] *-- There are no resources allocated for this at the department*[130] *-- Along with ordinary day job … no compensation, nor reduction for other teaching obligations*[131] *-- First time there was a booking system [for work] on a "minute level" and based on this the used working time was calculated*[132] *-- Problems are solved right away, so that they cannot cumulate*[133] *-- Problems are solved already before the next course*[134] *-- If someone wants to make, for example teaching videos, necessary equipments are available from Learning Center*[135] *-- Virtual education has supported other teaching*[136] *-- There were previously quota restrictions with Unix systems*[137] *-- There is also possibility for returning paper versions [of assignments] into Open University student office*[138]

When available resources are not adequate, these are completed with additional solutions. For example, if IT systems are not functioning fully, additional systems might be used (for example, if returning assignments online does not work, it is possible to return assignments in the paper format).

Relation K (Resources influence on Intention to use)

Relation between constructs Resources and Intention to use is one way relation, where Resources influence on Intention to use. If the resources are not available (for example, if there are no licenses available for WBT system) it is very unlike-

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124 "Rutiinit on pakko kehittää" (Interviewee 12)
125 "vaatii resursseja, ei tapahdu itsekseen" (Interviewee 12)
126 "Työntekijöiden laitteita ja ohjelmistoja on uudistettu viimeaikoina" (Interviewee 12)
127 "Teknologian suhteen ei investointeja" (Interviewee 13)
128 "aloitettiin 3-4 kk aikaisemmin kurssin suunnittelu. Luentorunko oli jo valmiiksi olemassa" (Interviewee 13)
129 "ei kaikki aika mennyt tähän koska apuna täyspäiväisesti palkattu apulainen" (Interviewee 13)
130 "Laitoksella ei allokoida resursseja" (Interviewee 13)
131 "OTO … ei korvausta, tai helpotusta muuhun opetukseen" (Interviewee 13)
132 "Ensimmäisellä kerralla työajan "minuuttikirjanpito" jonka pohjalta laskettiin työaika" (Interviewee 15)
133 "epäselvyydet selvitetään saman tien joten ei pääse kumuloitumaan" (Interviewee 15)
134 "ongelmat korjataan seuraavalle kurssille mennessä" (Interviewee 15)
135 "Jos haluaa tehdä esim. opetusvideoita, olisi sitten siihen tarvittavat välineet satavilla OPKE:ssa" (Interviewee 17)
136 "Virtuaaliopetus tukenut muuta opetusta" (Interviewee 20)
137 "Unix puolella oli aikaisemmin quotarajoituksia (opiskelijatunnusten takaa ei hyvä jakaa materiaaleja) " (Interviewee 20)
138 "Rinnalla paperiversion palautus avoimen kansliaan" (Interviewee 20)

ly that target system will be adopted into use. Time is another example of essential resources. If there is no time allocated for designing and preparing online courses, those are unlikely to take place — or if they do, the quality is being compromised severely.

> *If there would be more time available for preparing courses, more time would be used … research based education*[139] *-- Work practices are changing*[140] *-- the utilization/resistance of materials available on the Internet*[141] *-- Tools are not available for use … licences* [142] *-- I do not know if I will continue to use WebCT* [143]

Because of the new technology, the work practices are changing. It is also apparent, that some educators see online resources as a horn of plenty, while others are concerned about those. This is understandable, because the use of online resources is not always that simple. For some disciplines, there are a lot of high quality materials available, but for other disciplines the situation is not equally good, although the situation appears to be improving all the time.

3.4.3 Verifying WBT Adoption Model for Higher Education

For testing how well the proposed tentative theoretical framework fits empirical findings, one case is analyzed in this section using constructs and relations presented previously. Interviewee 16 had previous ICT experience and she considered herself as possessing average IT skills. She did see benefits on using WBT system on her course and decided to give it a try (relation B and I). This decision was made by herself, without anyone else influencing, nor dictating what to do (relation A). She then prepared course materials with a help from a technically oriented assistant (relations J and K), and took WBT system into use on her course (relation E). She had herself studied pedagogy and was curious about "*…what good could come out of this..*"[144] (relation G). She was also using the system for producing a course that was not all online, but used some aspects provided by WBT platform (such as sharing course materials, internal email and course work submission system) to support teaching (relations C and F). She had all the materials produced by her, thus possessing immaterial rights for her materials (relation D).

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139 "Jos olisi enemmän aikaa opetuksen valmisteluun, käyttäisi enemmän … tutkimukseen perustuvaa opetusta" (Interviewee 16)
140 "työtavat muuttuvat" (Interviewee 19)
141 "Verkkomateriaalien hyödyntäminen/vastustaminen" (Interviewee 19)
142 "Ei työvälineitä käyttöön saa … lisenssit" (Interviewee 20)
143 "ei tiedä käyttääkö jatkossa WebCT:tä" (Interviewee 20)
144 "…mitä hyötyä tästä on." (Interviewee 16).

All the relations presented in tentative theory were present in this case, and the same applies also on other cases, except two. In the case of interviewee 14 the decision to take a WBT system into use was not a voluntary decision. This resulted a decision not to continue system use later on. Another case, where the use of WBT was not continued was in the case of interviewee 19. This person was a very skilled IT professional, and after using the system decided not to continue to use it. Reason was: *"..I don't want to use closed environments, because of the principle of openness, and easiness.."*[145] . This referred to the academic principle for providing academic knowledge freely to everyone who is willing to utilize it.

Empirical findings indicate that versatile system usage in case of WBT appears to require flexibility from the used technology. Flexibility of technology, e.g., perception about how adjustable the target system is for user needs (see interpretative flexibility of technology by Orlikowski (1992a) and technological inscription by Cordella & Simon (2000)). This translates into a substantial selection of features where to choose from, depending on one's taste and preferences, and a possibility for customizing working environment in question. Another feature related to this is the need to be able to choose between tools that offer possibility for synchronous or asynchronous communication, thus offering a freedom of time or place — or both. Twelve out of twenty did express that, when teaching they are using several different teaching methods to support their teaching (such as lecturing, exercises, discussions, etc. which apparently are more or less related to teachers personal preferences or subject related special requirements, as in studying languages for example). When discussing about teaching and virtual courses, six out of twenty addressed that they are teaching pure virtual courses, where nine out of twenty stated totally the opposed. This shows that WBT tools are flexible and can be used to support many different types of approaches towards teaching.

[145] "..ei halua käyttää suljettuja ympäristöjä, koska avoimuuden periaate, ja vaivattomuus..", (Interviewee 19).

4 ENFOLDING LITERATURE AND REASSESSING FINDINGS

In this chapter, the findings from empirical part are summarized and reflected with existing literature. This chapter is organized in six main sections, where Section 4.1 focuses on IT adoption studies, Section 4.2 focuses on impacts of computing, Section 4.3 focuses on theories on development and change in organizations, and Section 4.4 focuses on ICT in higher education. In the end of each section, empirical findings are compared with literature. Section 4.5 summarizes previous studies and reflects empirical findings with literature and finally Section 4.6 presents enhanced WBT adoption model.

4.1 IT Adoption Studies

Gallivan (2001: 51) notes that research on innovation adoption and diffusion has long converged on a core set of theoretical frameworks that seek to explain target adopter attitudes and their innovation-related behavior. Although these core frameworks have received widespread validation for many technological innovations where individual autonomy is permitted to adopt or reject an innovation, Gallivan (ibid.) criticizes these for neglecting the realities of implementing technology innovations within organizations, especially when adoption decisions are made at the organizational, division, or workgroup levels, rather than at the individual level.

Traditional innovation adoption models (e.g. Diffusion of Innovation theory (Rogers 2003), the Theory of Reasoned Action (Ajzen & Fishbein 1975), the Technology Acceptance Model (Davis 1989), the Theory of Planned Behavior (Ajzen 1985), and Social Cognitive Theory (Bandura 1986; Compeau & Higgins 1995) are well-suited to a particular range of adoption scenarios and technology types, however, when they are misapplied in situations where their underlying assumptions are not met, they are likely to produce findings that are weak, unstable, or open to question. In particular, these traditional innovation adoption frameworks may yield inconsistent results when (Gallivan 2001: 55):

- Adoption occurs within an organizational setting where users are mandated to use the innovation.
- Adoption is subject to heavy coordination requirements or strong interdependencies across multiple adopters.

- Adoption requires extensive, specialized training to learn the principles underlying the innovation, in order to overcome knowledge barriers to use.

- Adoption and use occur within an organizational setting, but only a single respondent is available to vouch for the innovation use of many other employees in the organization.

Gallivan (2001: 55) also notes that traditional innovation adoption frameworks have repeatedly shown strong explanatory power in studies that examined certain classes of innovation adoption. The adoption scenarios for which these frameworks are well suited are those where individuals voluntarily decide whether or not to use a "personal use" technology. This type of scenario is where Technology Acceptance Model and Diffusion of Innovations have demonstrated their value in explaining individual acceptance of technology, thus these two models are discussed more in detail.

Technology acceptance model (TAM) created by Davis (1989) tries to explain the adoption process and underlying influencing factors in technology acceptance. The most important things Davis found in his research were that perceived usefulness and perceived ease-of-use are the primary drivers of technology adoption. Later on the model has been used widely in IS research (Adams, Nelson & Todd 1992; Hu, Chau, Sheng & Tam 1999; Brown, Massey, Montoya-Weiss & Burkman 2002).

Venkatesh & Davis (2000) developed later theoretical extension into the original TAM model created by Davis (1989). They named this new and improved model TAM2. TAM2 introduces several new concepts into the theory. Figure 7 illustrates this model. Subjective norm included in the model refers to Fishbein & Ajzen's (1975: 302) idea which refers to person's perception that most people who are important to him or her think that he or she should or should not perform the behavior in question, where according to the theory, the general subjective norm is determined by the perceived expectations of specific referent individuals or groups, and by the person's motivation to comply with those expectations.

Voluntariness (Agarwal & Prasad 1997; Hartwick & Barki 1994; Moore & Benbasat 1991) in the model refers to the extent which potential adopters perceive the adoption decision to be non-mandatory (Venkatesh & Davis 2000). Image (as used in Moore & Benbasat 1991: 195) refers to the degree in which the use of an innovation is perceived to enhance one's status in one's social system (Venkatesh & Davis 2000). Experience refers to increasing experience when using a target system. Job Relevance refers to individual's perception regarding the degree to

which the target system is applicable to his or her job. Output Quality refers to the fact, that people will take into consideration how well the system performs those tasks in question. (Venkatesh & Davis 2000: 189-190; 191). Result Demonstrability (as originally used in Moore and Benbasat 1991: 203) is defined as tangibility of the results using the innovation, which will directly influence perceived usefulness (Venkatesh and Davis 2000). Perceived Usefulness, Perceived Ease of Use, Intention to Use and Usage behaviour are presented as in the original TAM (Venkatesh & Davis 2000: 187-192).

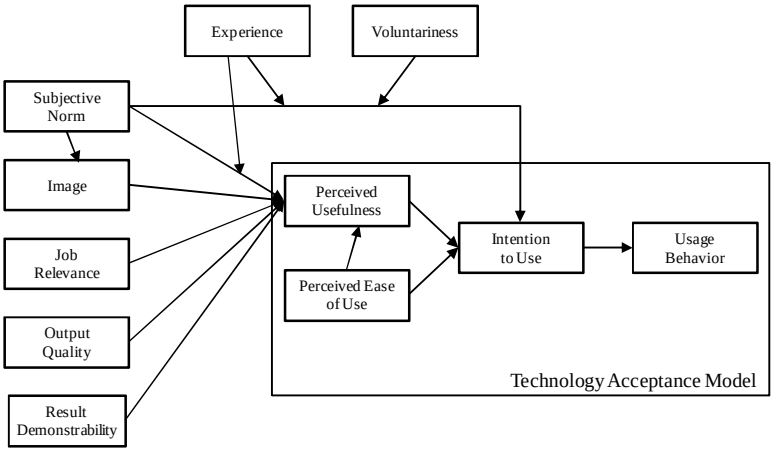

Figure 7. TAM2 Model (Venkatesh & Davis 2000: 188).

Few years later Venkatesh, Morris, Davis & Davis (2003) presented a Unified Theory of Acceptance and Use of Technology (UTAUT), which integrated elements across eight different user acceptance models. A good example of the popularity of TAM model is Guus van Piper's website[146] , where he has collected dozens of research references to studies, which are using TAM model in a form or another. In year 2003 he stopped updating the webpage due to the fact that the number of studies related to TAM model had began to increase to such a level that keeping list up-to-date became virtually impossible.

Rogers (2003) has developed his framework on the Diffusion Of Innovations (DOI) during the last 30 years. Originally the model is based on the study of agricultural innovations, but it has been used quite widely in IT adoption studies (Prescott & Conger 1995; Fichman & Kemerer 1999; Gallivan 2001) along with many other areas and disciplines.

According to Rogers (2003: 5), diffusion is the process by which an innovation is communicated through certain communication channels over time among the

[146] http://www.guuspijpers.com/TAM.htm (cited January 5, 2007).

members of a social system. Innovation (ibid. 12) is an idea, object or practice which is perceived as new by an individual or another unit of adoption. As such, the diffusion process largely is a communication process (Kautz & Larsen 2000). Rogers (2003: 14) asks how to be able to make a difference where one innovation ends and another begins, and introduces concept technology cluster (technology cluster consists of one or more distinguishable elements of technology that are perceived as being closely interrelated).

The innovation-decision process is the process through which an individual (or other decision-making unit) passes from the first knowledge of an innovation, to the formation of an attitude toward the innovation, to a decision to adopt or reject, to implementation and use of the new idea, and to confirmation of this decision. This is a process crucial for the diffusion of an innovation. Here five stages are distinguished (Rogers 2003: 20):

1. Knowledge is gained when an individual (or one of the decision-making units) learns of the innovation's existence and gains some understanding of how it functions.

2. Persuasion takes place when an individual forms a favorable or unfavorable attitude toward the innovation.

3. Decision occurs when an individual engages in activities that lead to the choice to adopt or reject the innovation.

4. Implementation takes place when an individual puts an innovation into use. Re-invention is especially likely to occur at the implementation stage.

5. Confirmation occurs when an individual seeks reinforcement of an innovation-decision that has already been made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation.

In the innovation-decision process, potential adopters are interested in three types of knowledge. Awareness-knowledge consists of information about the existence of an innovation. Awareness-knowledge may motivate an individual to seek a second and third type of knowledge. How-to knowledge consists of information necessary to use an innovation properly. Principles-knowledge consists of information dealing with the functioning principles underlying how an innovation works. It is usually possible to adopt an innovation without principles-knowledge,

but the danger of misusing a new idea is greater and discontinuance may result. (Rogers 2003: 172-173)

Communication channels are the means by which messages get from one individual to another. Rogers (2003: 18) divides these channels in two categories; mass media channels and interpersonal channels. According to Rogers, mass media channels cover all those means of transmitting messages that involve a mass medium, such as radio, television, newspapers, and so on, which enable one or few individual to reach an audience of many, where Interpersonal channels involve a face-to-face exchange between two or more individuals. In addition to mass media and interpersonal communication channels, interactive communication via the Internet has become more important for the diffusion of certain innovations in recent decades. Another dimension Rogers (2003: 207) uses is the division to cosmopolite channels (which are those linking an individual with sources outside the social system under study) and localite channels (which are linking individuals with local sources). Here Interpersonal channels may be either local or cosmopolite, while mass media channels are almost entirely cosmopolite. Rogers also notes that cosmopolite channels are relatively more important at the knowledge state, and localite channels are relatively more important at the persuasion stage in the innovation-decision process. On the other hand, Rogers (ibid. 211) also generalizes communication channels by adopter categories by stating, that Mass media channels are relatively more important than interpersonal channels for earlier adopters than for later adopters.

Rogers (2003: 279) points out, that anyone seeking to standardize adopter categories must decide on (1) the number of adopter categories, (2) the portion of the members of a system to include in each category, and (3) the method, statistical or otherwise, of defining the adopter categories. Rogers presents five different (ideal type) adopter categories, which are (ibid. 282-285):

1. *Innovators (Venturesome)* play a gatekeeping role in the flow of new ideas into a system.

2. *Early adopters (Respect)* help trigger the critical mass when they adopt an innovation. The early adopter decreases uncertainty about new idea by adopting it, and then conveying a subjective evaluation of the innovation to near peers through interpersonal networks.

3. *Early majority (Deliberate)* follow with deliberate willingness in adopting innovations (but seldom lead). The early majority has a unique location between the very early and the relatively late to

adopt makes them an important link in the diffusion process. They provide interconnectedness in the system's interpersonal networks.

4. *Late majority (Skeptical)* often have scarce resources, and because of this most of the uncertainty about a new idea must be removed before the late majority feel that it is safe to adopt.

5. *Laggards (Traditional)* are the most localite of all adopter categories in their outlook. Many are near isolates in the social networks of their system. Their innovation-decision process is relatively lengthy, with adoption and use lagging far behind awareness-knowledge of a new idea. The laggard's precarious economic position forces the individual to be extremely cautious in adopting innovations.

Rogers (2003: 281) presents normal frequency distribution of the adopter categories, as illustrated in Figure 8. This provides a possible prediction about the progress of the diffusion process. In Rogers (ibid. 280-281) categories, the innovators cover the first 2,5 percentage of the individuals in a system to adopt an innovation. Next 13,5 percent are the early adopters. Next 34 percent are the early majority, as it is the following 34 percent, namely the late majority. Remaining 16 percent are the laggards.

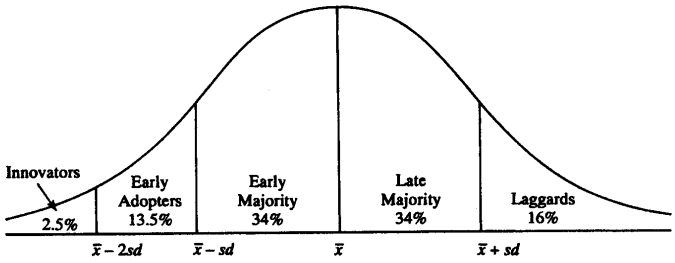

Figure 8. Adopter Categorization on the Basis of Innovativeness (Rogers 2003: 281).

The innovation itself plays an important role in innovation diffusion. Following five attributes affect the rate of adoption of an innovation. The better these attributes are understood, the higher are the chances of a successful adoption of an innovation (Rogers 2003: 15-16):

1. *Relative advantage* is the degree to which an innovation is perceived as being better than the idea it supersedes.

2. *Compatibility* is the degree to which an innovation is perceived as being consistent with existing values, past experiences, and needs of a potential adopters.

3. *Complexity* is the degree to which an innovation is perceived as being difficult to understand and use.

4. *Trialability* is the degree to which an innovation may be experimented with on a limited basis.

5. *Observability* is the degree to which the results of an innovation are visible to others.

Rogers' (2003: 30-31, 100) framework covers also the consequences of innovations. He defines consequences as the changes that occur to an individual or to a social system as a result of the adoption or rejection of an innovation. These consequences are classified as:

1. *Desirable* versus *undesirable* consequences, depending on whether the effects of an innovation in a social system are functional or dysfunctional.

2. *Direct* versus *indirect* consequences, depending on whether the change to an individual or to a social system occurs in immediate response to an innovation or as a second-order result of the direct consequences of an innovation.

3. *Anticipated* versus *unanticipated* consequences, depending on whether or not the changes are recognized and intended by the members of a social system.

Fichman & Kemerer (1999) point out, that innovation researchers have known for some time that a new information technology may be widely acquired, but then only sparsely deployed among acquiring firms. They claim that the observed pattern of cumulative adoptions will vary depending on which event in the assimilation process (i.e., acquisition or deployment) is treated as the adoption event and suggest that instead of mirroring one another, a widening gap-termed (which they refer as an assimilation gap) will exist between the cumulative adoption curves associated with the alternatively conceived adoption events. This is illustrated in Figure 9.

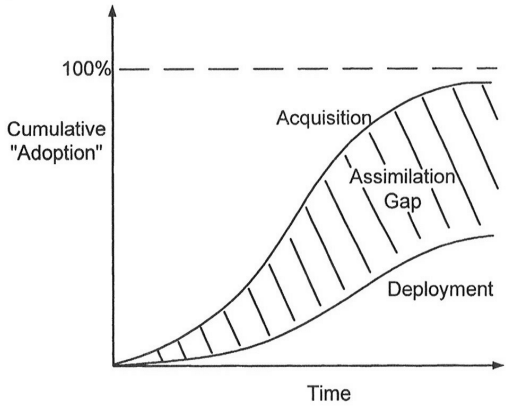

Figure 9. Assimilation Gap (Fichman & Kemerer 1999: 257).

Fichman & Kemerer (1999) claim, that when a pronounced assimilation gap exists, the common practice of using cumulative purchases or acquisitions as the basis for diffusion modeling can present an illusory picture of the diffusion process-leading to potentially erroneous judgments about the robustness of the diffusion process already observed, and of the technology's future prospects. They also warn that researchers may draw inappropriate theoretical inferences about the forces driving diffusion, or practitioners may commit to a technology based on a belief that pervasive adoption is inevitable, when it is not.

IT adoption on personal level has covered technology acceptance (Davis 1989; Davis et al. 1989), User Information Satisfaction (UIS) (Bailey & Pearson 1983; Ives, Olson & Baroudi 1983), end-user satisfaction (Doll & Torkzadeh 1988), computer self-efficacy (Marrakas, Yi & Johnson 1998), information acquisition (Vessey & Galleta 1991) as well technology usage (Taylor & Todd 1995) to name a few. Gallivan (2001: 53) refers to adoption process in organizational level, which occurs in two stages (Leonard-Barton & Deschamps 1988) and calls this Contingent Authority Innovation Adoption within Organizations. Processes, as described at a high level of analysis, are as follows. First, managers identify objectives to change some aspect of their business and seek available innovations which may fit their objectives. Second, managers proceed to make the primary adoption decision — essentially providing the "go ahead" for other members of the firm to purchase and implement the innovation. Third, the secondary innovation process takes place, and it is also influenced by other influences on innovation adoption. On this stage management may proceed by three fundamentally different paths to ensure secondary adoption: (a) they can mandate that the innovation be adopted throughout the organization at once; (b) they can provide the necessary infrastructure and support for users to adopt the innovation, while allowing it to diffuse voluntarily; or (c) they may target specific pilot projects with-

in the firm, observe the processes and outcomes that unfold, and decide whether to implement the innovation more broadly later on. (Gallivan 2001: 53)

Above mentioned process description does fall short in describing this two-stage process by neglecting details contained in the construct "other influences on innovation adoption" and this gap Gallivan (2001: 60) tries to fill with his theoretical framework. Theoretical framework used in Gallivan's study is presented in Figure 10.

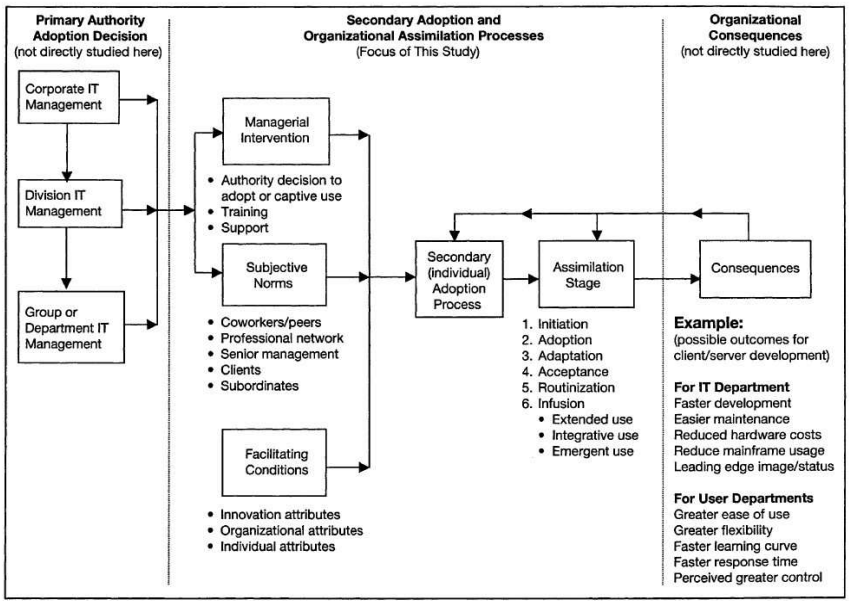

Figure 10. Theoretical Framework for Studying Two-Stage Innovation Adoption (Gallivan 2001: 60)

Theoretical framework traces a two-stage (or multi-stage) adoption process from the primary adoption decision, which may occur at the corporate-, division-, or department-level in an organization. Here the vertical dotted lines separating the figure into three sections (primary adoption, secondary adoption/assimilation, and outcomes) are used to indicate that focus of Gallivan's (2001) study is on the center part of Figure 10. (Gallivan 2001: 59, 61)

Gallivan (2001: 54) presented a classification scheme for different organizational adoption categories for two stage innovation adoption, as illustrated in Figure 11, which apparently offers obvious benefits when analyzing innovation adoption on organizational level. Gallivan (2001: 54) notes that innovation in organizations does not always occur top-down, but may instead emerge as a grass roots or bottom-up initiative (bottom-right and top-right cell). Both primary and secondary adoption occurs in contingent, authority based innovation adoption (top-left cell).

Further, although two-stage adoption may be the objective, the primary adoption decision does not guarantee that the innovation will actually be implemented or used by the targeted users (bottom- left cell), as illustrated by the notion of an assimilation gap in Figure 9 (Fichman & Kemerer 1999).

		Does the Organization Adopt the Innovation?	
Do Employees in the Organization Adopt the Innovation?		Yes	No
	Yes	Authority-based Innovation Adoption	Bottom-Up Adoption
	No	Adoption but No Deployment	Non-adoption

Figure 11. A Taxonomy of Two-Stage Innovation Adoption Types (Gallivan 2001: 54).

Jeyaraj, Rottman & Lacity (2006), performed a comprehensive literature survey on IT innovation adoption research. They found out that there are known theoretical biases in this research approach. These biases include the pro-innovation bias (all adoption is good) and the rational bias (adopters make rational decisions). There are also known methodological biases including recall bias (self reports are unreliable) and pro-adopter bias (non-adopters are understudied).

Jeyaraj et al. (2006) state that the best predictors of individual IT adoption include Perceived Usefulness, Top Management Support, Computer Experience, Behavioral Intention, and User Support. The best predictors of IT adoption by organizations were Top Management Support, External Pressure, Professionalism of the IS Unit, and External Information Sources. At the level of independent variables, Top Management Support stands as the main linkage between individual and organizational IT adoption. But at an aggregate level, two collections of independent variables were good predictors of both individual and organizational IT adoption. These were innovation characteristics and organizational characteristics. They also state that generic characteristics of the innovation and characteristics of the organization are strong predictors of IT adoption by both individuals and organizations. From the analyses, Jeyaraj et al. (ibid.) identified 10 prescriptions for future research. These are summarized in Table 6.

Table 5. Ten Prescriptions for IT Adoption Research (Jeyaraj et al. 2006: 2).

Analyses	**Prescription**
Predictors	1. Continue to use the best predictors of individual IT adoption: Top Management Support, Computer Experience, Perceived Usefulness, Behavioral Intention, and User Support. 2. Continue to examine promising predictors of individual IT adoption, including System Quality, Professionalism of the IS Unit, User Training, Computer Self-Efficacy, Outcome Expectations (performance), Outcome Expectations (personal), Perceived Behavioral Control, and Problem Importance. 3. Continue to use the best predictors of organizational IT adoption: Top Management Support, External Pressure, Organizational Size and External Information Sources. 4. Continue to examine promising predictors of organizational IT adoption, including Environmental Instability, Top Management Characteristics, System Quality, User Training, Experience, Quality Orientation, Administrative Intensity, Career Ladder, Managerial Training, Middle Management Support, and Customer Support.
Linkages	5. Use individual characteristics in organizational adoption studies to assess the characteristics of individuals within organizations that facilitate IT adoption, including Champions, Management, and Users. 6. Use environmental characteristics in individual adoption research. 7. Increase the study of Rate of Adoption as a dependent variable in individual adoption research.
Biases	8. Increase the study of Outcomes as a dependent variable in both individual and organizational adoption research to overcome the pro-innovation bias. 9. Increase the study of Actual System Use as a dependent variable in both individual and organizational adoption research to overcome the self-reporting bias. 10. Increase the study of non-adopters to overcome the adopter bias in individual adoption studies.

In their empirical study Garland & Noyes (2004) did find out that computer experience actually has a poor predictive ability in explaining computer attitudes. They note that this could be considered surprising in light of the consistent relationships between these constructs reported in the literature. On the other hand, they argue that this is a reflection of overstated earlier findings based on inappropriate statistical analyses.

Parthasarathy & Bhattacherjee (1998) studied post-adoption behavior (continued adoption versus discontinuance) within the context of online service use. Framework for their study was innovation diffusion theory in order to extend information technology adoption research to the case of post-adoption behavior. Results of their study indicate that potential discontinuers can be discriminated from continued adopters based on their sources of influence (external and interpersonal), perceived service attributes (usefulness and compatibility), service utilization and network externality (complementary product usage), during their time of initial adoption. Authors also note that later adopters are more likely to discontinue due to disenchantment than replacement, and are more influenced by interpersonal

sources and utilize the service less during their adoption period than replacement discontinuers.

For IT adoption studies, traditional innovation adoption frameworks have shown strong explanatory power. Technology Acceptance Model (TAM) and Roger's Diffusion of Innovation (DOI) are especially suitable for adoption scenarios, but these are restricted to situations where individuals voluntarily decide whether or not to use technology. In addition to these, also organizational level and mandated adoption of innovations should be covered, as Gallivan's (2001) framework suggests.

Cordella & Simon (2001: 190) use two concepts for analyzing technology adoption in organizations. These concepts are: 1) technology inscription, e.g. the rigidity of the technology in constraining the users in the way they are related to the technical object; and 2) organizational inscription, e.g. the level of freedom or rigidity in organizational procedures or, in other words, the extent to which organizational agents are allowed to reshape the ways in which the technical objects are used with respect to organizational rules. Authors (ibid.) note, that as a consequence of this relationship, organization and technology interact and reciprocally shape the organizational context that results from their interaction. This is to say, that technology provides a platform for performing organizational activities, and the way of using the technology in the organization 'situates' technology itself. Using these two concepts, a double-entry matrix can be outlined. This is illustrated in Table 6.

Table 6. Framework for Analyzing Infrastructure Implementation (modified from Cordella & Simon 2001: 190).

		Technology inscription	
		Low	High
Organization inscription	High	Rigid organization	Strict alignment
	Low	Loose coupling	Rigid technology

The double-entry matrix in Table 6 provides a combination of alternative scenarios based on different inscription levels in its two dimensions, and allows characterizing different ways of conceiving infrastructure and its deployment. The entries in the Table 6 represent four alternative infrastructure implementation contexts. These are (Cordella & Simon 2001: 190-191):

- *Strict alignment*. In this case, the design of organizational procedures leaves no room for local adaptation. At the same time, technology is rigid. There is no option for use outside the defined context. Standardization of technology and organizational procedures and strict alignment between these elements typically characterize the infrastructure.

- *Rigid organization*. Organizational procedures are strictly defined at global level, while technology is open to modifications. The infrastructure is characterized by tensions between different technologies adopted at local level.

- *Rigid technology*. Organizational procedures are open for local adaptation, while technology does not permit changes in use. Infrastructure is characterized by tensions between global and local organization procedures, which may aim to satisfy the same objectives, but differ in the means for their achievement.

- *Loose coupling*. Organizational procedures and technology use can be redefined and adapted locally. The infrastructure allows adaptation to internal and environmental dynamics and is typical of knowledge-intensive organizations.

Cordella & Simon (2001: 191) propose their framework to be considered as an explanatory model to understand possible interactions between organization and technology and to outline the characteristics of the infrastructure in use in these two dimensions. On the other hand they (ibid.) note that these four contexts presented can not serve as a prescriptive model for selecting the best possible infrastructure for a given organizational setting. In addition, neither can these contexts be used straight away for optimizing an organization using a specific technology.

According to a very common stereotype, men have been associated with technology, while women have often been depicted as more passive users (Van Slyke et al. 2002: 83). On the other hand, too many women seem to think that computers will play no role in their lives as professional adults (Leister 1993: 292). Although very common, it is questionable whether these claims are well founded. There has been previous research, which supports presumption that there are gender differences in computer usage (Leister 1993: 292; Venkatesh & Morris 2000: 129; Hakkarainen et al. 2000: 110), differences seem to be mainly found in differing attitudes towards ICT usage than actual use (Wood et al. 2002: 298).

When considering adopting ICT into use there seem to be noticeable differences between genders. Venkatesh & Morris (2000: 129) suggest that men are more

focused in their decision making regarding new technologies, while women are more balanced in their decision making process. In other words, while men only consider productivity related factors, women consider inputs from a number of sources including productivity assessments when making technology adoption and usage decisions. Wood et al. (2002: 298) on the other hand suggest that females in the university setting are quite comfortable using computers in a ”task-oriented” way, although do not feel as comfortable with computers nor are interested in computers just in their own right, like men are.

Gender, along with other factors, seems to be influencing social life in different dimensions. Gender seems to play important role in willingness to obtain skills necessary for success in information society (Leister 1993: 292). For example, Davies (1984, Quoted in Carter & Jenkins 1999: 3) observed that female students show a tendency towards working more consistently, and stamping out difficulties before they became real problems, whilst male students show more of a tendency to refuse to admit that there is a problem, often ignoring the issue until it has become much more serious. It appears that there are obvious differences in approaches towards learning ICT skills, but this difference could be explained through differing learning patterns between genders (Carter & Jenkins 1999: 3).

Empirical Findings and ICT Adoption Literature

Based on empirical findings it appears that there are several prerequisites which are influencing the adoption of new ICT into use and these can be grouped as prerequisites on two levels; personal and organizational. Gallivan (2001) suggests that adoption should be studied as two-stage process. Also Jayerajan et al. (2006) use two levels for summarizing prerequisites for successful adoption. On personal level *conscious choice, better than average IT skills* and *familiarity with the Internet applications* were found favorable conditions for adoption of new ICT based technologies. Favorable previous encounters with ICT, e.g., *previous experience* was also seen as a favorable prequisite for successful IT adoption, although literature has reported also opposite results (Garland & Noyes 2004).

Jeyaraj et al. (2006) state that the best predictors of individual IT adoption include Perceived Usefulness, Top Management Support, Computer Experience, Behavioral Intention, and User Support. In my study, on organizational level *working IT infrastructure*, and *organized IT support* were seen as favorable prerequisites, while the best predictors of IT adoption by organizations listed were Top Management Support, External Pressure, Professionalism of the IS Unit, and External Information Sources. Jeyaraj et al. (ibid.) noted that Top Management Support stands as the main linkage between individual and organizational IT adoption.

This is supported by the empirical findings of my study. On the other hand, innovation characteristics and organizational characteristics were listed (ibid.) as independent variables, which are good predictors of both individual and organizational IT adoption. These are important issues and apparently WBT systems in question and higher education context are to be taken into account.

Based on empirical findings I presented a data-driven IT adoption path (or framework) for successful ICT adoption in higher education. In this conceptual model predeterminants for intention to use target system are individual's freedom (e.g. freedom to decide and make a choice) and perceived usefulness of used technology. Also previous experience is suggested to have significance on perceived usefulness. Versatile system usage follows Intention to use. Both Perceived usefulness and Versatile system usage are affected by Pedagogical insight. Versatile system usage is also affected by the awareness of Immaterial issues.

When looking the results using theoretical framework from TAM, it can be quite unarguably said that perceived usefulness does play more important role than perceived ease of use. Venkatesh and Morris (2000) did suggest that this is a male dominant way of thinking, but this study does not make that clear difference between genders. This is quite obvious when listening stories about difficulties encountered when taking web based systems into use for the first time. On the other hand, if taking into consideration underlying factors added into TAM2 the picture gets a lot richer. When taking into account experience and voluntariness findings do point to this direction. These factors clearly support the adaptation of new educational technology and the continuation of use.

In case of involuntary usage, when decision of new technology adaptation was done against the will of individual by his superiors, result was simply one pilot, which did not bear any follow-ups afterwards. In all other cases the work and development has been voluntary, and therefore there is not enough material for comprehensive comparison. Although this one example suggests that voluntariness does play an important role and supports enhanced TAM2 model for this part.

Subjective norm did not present itself in the form it was introduced in TAM2, but when superior did suggest experimenting using web based course tools it did take place at least in one case. Image and job relevance were very important factors. Also output quality and result demonstrability both played important role. Result demonstrability seemed to be extremely important when judging whether or not to continue the use of system. All factors introduced in TAM2 were noticeable at least in some degree, but in none of the cases were all factors clearly present at

the same time. These findings suggest that there seems to be personal differences in approaches towards technology.

Virtual education can be seen as an innovation in a sense concept is used by Rogers (2003: 475): "*An idea, practice, or object that is perceived as new by an individual or other unit of adoption*". Empirical evidence in this study does not clearly support the logic of DOI. One reason might be that the process is in the very beginning, and thus only the venturesome innovations are engaged and openings in order to get early adopter involved are taking place. The other possible explanation for the difference between acquisition and deployment rates might be so called "assimilation gap" (see Fichman & Kemerer 1999). According to Fichman & Kemerer (ibid.), when a pronounced assimilation gap exists, the common practice of using cumulative purchases or acquisitions as the basis for diffusion modeling can present an illusory picture of the diffusion process-leading to potentially erroneous judgments about the robustness of the diffusion process already observed, and of the technology's future prospects. This viewpoint offers one approach for trying to understand present situation.

Interviews showed that people adapt and use technology in different ways. It appears that efforts put on virtual education have originated in two ways. First, it appears that virtual education has started as a work of open minded pioneers at grass roots, e.g. from bottom-up. Second, virtual education has been taken into organizations ICT strategies and policy, introducing the idea from top-down. Basically virtual education has been introduced into organization in two ways, but for some reason the spillover effect has not touched everyone.

Gallivan (2001: 54) suggested taxonomy of two stage innovation adoption types, where adoption is simply analyzed by asking whether or not organization and/or employees adopt the innovation. Gallivan (ibid.) noted that innovation in organizations does not always take place top-down, but may instead emerge as a grass roots or bottom-up initiative. It appears that this might even occur both ways. In higher education context, it appears that in virtual education the adoption occurs first bottom-up and later top-down. During the time when empirical data for this study was collected, both approaches were used. Problem on Gallivan's (ibid.) framework is that although organization has adopted the innovation and it is included in future strategies, the part of employees who have adopted the innovation are still a minority.

Previous studies have shown that there appears to exist differences in computer usage between men and women (Leister 1993; Venkatesh & Morris 2000; Hakkarainen et al. 2000). Venkatesh & Morris (2000: 129) do suggest that men are more focused in their decision making regarding new technologies, while women are

more balanced in their decision making process. In other words, while men only consider productivity-related factors, women consider inputs from a number of sources including productivity assessments when making technology adoption and usage decisions.

When analyzing interviews of this study, the way how women had made decision to adopt new technology seemed to be decision, which was made after very thorough thinking. The fact was that all women did have pedagogical studies behind them, and they were in many ways interested in improving their working and teaching methods. Such a simple and clear motive behind men's decision in taking new technology into use was not that clear but it implies that most significant factor is more concrete solution for a technical problem. This could be expressed in a form of question. Women could ask:" What good for my work process could follow from using this technology?" when men could ask:" How do I resolve this problem using technology at hand?" Here the difference is not only on attitudes towards ICT usage (Wood et. al. 2002), but more on actual use.

In addition to this, usually technology has been categorized to be very male dominant area (Van Slyke, Comunale & Belanger 2002; Leister 1993), but this study does not give any implications of that sort. Actually, when it comes to use of new methods to improve individual work process or achieve greater efficiency, women seem to be more open to try new ideas. This can be seen from the fact that when tracking down possible candidates for interviews, there seemed to be more women involved into this kind of development of one's teaching methods than men.

The most important reasons for adapting new technology and work processes seemed to be interest for subject matter, to try new things, to pursue new benefits, to solve a problem at hand and to utilize web resources in education. Almost all of the interviewed had at least some pedagogical studies behind them, only two men did not have any pedagogical background. For women the exploitation of highly developed interactive communication seemed to be most the crucial factor, when men seemed to be oriented to more technical details. This supports the assumption (Wood et al. 2002), that women are using IT in a more task-oriented manner than men.

4.2 Impacts of Computing

To bring technology, especially information technology into organizations is an area that has been studied quite widely during last couple of decenniums. Dams-

gaard & Scheepers (1999), suggested that Nolan was the first to address the need for a descriptive stage-theory concerning the planning, organizing, and controlling activities associated with managing the organizational computer resource. They also state that the arrival of newer technologies such as those based on the Internet calls for fresh approaches in terms of their implementation and management.

Orlikowski & Baroudi (1991) examined more than five years of published information systems literature – from between January 1983 and May 1988 – in four major information systems outlets. These sources were Communications of the ACM, Proceedings of the International Conference on Information Systems, Management Science, and MIS Quarterly. They studied the frequency of the various research designs. The three primary designs which emerged from this analysis are case studies (13.5 %), laboratory experiments (27.1 %) and surveys (49.1 %). These three designs account for almost 90 % of the studies. Surveys, however, were clearly the dominant research method in this sample. Only one action research study was found in their sample. They also found out that although their research is not rooted in a single over-arching theoretical perspective, it does exhibit a single set of philosophical assumptions regarding the nature of the phenomena studied by information systems researchers, and what constitutes valid knowledge about those phenomena. They claim that a single research perspective for studying information systems phenomena is unnecessarily restrictive, and argue that there exist other philosophical assumptions that can inform studies of the relationships between information technology, people, and organizations. They also suggest that much can be gained if a plurality of research perspectives is effectively employed to investigate information systems phenomena.

In their literature review on IS journal outlets Chen & Hirschheim (2004) continue the work of Orlikowski and Baroudi (1991). They investigated the paradigmatic and methodological progress made since 1991 by examining 1893 articles published in eight major IS publication outlets between 1991 and 2001. These journals were MIS Quarterly (MISQ), Accounting, Management and Organization from year 2001 Information and Organization (AMIT/IO), European Journal of Information Systems (EJIS), Journal of Information Technology (JIT), Information Systems Journal (ISJ), Information Systems Research (ISR), Journal of Management Information Systems (JMIS) and Proceedings of the International Conferences on Information Systems (ICIS). According to them, the long-term endeavours of interpretivist researchers might need to continue because the paradigmatic progress appears somewhat inconsequential; positivist research still dominates 81 % of published empirical research. They argue that US journals, as opposed to European journals, tend to be more positivist, quantitative, cross-sectional and

survey oriented. According to them survey research is still the most widely used method (41 %), although case studies have gained substantial recognition (36 %). They also point out that the increase of qualitative research (30 %), empirical studies (61 %) and longitudinal cases (33 %) at the expense of laboratory experiments (18 %) might suggest that IS researchers have become more interested in obtaining scientific knowledge in real world settings. They argue in that the field has been dominated by the positivist paradigm, despite calls to the contrary.

Richardson & Robinson (2007) took Chen & Hirchheim's (2004) survey as a starting point for their study, where their goal was to fill the gap left by the absence of the critical paradigm in Chen & Hirchheim's analysis and make some criticisms of their method, as well as to continue the work started by Orlikowski & Baroudi (1991). In addition to analyzing the same seven publications (except ICIS) for papers falling within the critical paradigm, Richardson & Robinson also reviewed two additional publications, where their goal was to consider the development of critical research in the chosen decade. These publications were the Proceedings of IFIP Working Group (WG) 8.2 Conferences and the journal Information Technology and People (IT&P). The data collected covered the period from the start of 1991 to the end of 2001. It is worth noting, that the categories they used for analysis diverged in part from those used by Chen & Hirschheim. They found no surveys, laboratory experiments, field experiments or practitioner-oriented papers among their sample of CISR (Critical IS Research). They pointed out that ISR and JMIS published no critical papers, while the other journal each published a small number of critical papers. They rightfully addressed their research "investigating the mysterious case of the missing paradigm", the critical approach to information systems (IS) research and by doing this they nicely supplemented work done by Chen & Hirschheim (2004).

As Leidner & Kayworth (2006) have noted, an understanding of culture is important to the study of information technologies in that culture at various levels, including national, organizational, and group, can influence the successful implementation and use of information technology. According to them (ibid.) culture also plays a role in managerial processes that may directly, or indirectly, influence on IT.

Leidner & Kayworth (2006) conducted a comprehensive review of the organizational and cross-cultural IT literature in order to study linkages between IT and culture. Leidner and Kayworth (ibid. 363) observed the following six themes in their literature survey: (1) culture and information systems development, (2) culture, IT adoption, and diffusion, (3) culture, IT use, and outcomes, (4) culture, IT management, and strategy, (5) IT's influence on culture, and (6) IT culture.

Summary of IT-culture research based on present literature is illustrated in Figure 12.

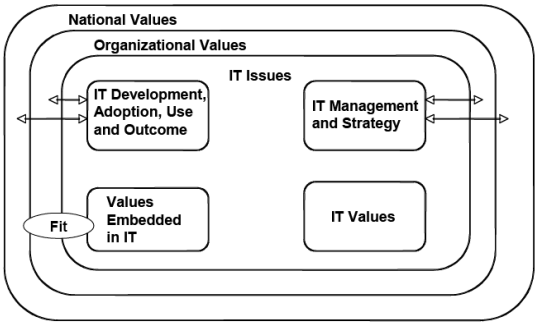

Figure 12. Summary of IT-Culture Research (Leidner & Kayworth 2006).

Leidner & Kayworth (2006: 373) suggest that according to findings in their review, IT-culture research must consider several forms of conflict that result from the intersection of national, organizational, and subunit cultures, values embedded in specific IT, and IT culture. They also prefer to refer to these as values rather than culture (ibid.). As a result, Leidner & Kayworth (ibid. 374) present propositions concerning three types of cultural conflict and the results of these conflicts. The three types of values are: (1) the group member values held by members of a group that signify the espoused beliefs about what is important to the particular group; (2) the values embedded in a specific IT refer to values that are assumed in the work behaviors that the IT is designed to enable; (3) the general IT values refer to those values that a group ascribes in general to IT. The three forms of values and the conflicts that result exist at the national, organizational, and subunit levels is represented in Figure 13 as three layers.

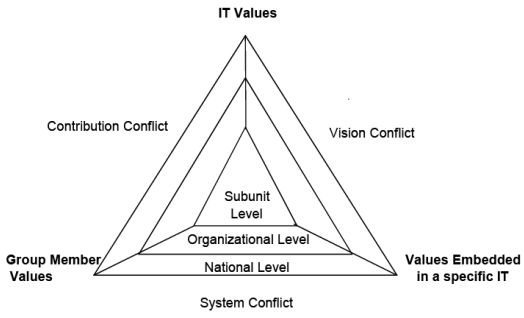

Figure 13. A Tripartite View of IT-Culture (Leidner & Kayworth 2006: 374).

In Leidner & Kayworth (2006) article, the theory presented suggests clearly that the reconciliation of these conflicts results in a reorientation of values. Authors (ibid.) also note that *it is via this reorientation of values that IT, over time, influences culture*.

Gallivan & Srite (2005) reviewed the literature on information technology (IT) and culture. According to them the construct of "culture" has alternately been defined and studied by international scholars as *national* culture, and by organizational scholars as *organizational* or *corporate* culture. They argue that these two research traditions have existed side-by-side, operating in parallel but not communicating effectively with each other. In their literature review they identify some gaps in these research streams, and propose a new conceptualization of culture. They ground their framework in social identity theory (SIT), and argue that it is necessary to advance from the fragmentary perspectives that exist at present to a more holistic view of culture.

Gallivan & Srite (2005) propose that social identity theory (SIT) is an alternate premise to traditional theories of OC and NC. Rather than emerging from cultural anthropology, SIT has its roots in social psychology. They argue that in developing a self-identity, people think of themselves as both individuals (i.e. their *personal* identity) and as members of certain groups (i.e. their *social* identity). According to them SIT explains three sets of processes with regard to how individuals identify with certain groups and how this shapes their attitudes and behavior: categorization, identification, and comparison. First, individuals *categorize* objects and people in order to simplify their understanding of reality; second, they *identify* with certain groups and not with others; lastly they engage in *comparison* processes, by evaluating their *in-groups* (i.e. groups with which they identify) relative to *out-groups* (i.e. groups with which they do not identify). During the latter two processes (identification and comparison), individuals emphasize the attributes for which they perceive in their in-group to be superior to various out-groups, and conversely, they de-emphasize the attributes on which their in-group may be judged inferior to others.

Huber (1990) concentrated studying the effects that computer-assisted communication and decision-aiding technologies have on organizational design, intelligence, and decision making. Huber's conceptual theory and propositions of the effects of advanced information technologies is presented in Figure 14. Huber's theory is related to the use of advanced information technologies, which he defines as (Huber 1990: 48): "*…devices (a) that transmit, manipulate, analyze, or exploit information; (b) in which a digital computer processes information integral to the user's communication or decision task; and (c) that have either made their appearance since 1970 or exist in a form that aids in communication or decision tasks to a significantly greater degree than did pre-1971 forms.*"

Huber (1990) formulated 14 propositions for better understanding of the effects of advanced information technologies in organizations. Propositions and corollaries

to proposition are summarized in Table 7. These propositions were not derived from a generally accepted theory. Instead, they were pieced together from organizational communication and information systems research.

Table 7. Propositions of the Effects of Advanced Information Technologies (Huber 1990).

No	Proposition
1	Use of computer-assisted communication technologies leads to a larger number and variety of people participating as information sources in the making of a decision.
2	Use of computer-assisted communication and decision-support technologies leads to decreases in the number and variety of members comprising the traditional face-to-face decision unit.
3	Use of computer-assisted communication and decision support technologies results in less of the organization's time being absorbed by decision-related meetings.
4	For a given organization, use of computer-assisted communication and decision-support technologies leads to a more uniform distribution, across organizational levels, of the probability that a particular organizational level will make a particular decision. **4a** For a highly centralized organization, use of computer-assisted communication and decision-support technologies leads to more decentralization. **4b** For a highly decentralized organization, use of computer-assisted communication and decision-support technologies leads to more centralization.
5	For a population of organizations, broadened use of computer-assisted communication and decision-support technologies leads to a greater variation across organizations in the levels at which a particular type of decision is made.
6	Use of computer-assisted communication or decision-support technologies reduces the number of organizational levels involved in authorizing proposed organizational actions.
7	Use of computer-assisted information processing and communication technologies leads to fewer intermediate human nodes within the organizational information-processing network. **7a** Use of computer-assisted information processing and communication technologies reduces the number of organizational levels involved in processing messages.
8	Availability of computer-based activity and transaction-monitoring technologies leads to more frequent development and use of computer-resident data bases as components of organizational memories.
9	Availability of more robust and user-friendly procedures for constructing expert systems leads to more frequent development and use of in-house expert systems as components of organizational memories.
10	Use of computer-assisted information processing and communication technologies leads to more rapid and more accurate identification of problems and opportunities.
11	Use of computer-assisted information storage and acquisition technologies leads to organizational intelligence that is more accurate, comprehensive, timely, and available.
12	Use of computer-assisted communication and decision-support technologies leads to higher quality decisions.
13	Use of computer-assisted communication and decision-support technologies reduces the time required to authorize proposed organizational actions.
14	Use of computer-assisted communication and decision-support technologies reduces the time required to make decisions.

Huber (1990) argues that presented propositions will not make a theory alone without a working framework. Huber uses constructs for summarizing and concept for connecting presented ideas. Resulting tentative framework is illustrated in Figure 14. In Hubers' theory four different concepts are utilized.

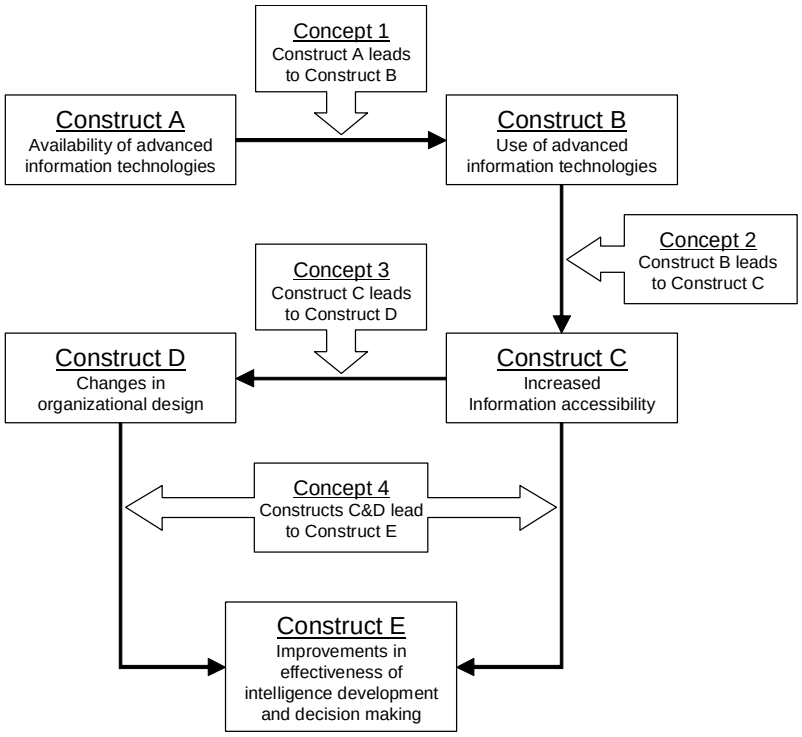

Figure 14. Conceptual Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making (Huber 1990: 66).

In *Concept 1*, advanced information technologies have properties different from more traditional information technologies. Availability of advanced information technologies (Construct A) extends the range of communication and decision making options from which potential users can choose. On occasion a technology will be chosen for use, and when chosen wisely — such that the chosen technology's properties better fit with the user's task — use of the technology leads to improved task performance. This reinforcement in turn leads to more frequent use of advanced information technology (Construct B). (Huber 1990: 65)

In *Concept 2* the use of advanced information technologies (Construct B) leads to more available and more quickly retrieved information, including external information, internal information, and previously encountered information, and thus leads to increased information accessibility (Construct C). Concept 2 follows from Propositions 1, 4, and 7 through 11. In *Concept 3* the increased information accessibility (Construct C) leads to the changes in organizational design (Construct D). Concept 3 follows from Propositions 1 through 7. (Huber 1990: 65)

In *Concept 4* increased information accessibility (Construct C), and those changes in organizational design (Construct D) that increase the speed and effectiveness

with which information can be converted into intelligence or intelligence into decisions, lead to organizational intelligence being more accurate, comprehensive, timely, and available and to decisions being of higher quality and more timely, decisions that lead to improvements in effectiveness of intelligence development and decision making (Construct E). Concept 4 follows from Propositions 11 through 14. (Huber 1990: 65)

In a classical work on issues concerning MIS implementation strategies by Markus (1983), three different theories of the causes of resistance are discussed. Simply stated, people resist MIS because of their own internal factors, because of poor system design, and because of the interaction of specific system design features with aspects of the organizational context of system use. These theories differ in their basic assumptions about systems, organizations, and resistance, but they also differ in predictions that can be derived from them and in their implications for the implementation process. The data and findings of a single case are used to illustrate abovementioned theories and to demonstrate the support for the third theory: "*People or groups resist systems because of an interaction between characteristics related to the people and characteristics related to the system*".

Attewell & Rule (1984) propose two well founded questions about research concerning computing in organizations, which are even more valid today than two decades ago. First issue is to determine as far as possible, what particular cause-effect relations prevail in specific context (for example, where is a computerization an authentic response to needs that are demonstrably fulfilled by the new technologies, and where, by contrast, might computerization actually create the needs that it is supposed to be fulfilling?). Second issue is locating such cases in which similar cause-effect relations can be expected to prevail. Attewell & Rule (1984: 1191) conclude that although the social impacts of computing are infinitely variable but that the sources of these variations are eminently accessible to study.

Markus & Benjamin (1996) studied the role of change agents in organizations, and they (Markus & Benjamin 1997) refer to the conception that the IT-enabled change in organizations would happen autonomously, following the “magic bullet theory” and see it as simply misguided. Markus & Benjamin (1997: 57) define the Magic Bullet Theory of Information Technology and Organizational Change as follows: *“IT changes people and organizations by empowering them to do things they couldn't do before and by preventing them from working in old, unproductive ways. I am an agent of change because I initiate, design, or build a powerful technology. When people use my systems, desirable organizational changes re-*

sult." Instead they see the change agents role as very important. They present two roles the change agents may take, change facilitator or change advocate.

According to Markus & Benjamin (1997: 63), agents of IT-enabled organizational change bring together all the necessary conditions for successful change: good technologies, supportive organizational conditions, and knowledgeable, mindful users. Whenever possible, they also empower all kinds of people about IT. They expand their opportunities to learn more about IT and organizational change and to effectively participate in IT decision making. Most of all, they foster a state of mind in which people accept responsibility for their IT-oriented behavior, however great and small their potential impact on organizational results.

Markus & Benjamin (1997: 64) also note that agents of IT-enabled organizational change can clearly see how the people in an organization can achieve better performance by adopting different work practices and using certain kinds of IT in certain ways. They are tireless, inventive promoters of the effective use of IT to achieve organizational goals. They use whatever tactics seem likely to work to change people's minds about the goals, the means, and the outcomes of their everyday actions.

For situations, where IT is used in such a way, that it can trigger major organizational changes, but creates high-risk and are potentially highly-rewarding, has Markus (2004) labeled a name; technochange (for technology-driven organizational change). According to Markus (2004) technochange differs from typical IT projects and from typical organizational change programs — and therefore requires a different approach.

According to Markus (2004) the risk that people will not use information technology and related work practices is not thoroughly addressed by the discipline of IT project management, which focuses on project cost, project schedule, and solution functionality. Another issue (ibid.) is that organizational change management approaches are generally not effective on their own, because they takes as a given the IT 'solutions' developed by a technical team. Consequently, the potential for the IT 'solution' to be misaligned with important organizational characteristics, such as culture or incentives, is great.

Merely combining IT project management and organizational change management approaches does not produce the best results, for two reasons. First; the additive approach does not effectively address the many failure threatening problems that can arise over the lengthy sequential process of the typical technochange lifecycle. Second; the additive approach is not structured to produce the characteristics of a good technochange solution: a complete intervention consist-

ing of IT and complementary organizational changes, an implementable solution with minimal misfits with the existing organization, and an organization primed to appropriate the potential benefits of the technochange solution. (Markus 2004)

Markus (2004) suggests that with hard work and care, the combined IT project management plus organizational change approach can be made to work, but an iterative, incremental approach to implementing technochange could be a better strategy in many situations. When studying the extent to which information technology deployed in work process facilitates changes in forms of control and forms of organizing, Orlikowski (1991) found out that information technology reinforced established forms of organizing and facilitated an intensification and fusion of existing mechanisms of control. According to her study (ibid.), when information technology mediates work processes, it creates an information environment, which while it may facilitate integrated and flexible operations, may also enable a disciplinary matrix of knowledge and power.

According to Orlikowski (1992a), early research studies assumed technology to be an objective, external force that would have deterministic impacts on organizational properties such as structure. Then again, later researchers focused on the human aspect of technology, seeing it as the outcome of strategic choice and social action. Orlikowski (ibid.) suggests that either view is incomplete, and proposes a reconceptualization of technology that takes both perspectives into account.

Jones & Karsten (2008) conducted a very comprehensive literature review within major academic IS journals on the work of Anthony Giddens (e.g. structuration theory) and its application in the IS field. They (ibid. 129-130) state that for analytical purposes, Giddens identifies three dimensions of structure (signification, domination, and legitimation), reflecting, it may be argued, his earlier theoretical interests on the work of Durkheim, Marx, and Weber. Figure 15 shows corresponding dimensions of interaction, described as communication, power, and sanctions, with which the structural dimensions are linked through modalities of, respectively, interpretive scheme, facilities, and norms.

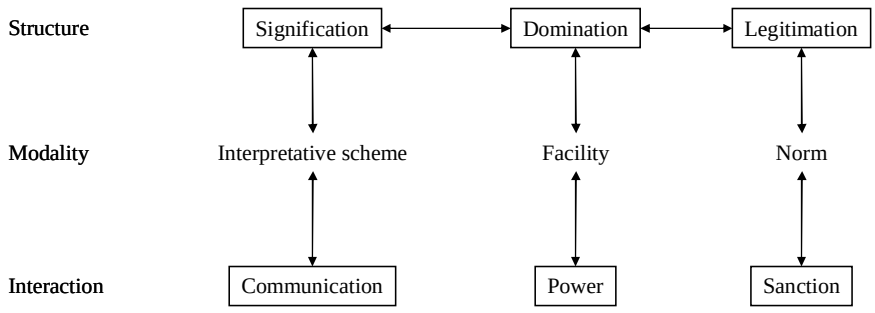

Figure 15. The Model of Structuration (Giddens 1984: 29).

According to Jones & Karsten (2008: 146) "*A number of aspects of the duality of technology would seem similarly at odds with Giddens's account of structuration.*" Where Orlikowski (1992b) pointed out that merely technology oriented, as well as merely human aspect oriented IS research is incomplete and asked for reconceptualization, Jones & Karsten (2008) use Giddens structuration theory for analyzing present IS research and for outlining promising opportunities for future structurational IS research. In a sense, Giddens structuration theory provides useful "theoretical lenses" for studying IT in organizations.

In a study of the introduction of groupware (Lotus Notes) into an organization by Orlikowski (1992b), results suggested that people's mental models and organization's structure and culture significantly influenced how groupware was implemented and used. Specifically, in the absence of mental models that stressed its collaborative nature, groupware was interpreted in terms of familiar personal, stand-alone technologies such as spreadsheets. Further, the culture and structure of the firm under study provided few incentives or norms for cooperating or sharing expertise. The firm's managers failed to modify this incentive structure.

Orlikowski made a follow-up study about successful groupware (also Lotus Notes in this case) implementation two years later (Orlikowski 1995) in order to understand how the technology was used to enable organizational changes over time. Building on its successful implementation of the groupware technology two years earlier, the customer support department realized many organizational changes that altered the nature and distribution of work, forms of collaboration, utilization and dissemination of knowledge, as well as coordination with internal and external units. These changes were enacted through a series of intended as well as opportunistic modifications to both the technology and the organization. The effectiveness of this change process suggests a strategy of implementing and using groupware technology that focuses first on enacting some initial planned organizational changes, and then builds on these to enact emergent changes in response to the opportunities and conditions occasioned by the planned changes. Because groupware technologies are largely open-ended and adaptable, this process of evolving organizationally with the technology over time may be a particularly useful way of implementing organizational change around groupware.

In the case of groupware implementation, some of the organizational changes were planned and some were emergent, namely use of the new electronic mechanism for collaboration led to an interesting emergent change in the customer support department: It shifted the form of collaboration from being primarily reactive to being primarily proactive. Because all specialists had access to the database of customer calls being worked on in the department, they browsed through each

others' calls to see which ones they could help on. Rather than waiting to be asked if they had solution to a particular problems (reactive collaboration), they actively sought problems that they had solutions for (proactive collaboration). (Orlikowski 1995)

According to Orlikowski (2000), as both technologies and organizations undergo dramatic changes in form and function, are organizational researchers increasingly turning to concepts of innovation, emergence, and improvisation to help explain the new ways of organizing and using technology evident in practice. With a similar intent, Orlikowski has proposed an extension of the structurational perspective on technology, that develops a practice lens to examine how people, as they interact with a technology in their ongoing practices, enact structures which shape their emergent and situated use of that technology. As such, Orlikowski (ibid.) developed a concept of a practice lens, which posits human as constituting structures in their recurrent use of technology. The practice lens she proposed focuses on emergent technology structures enacted in practice rather than embodied structures fixed in technologies. This practice lens further recognizes that in both research and practice researchers often conflate two aspects of technology: the technology as artifact (the bundle of material and symbol properties packaged in some socially recognizable form, e.g. hardware, software, techniques); and the use of technology, or what people actually do with the technological artifact in their recurrent, situated practices. The main message of Orlikowski's article appears to be that human conception about information systems changes during time, although the systems in question remain the same.

IT and organizations are an area, where research quite often requires "two supporting feet", namely both information technology and organization studies. Orlikowski & Barley (2001) raise this important topic into limelight by asking candidly: "What can research on information technology and research on organizations learn from each other?" Authors argue that because of important epistemological differences between the fields of information technology and organization studies, much can be gained from greater interaction between them. In particular, authors argue that information technology research can benefit from incorporating institutional analysis from organizational studies, while organization studies can benefit even more by following the lead of information technology research in taking the material properties of technologies into account.

Orlikowski & Barley (2001: 146-147) discuss the characteristics of both IT and organization research and state the agenda of much IT research is to develop systems and understand the consequences of information technology (whether models, techniques, or devices), given specific objectives and conditions of operation.

A considerable portion of IT research centers on the design, deployment, and use of artifacts that represent tangible solutions to real world problems. As such, IT has a great deal in common with engineering, architecture, and other fields of design. As in engineering, the practical question: ”What works?” drives much of IT research. Although engineers and designers draw extensively on general scientific knowledge, their attention and energy is typically focused on addressing problems that are contextually, materially, and temporally bounded. Similarly, the objective of much IT research is to generate situated explanations, develop explicit inventions, and propose particular, practical solutions concerning the role of information technology in contemporary life. Then again, the epistemology of organization studies more closely resembles that of a traditional science: To develop and test parsimonious explanations for broad classes of phenomena. The field's primary subject matter is human behavior in and between organizations at individual, group, organizational and interorganizational levels of analysis. As do other social scientists, students of organizations seek primarily to answer the question, “Why?” They strive for theories of high generality. The objectives of organization studies are, therefore, to discover regularities, articulate general principles, and identify causal relationships.

Markus & Robey (1988) consider theories about why and how information technology affects organizational life. They examine theories in terms of their structures, where three dimensions of causal structure are considered - causal agency, logical structure, and level of analysis. Causal agency refers to beliefs about the nature of causality: whether external forces cause change (technological imperative), whether people act purposefully to accomplish intended objectives (organizational imperative) or whether changes emerge unpredictably from the interaction of people and events (emergent perspective). Technological imperative, organizational imperative and emergent perspectives are illustrated in Figure 16.

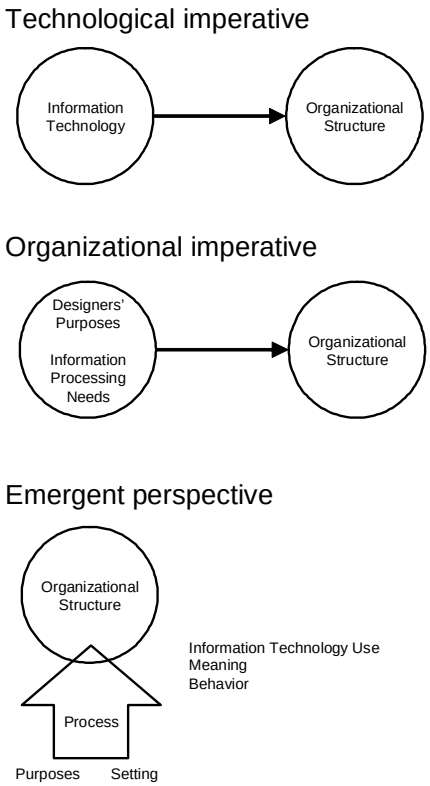

Figure 16. Technological Imperative, Organizational Imperative and Emergent Perspective (Markus & Robey 1988: 586).

Logical structure (ibid. 1988) refers to the temporal aspect of theory - static vs. dynamic - and to logical relationships between the "causes" and the outcomes [whether causes are related to outcomes in an invariant, necessary and sufficient relationships (variance models), or in a recipe of sufficient conditions occurring over time (process models)]. Concerning the logical formulation of the theoretical argument Mohr (1982) distinguishes between variance and process theories. The distinction in theoretical structure between variance and process theories is somewhat analogous to the distinction between cross-sectional and longitudinal research methodologies. Variance theories are concerned with predicting levels of outcome from levels of contemporaneous predictor variables; process theories are concerned with explaining how outcomes develop over time.

Level of analysis (Markus & Robey 1988) refers to the entities about which the theory poses concepts and relationships - individuals, organizations and society. Authors use three different types of entities, or levels of analysis: individuals, organizations, and society. Problems of inference arise when concepts are defined and data are collected at levels of analysis inappropriate for the theoretical propositions being examined. For example, researchers interested in organizational goals often collect data on the goals of key individuals. When inferences drawn

from these data refer only to organizational goals, levels of analysis have been confused. The customary division of levels of analysis into "macro-level" and "micro-level" theories reflect disciplinary boundaries, each with its favored research questions, acceptable methodologies, and conventions for reporting results The concepts in macro-level theories are properties of large scale collectives (organizations, populations, societies); this level of analysis is favored by macro-sociologists, macro-economists, and evolutionary theorists. The concepts in micro-level theories are properties of individuals and small groups; this level of analysis is favored by social psychologists and micro-economists.

Jasperson et al. (2002) studied the relationships between power and information technology impacts, development or deployment, and management or use using metatriangulation approach. In their study, they studied IT impacts, deployment or development, management and use ITIDMU (IT impacts, deployment of development, management and use, ITIDMU) and they examined the complex interrelationships among power and ITIDMU concepts using two sets of lenses. First set of lenses were referred as "technology lenses" and these were technological imperative, organizational imperative, and emergent perspective as proposed by Markus & Robey (1988). Second set of lenses were referred as "power lenses", and these were rational, pluralist, interpretive, and radical. This framework is a modified version of Burrel and Morgan's (1988) framework for sociological paradigms, according to Bradshaw-Camball & Murray's (1991) framework. Lenses are defined as follows (Jespersson et al. 2002: 407):

- *Rational*: Structural power that focuses on authority, information, and expertise as bases of power; emphasizes rational decision making. Power is viewed in terms of an objective reality in which there is an objectively identifiable, ordered set of optimal goals for the organization.

- *Pluralist*: Power that assumes objective definitions of power and that conflict is the norm; development, prioritization, and execution of organizational goals is an explicitly political process involving conscious negotiation based on control of resources and information. Power viewed in terms of an objective reality in which there are objectively identifiable sets of optimal goals for each participant in an organization.

- *Interpretive*: Power is based on the ability to control access to and direct the construction of organizational realities. Power that "assumes that reality is socially constructed … [and] that the parties involved exert influence by constructing the meaning of what others experience".

- *Radical*: Power and politics are outgrowths of social structures, such as class, racial, gender, or institutional structures, that exist outside any particular organization. Political activity, broadly defined, involves either maintaining or undermining (and ultimately overthrowing) existing power structures.

Based on each technology lens Jaspersson et al. (2002) provide metaconjectures. For the technological imperative they (ibid. 416-417) provide two metaconjunctures:

- Metaconjecture 1 (IT impact): IT use can moderate the effects of externally based power differentials on the distribution of participation in a group, organizational, or interorganizational decision-making process.

- Metaconjecture 2 (IT impact): IT use can only moderate the effects of externally based power differentials on the distribution of participation in a group, organizational, or interorganizational decision-making process on a temporary basis.

For the organizational imperative Jaspersson et al. (2002: 418, 420) provide three metaconjunctures:

- Metaconjecture 3 (IT management): Top management's failure to exercise formal authority leads to more prevalent exercises of influence behavior in IT decisions by other parties.

- Metaconjecture 4 (IT development): Top management support has more impact on project success in development environment characterized by resource conflict.

- Metaconjecture 5 (IT development): Top management support has more impact when there is uncertainty about the importance of IT generally or project specifically.

For the emergent perspective Jaspersson et al. (2002: 421, 423) provide three metaconjunctures:

- Metaconjecture 6 (IT management): In situations where the IT function and/or developers lack formal authority or resources, there is greater emphasis placed upon generating acceptance of a formal methodology which in turn alters the formal structures of authority.

- Metaconjecture 7 (IT management): In organizations or groups where the IT function and/or developers have high levels of formal authority or resources, there is less emphasis on educating top management and more on negotiating.

- Metaconjecture 8 (IT impacts): Once power-altering IT has been introduced, it takes some time for the organization to reach a new equilibrium state. The indicators of IT's impact on a new equilibrium state are evidenced by new power structures, language, and symbols.

Järvinen (2008a) analyzed existing review articles and identified two approaches: the concept-centric and lens-directed ones, and recommends concept-centric approach over lens directed one. Reason is that there were found many deficiencies in the lens-directed review articles. Järvinen (ibid.) suggested that one potential reason for using the lens-directed approach might to prepare a review article without any aim to continue any research study. In this case the researcher does not then have any particular research problem. In addition to this, the lens-directed approach appears to be easier than the concept-centric approach.

In order to understand relationship between IT and organizations, Orlikowski & Robey (1991) applied approach from social theory, where social phenomena can be understood as comprising both subjective and objective elements and applied this premise of duality into understanding the relationship between information technology and organizations. They constructed a theoretical framework in which the development and deployment of information technology in organizations is a social phenomenon, and in which the organizational consequences of technology are products of both material and social dimensions. According to them, the framework can be used to guide studies in two main areas of information systems research — systems development and the organizational consequences of using information technology.

Gurbaxani & Whang (1991) combined the transaction cost theory with the agency theory. According to them (ibid.) the trade-off between decreasing transaction costs and increasing internal coordination and operations costs gives the optimal vertical firm size. The transaction costs consist of operational (search, transportation, inventory holding, communications costs) and contractual (writing and enforcing contracts) costs. The internal coordination costs are the sum of the agency costs (monitoring costs, bonding costs, the residual loss) and decision information costs (information processing costs [communication, documentation] and opportunity costs due to poor information).

According to Gurbaxani & Whang (1991) roles of the IS in an organization are: a) it increases scale efficiencies of the firm's operations (operations); b) it processes basic business transactions (transaction processing); c) it collects and provides information relevant to managerial decisions and even makes decisions (decision support); d) it monitors and records the performance of employees and functional units (monitoring and performance evaluation); and e) it maintains records of status and change in the fundamental business functions within the organization and maintains communication channels (documentation and communication). Authors (ibid.) do note that their list is not exhaustive, and the items are neither clear-cut nor mutually exclusive. It appears that this list supplements nicely the role of IT presented so far.

Thong, Yap & Raman (1996) studied IS implementation in small businesses. They state that the top management support is seen as a key recurrent factor critical for effective information systems (IS) implementation. However, the role of top management support may not be as critical as external IS expertise, in the form of consultants and vendors, in small business IS implementation due to the unique characteristics of small businesses. These characteristics cover resource poverty, low uncertainty avoidance, less individualistic culture, and a come from behind use of IT. Results in their study show also that top management support is not as important as effective external IS expertise in small business IS implementation. While top management support is essential for IS effectiveness, high quality external IS expertise is even more critical for small businesses operating in an environment of resource poverty. While top management may provide the resources needed for the project, ultimately it is the external IS experts in the forms of vendors and consultants who implement the systems. The implication for small business management is that to achieve a high level of implementation effectiveness, they should direct more efforts at selecting and engaging high quality external vendors and consultants.

From a Social Informatics viewpoint Kling (2000: 219) stated the starting point as follows: *"To set the groundwork for sociotechnical networks, we start with a more general concept, that ICT, in practice is socially shaped. … We called this combination of equipment, people, governance structures, and ICT policies "the local computing package" or "web of computing"*. Following list (as adapted from Kling 2000: 219) summarizes some elements of above mentioned "local computing package":

- People in various roles and relationships with each other and with other system elements

- Hardware (computer mainframes, workstations, peripherals, telecommunications equipment)
- Software (operating systems, utilities, and application programs)
- Techniques (management science models, voting schemes)
- Support resources (training/support/help)
- Information structures (content and content providers, rules/norms/regulations, such as those that authorize people to use systems and information in specific ways)

The local computing package is also an example of a sociotechnical network. A socio-technical network brings together equipment, equipment vendors, technical specialists, upper-level managers, ICT policies, internal funding, and external grant funding with people who will use information systems in the course of other work (such as policing, accounting, taxing, or planning). These elements are not simply a static list but are interrelated within a matrix of social and technical dependencies. Table 8 illustrates some of the ideas that developed from the socio-technical networks approach. (Kling 2000: 219-220)

Table 8. Conceptions of ICT in Organizations/Society (Kling & Lamb 1999).

Standard (Tool) Models	**SocioTechnical Models**
IT is a tool	IT is a sociotechnical system
Business model is sufficient	Ecological view is needed
One shot implementation	Implementation are an ongoing social process
Technological effects are direct and immediate	Technological effects are indirect and involving different time scales
Politics are bad or irrelevant	Politics are central and even enabling
Incentives to change are unproblematic	Incentives may require restructuring (and may be in conflict with other organizational actions)
Relationships are easily reformed	Relationships are complex, negotiated, multivalent *the nature of the relationship with the customer makes a difference in what can become digital (including trust)
Social effects of IT are big but isolated and benign	Potentially enormous social repercussions from IT (not just QWL, it's overall quality of life)
Context are simple (described by a few key terms or demographics)	Context are complex (matrices of businesses, services, people, technology history, location, etc.)
Knowledge and Expertise are easily made explicit	Knowledge and Expertise are inherently tacit/implicit
IT Infrastructure are fully supportive	Articulation needed to make IT work

According to Kling (2000: 219), in the highly intertwined model, the technology in use and the social world are not separate – they constitute each other. This is to

say, that (ibid. 228-226): "*one key idea of social informatics research is that the social context of information technology development and use plays a significant role in influencing the ways in which people use information and technologies, and thus affects the consequences of the technology for work, organizations, and other social relationships. Social context can be characterized by particular incentive systems for using, organizing and sharing information in different work groups and work roles*".

Workable computer applications are usually supported by a strong sociotechnical infrastructure. Thus the surface features of computer systems are the most visible and are the primary subject of debates and systems analyses. But they are only one part of computerization projects. Many key parts of information systems are neither immediately visible nor interesting in their novelty. They include technical infrastructure such as reliable electricity. They also involve a range of skilled support – from people to documents system features and train people to use them, to rapid-response consultants who can diagnose and repair system failures. (Kling 2000: 228)

There has been recent discussion about the similarities and differences between Information Systems and Social Informatics. Järvinen (2006) suggests that according to the broad view on Information Systems they appear quite similar, but points out few differences. According to him Social Informatics prefers to use intensive case studies as a research approach in order to understand human behavior, while most Information Systems researchers are using surveys. Järvinen also notes that the researchers in both sciences seem to believe that people's behavior can be predicted, but argues that this is not true.

According to Gregor & Jones (2004) Information Systems (IS) as a discipline is concerned with action - the design, construction and use of software and systems involving people, technology, organizations and societies, while social informatics researchers (Kling 2000) study specific ICTs in specific settings to develop concepts and theories that apply to many kinds of ICTs in many kinds of settings. IS researchers are searching for guiding knowledge to be transferred from one situation to another, where underlying assumption is that people are considered to behave in a similar way to technology, i.e. regularly. Social informatics tries to understand how people's behavior can help scientists develop empirically-grounded concepts that help scientist to predict (or at least understand) variations in the ways that people and groups use information technologies (Kling 1999). Järvinen (2006) argues that because of free will, people do not always behave regularly or predictably, and hence both Social Informatics and Information Systems must be improved by new, more realistic models of the human being.

Barley (1996) studied the work of the technicians at the workplace. He concentrated on two questions: What do technician do and what do they know? According to Barley (ibid.), most occupations have historically revolved around the manipulation of things, symbols, or people. Work focused on things has traditional entailed little responsibility for symbols or people, and vice versa. In many systems of production, however, material and symbolic work cannot be completely segregated. When important symbols represent material phenomena, symbolic work will lack accuracy unless the symbolic and the material are linked. The core of technicians' work lies in creating these linkages.

Although the substance of technicians' work varied widely across the occupations Barley studied, his group found that all technicians worked at an empirical interface: A point at which a production system met the vagaries of the material world. Using sophisticated instruments, techniques, and bodies of knowledge, technicians stood with one foot in the material world and the other in a world of representations. Depending on the occupation, the material entities were computers, software, micro-organisms, the human body, a manufacturing technology, or another mechanical system. Similarly, depending on occupation, relevant representations consisted of data, test results, images or diagnoses. As Figure 17 indicates, bridging the material and the representational pivoted around two complementary processes, transformation and caretaking. (Barley 1996)

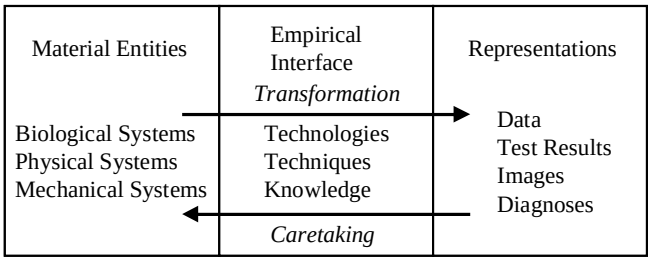

Figure 17. The Non-Relational Aspects of Technicians' Work: The Empirical Interface (Barley 1996: 419).

According to Barley (1996) transformation and caretaking at an empirical interface highlight the core of technicians' work: They are what makes technicians' work technical. But to understand technicians' role fully, one must also consider the social meaning of their work, which rested on how they were situated in a local division of labor. Whereas the nonrelational structure of technicians' work was constant across all occupations Barley and his group studied, they found that technicians were positioned in organizations in two different ways: as what they buffers (Figure 18) and brokers (Figure 19).

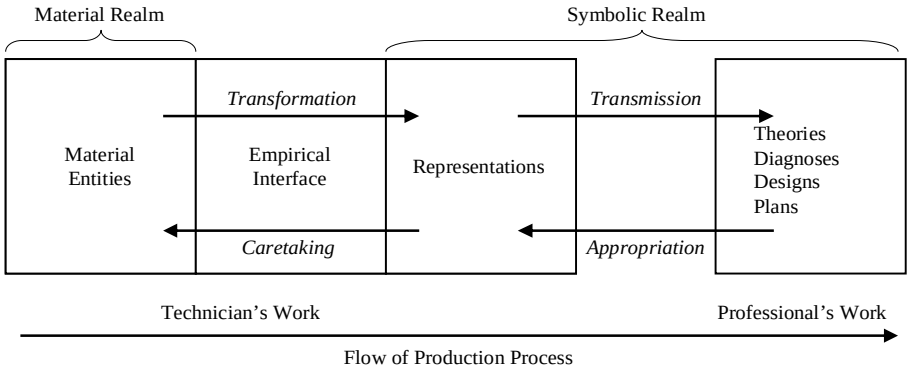

Figure 18. Buffer Technicians (Barley 1996: 421).

In Barley's (ibid.) description, the flow of production moves from left to right, with the technician first reducing physical phenomena to representations and then conveying those representations to a professional, who operates on the representations to synthesize a more complex symbolic product. Buffers routinely appropriated the professionals' theories plans, diagnoses, or designs to guide their own work at the empirical interface.

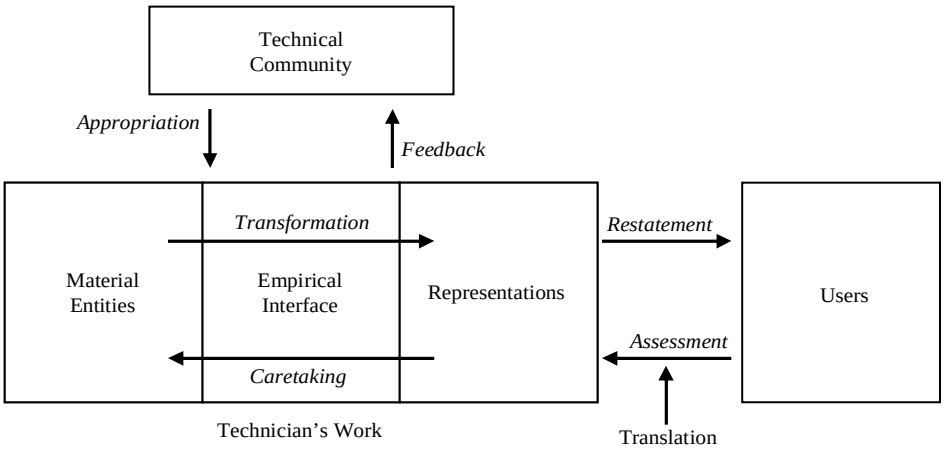

Figure 19. Broker Technicians (Barley 1996: 422).

Brokers in the Barley's study (1996) bridged two communities: the users they served (either permanently or temporarily) and the technical community associated with the technology for which they were responsible. The work entailed adapting the technical community's knowledge and products to the contextually specific needs of users, clients, or customers.

Kraut, Rice, Cool & Fish (1998) studied introduction and use of a pair of competing video telephone systems in a company. Consistent with utility explanations, people in the most communication-intensive jobs were the most likely to use video telephone. Consistent with social influence explanations, people used a par-

ticular system more when more people in general were using it and when more people in their work group were using it. In their study, two conceptually distinct, but empirically entangled, types of social influence emerged. First, use by other people changed the objective benefits and costs associated with using the systems, and thus their utility. Second, use by others changed the normative environment surrounding the new technology. Both utility and normative influences were stronger in one's primary works group. Kraut et al. (ibid.) suggests that implementers, users, and researchers should consider both utility and normative factors influencing both the success and failure of new organizational communication systems.

To summarize, Huber's (1990) conceptual theory, although dating nearly two decades back, provides insightful approach on organizational effects of IT adoption. Issues recognized by Huber are quite tangible, and relatively easier to perceive than IT-culture value issues recognized by Leidner & Kayworth (2006). Markus (1983) suggests that people resist MIS because of their own internal factors, because of poor system design, and because of the interaction of specific system design features with aspects of the organizational context of system use. Attewell & Rule (1984) suggest that one should determine as far as possible what cause-effect relations prevail in specific context and to locate such cases, in which similar cause-effect relations can be expected to prevail. Also Markus & Benjamin (1997) question that IT-enabled organizational change should happen autonomously, and suggest that solution for this should be persistent change agents.

While Orlikowski (1991) studied implementation of a new information technology at an accounting firm, it turned out, that CASE-tool controlled the design of information system. When Orlikowski (1992b) studied introduction of Lotus Notes into organization, the results suggested that people's mental models and organization's structure and culture significantly influenced how groupware was implemented and used. In this particular case the users were not told that the system has inbuilt groupware functionality, and in addition people in organization were working as private entrepreneurs, thus not encouraging the utilization of such tools. These both examples suggest that either IT influences the way how work is being done (Orlikowski 1991), but the way how technology is being taken into use is influenced by organization culture (Orlikowski 1992b).

While Orlikowski & Barley (2001) discuss the difference between IT engineers and organization scientists' different approaches on problem recognization and solving, theoretical framework used in Orlikowski's (2000) study from social sciences (e.g. Giddens' structuration theory) appears to interfere with the message of Orlikowski paper. Although widely cited theory in IS research (see Jones &

Karsten 2008), it is not always simple to transfer theories correctly from other disciplines on specific research problems.

Markus & Robey (1988) considered three lenses for understanding why and how IT affects organizational life. Suggested lenses were technological imperative, organizational imperative and emergent perspective, giving room for different interpretations. On the other hand, Kling (2000) and Lamb & Kling (2003) underline the importance of understanding that the technology in use and the social world are not separate, but instead they constitute each other. This is erroneous interpretation, because combining IT with people into social actor is not correct — these should not be treated as one unit. Then again on his study about technicians at the workplace, Barley (1996) suggested that all technicians worked at an empirical interface, meaning that technicians were operating on the other hand in the material world and on the other hand in a world of representations. Kraut et al. (1998) suggested that both utility and normative factors are important issues when implementing new IT systems.

Empirical Findings and ICT Impact Literature

There are obvious similarities with reported results in the IT impacts literature and empirical findings, but differences need a closer look. It appears that the context where this study has been conducted has its characteristics. Apparently the teachers work in higher education is usually quite lonesome work. This has both benefits and drawbacks. For example, in academic environment, there appears to exist a freedom in planning and organizing ones own courses so that administration does not dictate how to do things. On the other hand this culture might influence how the role of administration is seen by teaching personnel. Markus (1983) suggested that people or groups resist systems because of an interaction between characteristics related to the people and characteristics related to the system. It appears that both of these issues have impact on adoption of WBT systems. Empirical findings do give some implications that the characteristics related to people are a little stronger, but not the only issues of importance.

Reported changes on personal level were that the contacts are taking increasingly virtual form (e.g., interaction with students). Also the pioneer work has become of interest for others. Work is increasingly being done in front of computer and new technology requires development of new working routines. This is related to immaterial problems, which were seen as a concern. It was also reported that the roles between University's Computer Center and Learning Center were not at all that clear when it comes to WBT support, and on technical issues related to virtual education. All these findings indicate that the work itself is exposed to trans-

formation because of used technology. The critique Markus & Benjamin (1997) present on the "magic bullet theory" of information technology and organizational change appears to be well founded, when taking closer look at empirical findings. Whether one can talk about technochange (Markus 2004), or merely about expanding already existing possibilities in case of virtual education is another question. In many cases the virtual education endeavors appear to be experimental or additional issues along with more traditional ways of working in education.

The change to virtual education does not seem to happen automatically, like in the "magic bullet theory". Change needs change agents, but not as radical ones as described by Markus & Benjamin (1997). One function of Learning Center appears to be to act as a change agent, or as a supporting organizational unit for change agents. According to Markus (2004) the risk that people will not use information technology and related work practices is not thoroughly addressed by the discipline of IT project management, which focuses on project cost, project schedule, and solution functionality. This is an issue of great importance, and this study has shown that this is actually an issue to take a closer look at.

The ways how the WBT system was used highlighted two main categories of usage, as an information channel, or as a medium for delivering course materials or exercises. Interviewees presented many other uses for WBT system, but these mentioned ones were apparently the most important ones. Huber (1990) suggested that the availability of advanced IT that can improve performance, will be taken into use and will lead to more available, and more quickly retrieved information. According to Huber (1990) increased information accessibility leads to changes in organization design, which in turn increase the speed and effectiveness how information can be collected and utilized in decision making, thus improving organizational performance. Empirical findings suggest, that WBT systems cause changes, but not exactly like Huber (1990) predicted. IT will provide means for accessing and processing data very fast and accurately. In case of virtual education, organization design has changed, a new organization unit was founded (e.g. Learning Center). Findings of this study also indicate that in general level WBT is a natural extension for those who are already using IT in education (whether it is the use of presentation graphics during lectures, the Internet resources or the use of personal email for interaction with students) as long as it is technically possible. Huber (1990) appears to be missing one very important issue in his suggested framework, namely cases where advanced technology is not being adopted into use, although it is available. It appears that Huber's theory has the pro-innovation bias (Jeyaraj, Rottman & Lacity 2006) to tackle with, e.g. idea that "all adoption is good".

Huber (1990) proposed four different concepts for better understanding of the effects of advanced information technologies in organizations. Although the study was based on theoretical assumptions, it does provide useful tools for comprehending empirical findings for this study. According to first concept, advanced information technologies have properties different from more traditional information technologies. This applies very well on WBT, because technology of this type provides teachers (as well as students) flexibility from time and space, as well as possibilities for forming social networks and collaboration in such a manner that have not been possible before. According to second concept, the use of advanced information technologies leads to more available and more quickly retrieved information, including external information, internal information, and previously encountered information, and thus leads to increased information accessibility. This concept describes the very nature of the Internet as a communication channel in education. Although WBT systems provide means for organizing closed virtual learning environments, it is possible to use also inexhaustible information resources the Internet has to offer.

According to Huber's (1990) third concept, the increased information accessibility leads to the changes in organizational design. This can be seen from the fact that the Learning Center was founded to support the use of new educational technology in campus. Also other means to encourage good practices were used, in the form of financial support for projects concentrated on development of virtual education. Huber's (ibid.) fourth concept suggests, that increased information accessibility, and those changes in organizational design that increase the speed and effectiveness with which information can be converted into intelligence or intelligence into decisions, lead to organizational intelligence being more accurate, comprehensive, timely, and available to decisions being of higher quality and more timely, decisions that lead to improvements in effectiveness of intelligence development and decision making. In educational context this applies for individual courses and knowledge creation within this context. It appears that it is too early to make this type of generalization on virtual education and the use of WBT technologies in higher education.

It is not always easy to combine advanced information technology and users. When technology in question requires different type of thinking, it is even more demanding task. Barley's study (1996) used concept broker for persons, who managed to bridge the users they served and the technical community associated with the technology. University of Vaasa used to have clear separation between administration (including IT administration) and teaching and research personnel. When Learning Center was founded, the situation changed. This caused naturally a little bit disorder, because it was not that clear what was the responsibility of

this new unit — whether it was to support teaching, or to provide technical support. The latter used to be a task solely allocated to university's IT administration. When considering Barley's (ibid.) model, the Learning Center representatives are actually taking the role of a technical broker. In addition to this, they provide also support for pedagogical issues, thus following the idea presented by Barley (idid.) and even expand it further.

4.3 Theories on Development and Change

Studies concerning change and development in organizations have been studied by several disciplines. Since the rapid expansion of IT in all fields of life, the impacts it has on organizations and individuals has gained interest from IS professionals. Usually large scale changes and reorganizations in organizations require changes in information systems, but on the other side also implementation of new systems or changes in existing systems mediate changes in organizations. Thus it is only rational to include both technical and social aspects on studies concerning IT and organizations.

According to Huber (1990: 67) information technologies affect processes that are central to organization theory and due to this they also affect the potential nature of organization design (a principal application of organization theory). Therefore Huber (ibid. 67-68) suggests, that organizational researchers should study advanced information technology as (a) an intervention or jolt in the life of an organization that may have unanticipated consequences with respect to evolved organizational design, (b) a variable that can be used to enhance the quality (broadly defined) and timeliness of organizational intelligence and decision making, and (c) a variable that enables organizations to be designed differently than has heretofore been possible.

While Huber (ibid.) wanted to expand the knowledge or organizational researchers, Orlikowski & Barley (2001: 158) go even further by stating that combining information technology, and organization research in areas, where these have mutual interests, might prove out to be very productive.

Change in Organizations

Whenever a change is happening in an organization, it is actually a change process taking place. Van de Ven and Poole (1995) have identified four ideal process theories of organizational development and change, based on an interdisciplinary literature review. These are *Evolution, Dialectic, Life Cycle* and *Tele-*

ology. In Table 9 these process theories are summarized in terms of their members, pioneering scholars, event progressions, generative mechanisms, and conditions under which they are likely to operate. These theories provide fundamentally different accounts of the sequence of events that unfold to explain the process of change in an organizational entity.

Table 9. Families of Ideal-Type Theories of Social Change (Van De Ven & Poole 1995: 514).

Family	Life Cycle	Evolution	Dialectic	Teleology
Members	Developmentalism Ontogenesis Metamorphosis Stage & cyclical models	Darwinism evolution Mendelian genetics Saltationism Punctuated equilibrium	Conflict theory Dialectical materialism Pluralism Collective action	Goal setting, planning Functionalism Social construction Symbolic interaction
Pioneers	Comte (1798-1857) Apencer (1820-1903) Piaget (1896-1980)	Lamarck (1744-1829) Darwin (1809-1882) Mendel (1822-1884) Gould & Eldridge (1977)	Hegel (1770-1831) Marx (1818-1883) Freud (1856-1939)	Mead (1863-1931) Weber (1864-1920) Simon (1916-)
Key metaphor	Organic growth	Competitive survival	Opposition, conflict	Purposeful cooperation
Logic	Imminent program Prefigured sequence Compliant adaptation	Natural selection among competitors in a population	Contradictory forces Thesis, antithesis, synthesis	Envisioned and state Social construction Equifinality
Event Progression	Linear & irreversible sequence of prescribed stages in unfolding of immanent potentials present at the beginning	Recurrent, cumulative, & probabilistic sequence of variation, selection, & retention events	Recurrent, discontinuous sequence of confrontation, conflict, and synthesis between contradictory values or events	Recurrent, discontinuous sequence of goal setting, implementation, and adaptation of means to reach desired end state
Generating Force	Prefigured program/rule regulated by nature, logic, or institutions	Population scarcity Competition Commensalism	Conflict & confrontation between opposing forces, interests, of classes	Goal enactment consensus on means cooperation/symbiosis

According to life-cycle theory, change is imminent. The typical progression of change events in a life-cycle model is a unitary sequence, which is cumulative and conjunctive. Each stage of development is seen as a necessary precursor of succeeding stages. Life-cycle theories of organizational entities often explain development in terms of institutional rules or programs that require developmental activities to progress in a prescribed sequence. (Van de Ven & Poole 1995: 515)

According to teleology, development of an organizational entity proceeds toward a goal or an end state. It is assumed that the entity is purposeful and adaptive; by itself or in interaction with others, the entity constructs an envisioned end state, takes action to reach it, and monitors the progress. Thus, proponents of this theory view development as a repetitive sequence of goal formulation, implementation, evaluation, and modification of goals based on what was learned or intended by the entity. The theory can operate for an individual or for a group of individuals or organizations who are sufficiently likeminded to act as a single collective entity. (Van de Ven & Poole 1995: 515-516)

Dialectical theory begins with the Hegelian assumption that the organizational entity exists in a pluralistic world of colliding events, forces, or contradictory val-

ues that compete with each other for domination and control. In a dialectical process theory, stability and change are explained by reference to the balance of power between opposing entities. Struggles and accommodations that maintain the status quo between oppositions produce stability. Change occurs when these opposing values, forces, or events gain sufficient power to confront and engage the status quo. The relative power of an antithesis may mobilize an organizational entity to a sufficient degree to challenge the current thesis or state of affairs and set the stage for producing a synthesis. Over time, this synthesis can become the new thesis as the dialectical process continues. By its very nature, the synthesis is a novel construction that departs from both the thesis and antithesis. However, there is no assurance that dialectical conflicts produce creative syntheses. In terms of organizational change, maintenance of the status quo represents stability, but its replacement with either the antithesis or the synthesis represents a change, for the better or worse. (Van de Ven & Poole 1995: 517)

As in biological evolution, change proceeds through a continuous cycle of variation, selection, and retention. Although one cannot predict which entity will survive or fail, the overall population persists and evolves through time, according to the specified population dynamics. Whatever the organizational level, an evolutionary model can be used to focus on processes of variation, selection, and retention among numerous organizational entities. Alternative theories of organizational evolution can be distinguished in terms of how traits are inherited, the rate of change, and the unit of analysis. (Van de Ven & Poole 1995: 518-519)

Figure 20 shows two analytical dimensions for classifying these developmental progressions in the four ideal-type process theories: the unit and mode of change. Arrows are used to illustrate likely sequences among events.

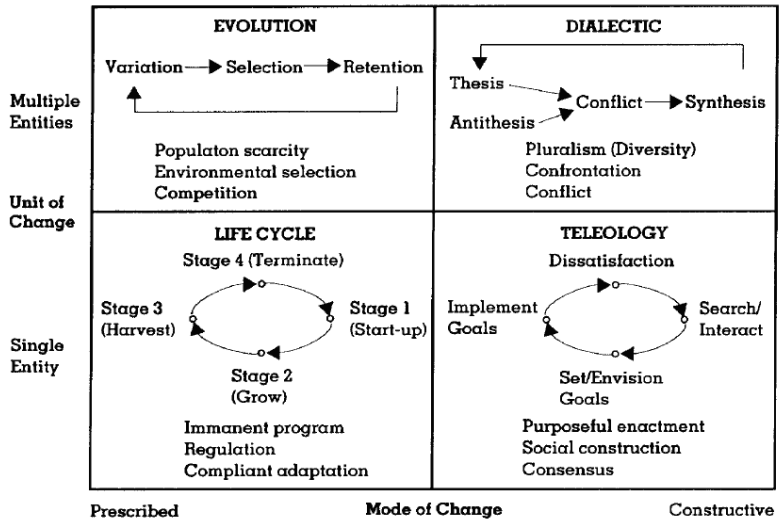

Figure 20. Process Theories of Organizational Development and Change (Van de Ven & Poole 1995: 520).

In each of these four process theories presented, the process of development is viewed as unfolding in a fundamentally different progression of change events and is governed by a different motor (ibid. 520-521):

- **A life-cycle model** depicts the process of change in an entity as progressing through a necessary sequence of stages. An institutional, natural, or logical program prescribes the specific contents of these stages.

- **A teleological model** views development as a cycle of goal formulation, implementation, evaluation, and modification of goals based on what was learned by the entity. This sequence emerges through the purposeful social construction among individuals within the entity.

- In **dialectical models** of development, conflicts emerge between entities espousing opposing thesis and antithesis that collide to produce a synthesis, which in time becomes the thesis for the next cycle of a dialectical progression. Confrontation and conflict between opposing entities generate this dialectical cycle.

- **An evolutionary model** of development consists of a repetitive sequence of variation, selection, and retention events among entities in a designated population. Competition for scarce environmental resources between entities inhabiting a population generates this evolutionary cycle.

Change and developmental processes go on at many organizational levels, including the individual, group, organization, population, and even larger communities

of organizations. These levels can be collapsed into questions whether the change in question focuses on the development of a single organizational entity or on the interactions between two or more entities. Evolutionary and dialectical theories operate on multiple entities. Evolutionary forces are defined in terms of the impact they have on populations and have no meaning at the level of the individual entity. Dialectical theories require at least two entities to fill the roles of thesis and antithesis. Conversely, life-cycle and teleological theories operate on a single entity. Life-cycle theory explains development as a function of potentials immanent within the entity. Although environment and other entities may shape how this immanence is manifested, they are strictly secondary. (Van de Ven & Poole 1995: 521)

Another way for distinguishing the four motors can be done in terms of whether the sequence of change events is prescribed a priori by either deterministic or probabilistic laws, or whether the progression is constructed and emerges as the change process unfolds. A prescribed mode of change channels the development of entities in a pre-specified direction, while a constructive mode of change generates unprecedented, novel forms that often are discontinuous and unpredictable departures from the past. Life-cycle and evolutionary theories operate in a prescribed modality, while teleological and dialectical theories operate in a constructive modality. (Van de Ven & Poole 1995: 522)

Tsoukas & Chia (2002) suggest, that traditional approaches to organizational change have been dominated by assumptions privileging stability, routine, and order. Because of this, as authors argue, organizational change has been reified and treated as exceptional rather than natural. They provide a different approach on understanding organizations, namely an account of organizational change on its own terms - to treat change as the normal condition of organizational life. They ask: What must organization(s) be like if change is constitutive of reality? By asking this they want to put focus on the pervasiveness of change in organizations, and this they refer as organizational becoming.

According to Tsoukas & Chia (2002) organization aims at stemming change but, in the process of doing so, it is generated by it. Feldman on the other hand (2000) argues, that organizational routines have a great potential for change even though they are often perceived, even defined, as unchanging. Feldman (ibid.) studied more than four years three routines in the housing function providing dormitories for approximately 10.000 single students and 4000 family members. Those routines were damage assessment, move-in, and hiring and training. Based on the changes in these routines, Feldman proposed a performative model of organizational routines, as illustrated in Figure 21. This model suggests that there is an

internal dynamic to routines that can promote continuous change. The internal dynamic is based on the inclusion of routine participants as agents.

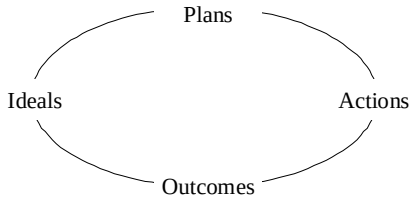

Figure 21. A Performative Model of Routine (Feldman 2000).

Feldman (2000) writes that the change process described is similar as the teleological change model described by Van de Ven & Poole (1995). She also observed how organizational routines involve people doing things, reflecting on what they are doing, and doing different things (or doing the same things differently) as a result of the reflection. Thus, organizational routines can include the 'double loop learning' as Argyris (1977) has identified. She also applied her model (Figure 21) to Nonaka & Takeuchi's (1995) view on organizational learning; "*Starting at the top of the diagram, plans become internalized or embodied into actions. This embodied knowledge becomes shared or socialized as the actions manifest themselves in outcomes. This shared knowledge is externalized as people compare it to models or ideals. These models or ideals then become systematized as plans that can be enacted in the next iteration of the routine.*" It should be noted, that Feldman's (2000) description of change process requires knowledge conversion from tacit knowledge to explicit knowledge.

When considering organizational change and Feldman's (2000) performative model for routine, learning and change are usually connected to each other. Although all presented theories of change (Van de Ven & Poole 1995) have one thing in common, namely iteration, none of these models include learning as a separate stage in their iterative processes. Although iteration usually includes reflection at least in some form, it is not that clearly reported in the models. Here Kolb's (1984) experiential learning model provides useful approach for understanding work-related learning. The model is presented as a learning cycle that contains four stages: concrete experience, reflective observation, abstract conceptualization, active experimentation, and the cycle then continues. This model is presented in Figure 22.

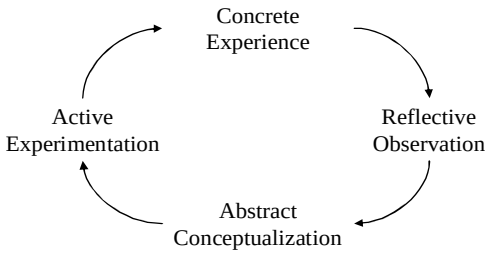

Figure 22. The Stages of the Kolb's Learning Model (Kolb 1984).

Huy (2001) questions whether change research has produced a cumulative and falsifiable body of knowledge and that there is a need to study change process from manager viewpoint. This applies especially on planned changes putting focus on two often neglected issues; time and content of change. There are several important reasons for this. Time is embedded in change process, but it is often left unstudied in organizational change theories. Second, content is one of critical dimensions in change in addition to context and process. Third, time and content are entwined often together in planned changes, because some parts of organizational elements change faster than other parts.

Huy (2001) proposes four ideal types of planned change processes, each with distinct temporal and nontemporal assumptions, and each associated with altering a distinct organizational element. Huy recognizes four types; commanding, engineering, teaching, and socializing. These ideal types are illustrated in Table 10. Huy describes each ideal type using five elements from change theory, and defines proposition for each change type, e.g. how to deal with change process in relation to timing.

Table 10. Content of Change and Associated Change Intervention Ideal Types (Huy 2001: 604).

	Emphasis of Change Literature	
Tangibility of Content	Episodic Change	Continuous Change
Tangible	Formal structures (changed through commanding)	Work processes (changed through engineering)
Intangible	Beliefs (changed through teaching)	Social relationships (changed through socializing)

Large-scale change, by definition, involves a significant alteration of many organizational elements, such as formal structures, work systems, beliefs, and social relationships. Large change process is often impossible to carry out applying only one change type, and because of this Huy (ibid.) suggests that ideal types should be used jointly together. Table 11 summarizes limitations of each presented intervention approach. In addition Huy analyses three situations, where jointly use of

ideal types is started with: a) using commanding; b) using one of three other types; or c) using a combination of ideal types.

Table 11. Limitations of Each Intervention Approach for Realizing Large-Scale Change (Huy 2001: 612).

Intervention Ideal Type	Potential Limitations of Intervention Approach Enacted in Isolation
Commanding	Could create covert resentment and resistance. Seldom leads to lasting, deep change in beliefs and values
Teaching	Cognitive change does not always lead to sustained behavioral change. Individualistic cognitive change seldom leads to corporate-wide strategic realization.
Engineering	Reinforces autonomy and parochialism of business units at the expense of corporate-wide integration and cooperation. Successful pilot site experiments rarely spread, for their very success generates defensiveness and rejection by other business units claiming that they are different.
Socializing	Too much socializing could create a splintered, anarchic organization. Groups work at cross-purposes and fight one another for scarce resources. Local expenditure of resources with little clear collective focus. Danger that informal groups indulging in experiential learning may narrow competence and creativity, limit the range of options considered, and tend toward inertia.

Both Van de Ven & Poole (1995) and Huy (2001) agree that organizational change process seldom includes ideal types in their pure form. While Huy (2001) suggests that ideal types of planned change processes should be used jointly together, Van de Ven & Poole (1995) see that new organizational change theories can be created by different combinations of aforementioned ideal type theories of social change. Both authors seem to agree on the fact that no single theory can cover large scale of changes in organizations.

Stability in Organizations

Widely used idea in both organization studies (Scott 1987) and IS studies (Sarker 2000; Keen 1981) is the Leavitt's diamond (Leavitt 1965). Although Leavitt (1965: 1144-1145) identifies the four "internal" elements (structure, tasks, technology and people), he does not include the environment as a separate factor. Scott (1987: 15) criticizes Leavitt for this, and suggests that environment is an indispensable ingredient in any organizational model. Figure 23 illustrates this supplemented organization model.

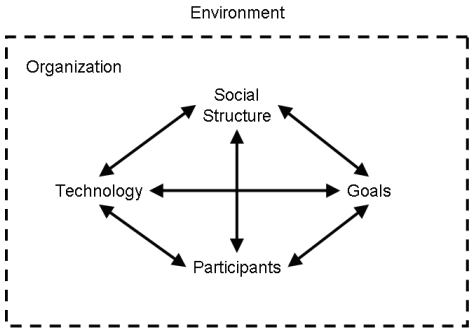

Figure 23. Leavitt's Diamond (adapted from Scott 1987: 15).

Basic underlying idea here is that organization is trying to maintain inner balance all the time, even when changes take place in organization. When a part of organization changes, other parts try to respond to the situation in such a manner that balance can be reached once again. Scott (Scott 1987: 15) suggests that components forming Leavitt's diamond are Social Structure, Technology, Participants and Goals, while Leavitt (1965: 1144-1145) used Structure, Technology, People and Tasks.

According to Sarker (2000: 195), implementation in its broadest sense refers to all that must be done by a specific organization for it to be able to harness the capabilities of a particular information technology as envisioned. A number of prominent operations research/management science (OR/MS) and information systems (IS) researchers have recognized that behavioral issues rather than technological issues seem to be at the root of problems related to implementation (Sarker 2000; Bostrom & Heinen 1977). Bostrom & Heinen (1977) underline the significance of interacting variable classes within work system by dividing work system into a) social system and b) technical system as illustrated in Figure 24. They use similar elements as in Leavitt's diamond; structure, people, technology and tasks (see Leavitt 1965).

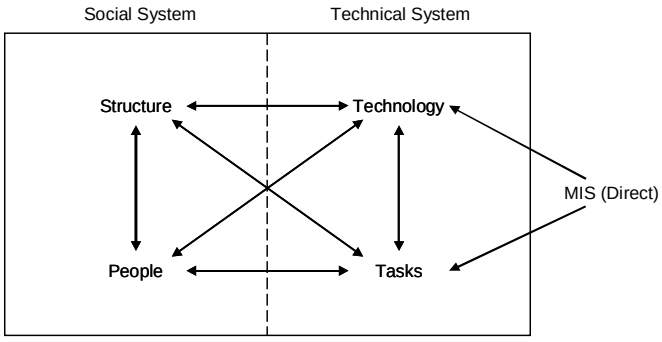

Figure 24. The Interacting Variable Classes Within a Work System (Bostrom & Heinen 1977: 25).

Alter (2008: 451) defines a work system as a system in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce specific products and/or services for specific internal and external customers. Alter (ibid.) also argues, that an IS is a work system whose processes and activities are devoted to processing information, that is capturing, transmitting, storing, retrieving, manipulating, and displaying information. Thus, an IS is a system in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce informational products and/or services for internal and external customers.

Bostrom & Heinen (1977: 25) state that in IS design the limited focus on particular changes in the task and technology variables leads the systems designer to ignore the fact that these changes cause more changes within other variables in the work system. Thus, these other changes are labeled secondary changes or effects — because they were not given primary consideration in the MIS design. They (ibid.) also underline the fact that substantial changes in the work relationships among people accompany changes in task structure. These secondary changes in the work relationships and people variables are as important as the changes in the task and technology variable. The most important message Bostrom & Heinen (ibid.) state is that all of these types of changes should be designed to complement and reinforce each other.

As widely used as Leavitt's diamond (Leavitt 1965) and theories derived from it are, there are few issues worth noticing. First, theory bundles together concepts, which usually are measured using very different scales. Second, skill-, information- and knowledge resource are lacking from theory. Third, "social" resources are over represented in theory. Fourth, task (or goals) is not resource, but instead describes what is being done. On the other hand, the universal principle of parts forming the system adapting them to be able to respond on changes in system appears to stand up to the ravages of time quite well.

Work Design

Buchanan (1979: 6) identifies the range of work (or job) design benefits in three categories. These are system gains, personnel benefits and worker benefits (ibid.):

1. **System Gains**: improved productivity; increased efficiency; reduced costs; increased profits; improved quality; reduced inspection; improved output; reduced training costs; reduced downtime; reduced shortages; increased flexibility

2. **Personnel benefits**: reduced labour turnover; reduced absenteeism; reduced lateness; improved work attitudes; increased commitment; fewer grievances; improved communications

3. **Worker benefits**: increased earnings; improved job satisfaction

According to Buchanan (1979: 138-141) there are at least six key problems that job design theories have in common: (1) Limited ability to predict the effects of job design on other parts of the organization; (2) Difficulty in defining significant job characteristics in operational terms; (3) Difficulty in transferring theory and practice from one organizational setting to another; (4) Difficulty in implementing job design change that cater for individual differences; (5) Difficulty in calculating the durability of champ; (6) Difficulty in evaluating the effects of job design on the quality of working life.

Buchanan (1979) identifies four different generations in job design. According to Buchanan, Taylor (1911) and Gilbrecht (1914) represent generation 0. Main idea proposed in these theories is that worker works more efficiently as long as he/she does not think while working. Buchanan considers Viteles (1950) to be one of first representatives of first generation theories of job design. These studies are based on relations illustrated in Figure 25.

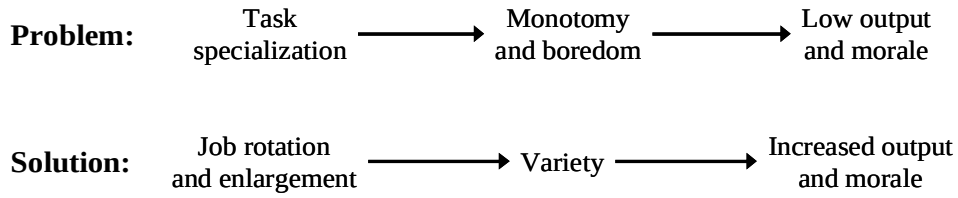

Figure 25. Arguments for Job Rotation and Enlargement, First Generation Theory (Buchanan 1979: 24).

Founding components of the first generation theory are job rotation and enlargement, but here problem is the amount how much to enlarge, or how often to use job rotation. Järvinen (1990: 37) criticizes this by pointing out that continuous job rotation might result many additional tasks related to starting a new job, and/or finishing it. Problem is that when there are far too many changes, tasks become "scattered" and the positive work experience might turn into negative one.

Ten years after Viteles separated Katzel, Barrett & Parker (1961) working environment, and employee's characteristics as variables that influence satisfaction and performance. Buchanan (1979) refers Katzel et al. (1961) theory as job enlargement, as illustrated in Figure 26.

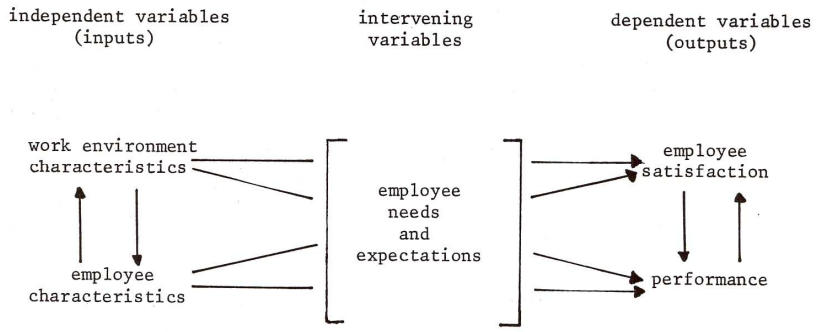

Figure 26. Model of the Work Situation: Second Generation Theory (Buchanan 1979: 33).

Buchanan (1979) refers third generation job design theory as job enrichment, and it is based on Herzberg (1966, 1968) research. Figure 27 presents defined and concrete instructions for job enrichment. Arrows illustrate dependencies, and emphasize motivation as a crucial factor for psychological growth and productivity. Järvinen (1990: 38) criticizes model for the lack of Herzberg's hygiene factors (working conditions, administration, personal relations and wages), as does Buchanan (1979: 40). According to Herzberg's theory, these do not increase job satisfaction after reaching certain minimum level.

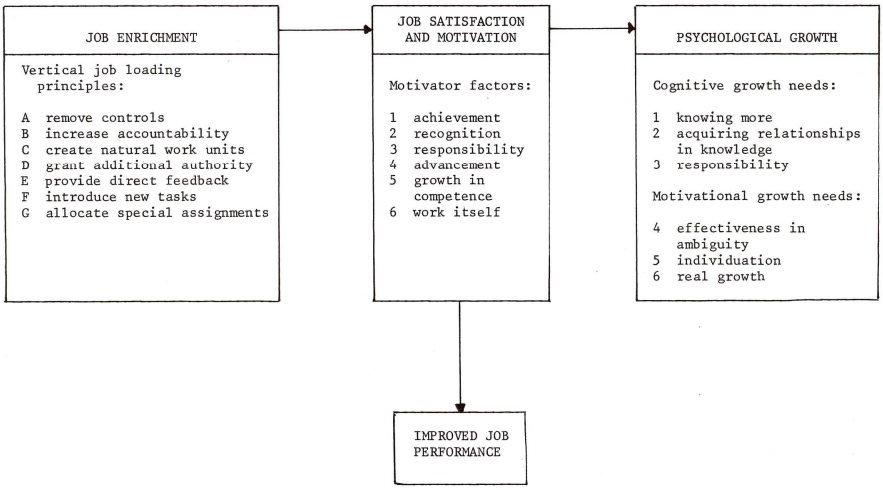

Figure 27. Herzberg and Job Enrichment, Third Generation Job Design Theory (Buchanan 1979: 43).

Buchanan (1979) refers fourth generation theory of job design as expectancy theory of motivation. Vroom (1964) was the first to create a valency theory based on human values. This forms the background for model of job characteristics model of work motivation (Hackman, Oldham, Janson & Purdy 1975), based on

human expectations. Goal of this theory is on high inner motivation, high quality work performance, high job satisfaction and low turnover of workers and low absenteeism. This is illustrated in Figure 28.

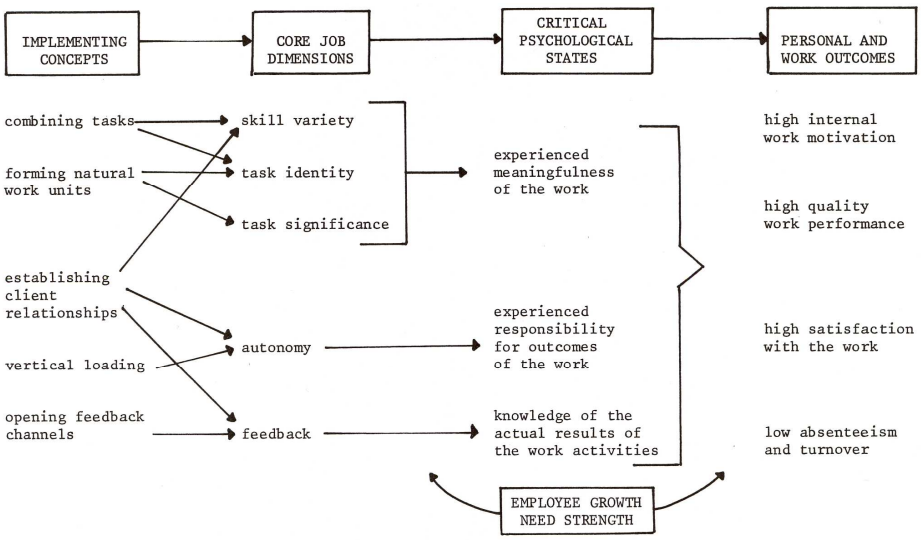

Figure 28. The Job Characteristics Model of Work Motivation: Fourth Generation Theory (Buchanan 1979: 71, orig. Hackman, Oldham, Janson & Purdy 1975: 62).

According to Järvinen (1990: 39) the relations between different recommendations, dimensions and states, and they all influence what consequences work has on employees and work outcomes. According to expectancy theory of motivation, work affects the whole personality of a worker in many ways. Järvinen (ibid.) also notes that all four job design generations are individual level theories. They are not revolutionary, because either authority or hierarchy will not vanish because of those.

If focus is on workgroup instead of tasks, there will be another option along with hierarchical organization — self managing workgroup. This means distribution of tasks and incomes between group members in a democratic manner. In cases like this, the expertise of each group member is utilized whenever it is possible. (Järvinen 1990: 39)

Scott (1985: 232) makes a difference between sosio-technical and system approach on work design. According to Scott, one guiding premise of socio-technical system approach is that work involves a combination of social and technical requisites and that the object of design is to "jointly optimize" both components—not sacrifice one for the other. By contrast, rational system approaches are more likely to focus on the demands of the technical system, ignoring the psycho-

logical and social needs of workers. Technical systems are designed; then human workers are "fitted in" to their requirements. And to fit human behavior into a pre-specified technical system requires that it is highly programmed, that the activities and interactions be specified and predictable — in a word, formalized.

If human as well as technical requirements are to be served, then it is necessary to determine what kinds of work situations motivate and satisfy workers. The Tavistock group (e.g. Tavistock Institute in London, following World War II) emphasizes both individual task features as well as social, organizational, particularly work-group, features. At the task level, repetitive, undemanding, isolated jobs undermine commitment and performance motivation. And at the workgroup level, competition and close supervision foments stress, petty deceptions, scapegoating, and low morale. One solution for this is to give more attention to social components. (Scott 1985: 232)

Cherns (1976) described the socio-technical design principles as follows:

- **Principle 1**: Compatibility. Process of design must be compatible with its objectives. This means that if the aim is to create democratic work structures then democratic processes must be used to create these.

- **Principle 2**: Minimal Critical Specification. No more should be specified than is absolutely essential. But the essential must be specified. This is often interpreted as giving employee groups clear objectives but leaving them to decide how to achieve these.

- **Principle 3**: The Socio-technical Criterion. Variances, defined as deviations from expected norms and standards, if they cannot be eliminated, must be controlled as close to their point of origin as possible. Problems of this kind should be solved by the group that experiences them and not by another group such as a supervisory group.

- **Principle 4**: The Multifunctionality Principle. Work needs a redundancy of functions for adaptability and learning. For groups to be flexible and able to respond to change, they need a variety of skills. These will be more than their day-to-day activities require.

- **Principle 5**: Boundary location. Boundaries should facilitate the sharing of knowledge and experience. They should occur where there is a natural discontinuity – time, technology change, etc. – in the work process. Boundaries occur where work activities pass from one group to another and a

new set of activities or skills is required. All groups should learn from each other despite the existence of the boundary.

- **Principle 6**: Information must go, in the first instance, to the place where it is needed for action. In bureaucratically run companies, information about efficiency at lower levels is collected and given to management. It is preferable for it to go first to the work group whose efficiency is being monitored.

- **Principle 7**: Support Congruence. Systems of social support must be designed to reinforce the desired social behaviour. If employees are expected to cooperate with each other, management must also show cooperative behaviour.

- **Principle 8**: Design and Human Values. High quality work requires:

    - jobs to be reasonably demanding;

    - opportunity to learn; an area of decision-making;

    - social support;

    - the opportunity to relate work to social life; and

    - a job that leads to a desirable future.

- **Principle 9**: Incompletion. The recognition that design is an iterative process. Design never stops. New demands and conditions in the work environment mean that continual rethinking of structures and objectives is required.

The rational system assumption that worker performance is enhanced when work demands are routinized and standardized—when complexity is factored into simple tasks and when uncertainty is removed—is strongly challenged by this approach (Scott 1985: 233). According to Mumford (2006: 338) the most important thing that socio-technical design can contribute is its value system: "*although technology and organizational structures may change, the rights and needs of the employee must be given as high a priority as those of the non-human parts of the system*". Scott (1985: 233) refers to job characteristics — variety, task identity, autonomy — and identifies these to be important, having "high motivating potential," but questions whether the potential is recognized depends on the psychological needs of the particular worker. According to Scott (ibid.) the socio-technical approach has placed greater emphasis on the social organization of work groups

— together with the necessary support features at higher organizational levels — than on the narrower matter of the design of individual jobs. This is to say, that work groups, properly structured, can provide workers with an ongoing source of incentives, error correction, assistance, and social support that no amount of attention to individual job design can hope to match.

Buchanan (2003) studied an organizational change process in a large acute city teaching hospital, and his study suggests that the unitary, authentic narrative is illusory. Political motivations underpinning account-giving, and phenomenological variations in the lived experience of change, make competing narratives a naturally occurring phenomenon, not a methodological aberration. Buchanan's findings suggest that change process has always many different interpretations. This is due to organizational tensions, disputes and contradictions. Although Buchanan's study has the change aspect as nominating theme, Buchanan's report shows that the change process in that hospital did not follow any of the four basic models of the change processes in organizations: life cycle, teleology, dialectics, and evolution (Van de Ven & Poole 1995). The ex post data on the case even question how effective that change process was.

Empirical Findings and Development Literature

Van de Ven & Poole (1995) proposed four theories for understanding organizational change; Evolution, dialectic, life cycle and teleology. Neither evolutionary nor dialectic theory appears to offer a working framework in this context. Life cycle and teleology offer a better starting point for understanding change. Both models suggest that the process is actually an iterative process. When studying the way how virtual education is taken into use, it happens gradually and it appears to be an iterative process. The difference between these two theories is that in life cycle theory change is divided into separate phases, while in teleology this is not the case. As such, teleological theory would provide a framework that would likely describe the development and change in the context of this study. Van de Ven & Poole (1995: 524-525) themselves underline the fact that, theories of organizational change and development seldom include the ideal types in their pure forms.

Huy (2001) proposed four ideal types of planned change processes; commanding, engineering, teaching, and socializing. In this study, the most promising theories are teaching and socializing, because it appears that in most cases the change in organization is not taking place top-down. In addition to this, the change in university appears to be continuous, albeit based on some strategic decisions, thus including also some milestones on the way. Also Huy (ibid.) see, that one theory

hardly covers large organizational change alone, and thus these should be used together. Huy's (2001) theory provides ideal type of socializing, which in turn provides a way for understanding change in university and the role of change agents.

When a teacher chooses to experiment virtual education in order to enhance, or improve performance, the approach follows the logic in teleology. It appears that teleological theory offers tools for explaining bottom-up type of approach. When change towards virtual education takes place top-down, life cycle theory appears to offer better framework for understanding the change. Here difference between these two is on mode of change; prescribed for life cycle and constructive for teleology.

The findings of this study are in line with the Leavitt's (1965) main message. One can not change one part of organization so that it does not affect others. In addition other parts of organization need to adjust themselves in order to cope with changes. Similar phenomenon appears to have taken place in case of virtual education. It is simply not just new technology that has been introduced into organization; it has given a birth for new ways of arranging teaching personnel's work routines, collaboration, and even requires new definition for work in this context. For example, the question concerning economical compensation for work on virtual courses is not that clear in all cases. According to Collis & van der Wende (2002) this appears to be typical for ICT usage in teaching and learning. This implies that alternative way for carrying out whole courses in virtual form is not commensurate with traditional ways, like lecturing for example.

4.4 ICT in Higher Education

The desire to understand effects of introducing new technology into organizations, as well as to achieve greater understanding of the various mechanisms employed by individuals in the development of their computer related skills and their decision to use computers in general, have been in focus by several academic disciplines. A lot of research has been done to understand how to make implementation process of IT system as fluent as possible. Underlying problem here is the fact that although technology might be brilliant there are people using it and these do not always mix. It is undeniable that information technology has changed the way how services, as well as digitized products can be made available for public. Computing has been undeniably one of the most important technologies that have influenced modern societies and ways of work for over 30 years (Eason 2001).

According to Tynjälä & Häkkinen (2005) information and communication technology (ICT) has a dual role in the information society. On the one hand, it is assumed that future information society and its educational contexts in particular will be subject to various unpredictable changes. The increasing challenges produced by rapidly changing, knowledge-intensive and technology-oriented working life presuppose that facilities for life-long learning and the continuous development of competence can be guaranteed to people in different phases of life. On the other hand, it is expected that ICT can help in finding solutions to these challenges.

Bransford, Brown & Cocking (1999) claim, that computer-based technologies are holding a great promise both for increasing access to knowledge and as a means of promoting learning. According to them, what has not yet been fully understood is that computer-based technologies can be more than just rich sources of information and powerful pedagogical tools. ICT can work as an extension of human capabilities and contexts for social interactions supporting learning. The process of using technology to improve learning is never solely a technical matter, concerned only with properties of educational hardware and software. Technology resources for education function in a social environment, mediated by learning conversations with peers and teachers.

Tynjälä & Häkkinen (2005) note that the most optimistic views suggest that global networks and the use of computers for intellectual communication will automatically expand the ways in which humans connect, communicate, and create a sense of community. Häkkinen (2002) criticizes this by noting that such views oversimplify the notions of knowledge and learning, and lead easily to misunderstandings, disappointments and irrelevant pedagogical practices.

Although bringing new technology into school might appear to outsiders as straight-forward improvements, it can often feel to those within an organization as undesirably disruptive if it means that the culture must change its values and habits in order to implement it. As an operating environment, schools are highly hierarchical organizations. Schools are also very normative institutions, e.g. schools are often actors in and venues for the performance of significant shifts in social mores and policy. (Hodas 1996: 199)

For at least the last hundred years, schools have been seen as some sort of processing machines. Schools have been elaborated as machines set up to convert raw materials (new students) into finished products (graduates, citizens, workers) through the application of certain processes (pedagogy, discipline, curricular materials, gym). Because of this processing function, rationalist proposition is that

schools can be tuned well or poorly, can be made more or less efficient in their operation. (Hodas 1996: 204)

At least two impetuses for wanting to bring machines into schools can be pointed out. The first is the desire of the central planner and social scientist to have schools to be as modern as the world of tomorrow they help conjure into being. The second concern of technologists has been standardization. Regardless of how well they succeed, schools' intention is to produce the same outputs year after year. Schools are supposed to ensure that students will achieve the same set of skills and broad values this year as last. This is the reason behind the idea of modeling schools on factories as a promise of standardization, of uniformity of outcome Technologists and planners have for a long time felt, that the weakest link in this chain is the last, the teacher. Using standardization of curricula, of facilities, of teacher certification requirements, are ways to try to calibrate "the instructional delivery vehicle", the teacher. But these mean very little once the classroom door is closed and the teacher is alone with his/her students. For this reason, educational technologists have tended to produce solutions designed not to aid teachers, but to recast, replicate, or replace them, either with machines or through the introduction of "teacher-proof" curricula. (Hodas 1996: 205-206)

According to the European Commission of the European Communities (2004: 8), European universities have long modeled themselves along the lines of some major models, particularly the ideal model of university envisaged nearly two centuries ago by Wilhelm von Humboldt in his reform of the German university, which sets research at the heart of university activity and makes it the basis of teaching. In addition (ibid. 7) the knowledge economy and society stem from the combination of four interdependent elements: the production of knowledge, mainly through scientific research; its transmission through education and training; its dissemination through information and communication technologies; and its use in technological innovation.

Bransford et al. (1999) state that good educational software and teacher-support tools, developed with a full understanding of principles of learning, have not yet become the norm. They (ibid.) also claim that software developers are generally driven more by the game and play market than by the learning potential of their products. When considering how large industry game and play market at present is, such claims are understandable. Bransford et al. (1999) see that the software publishing industry, learning experts, and education policy planners, in partnership, need to take on the challenge of exploiting the promise of computer-based technologies for improving learning.

Adopting ICT into use in higher education appears to be slow change process, with no radical indications. ICT usage in teaching and learning is widespread but part of a blend, where more traditional forms of education are still utilized. ICT is serving as a complement to already existing instructional tools. Characteristic for ICT usage is also the fact that instructors are gradually doing more, but with no reward for their efforts. (Collis & van der Wende 2002: 7-8)

Distance Education and Learning Environments

Distance education has quite long history. Since the first correspondence courses in the beginning of 19th century a lot of progress has been done. The use of ICT in education is a fourth development phase of distance education. Characteristics for this phase is that when information technology, hardware and software evolve and while they integrate with communication technology, it is possible to produce totally new kinds of educational material production-, editing- and delivery methods. Typical for this phase is also better possibilities for interaction between people who are in the process. (Immonen 2000: 16)

The quality and depth of learning varies, and depending on how profound learning is goal, the more studying is required. The shift from lower levels of learning (receiving information and remembering) to higher levels (understanding and adapting) is illustrated in Figure 29. Acquiring information and remembering are only starting points for learning. Examples for this type of activities are exams or essays. Understanding and adapting new things can be achieved through guiding information processing and practice. (Manninen 2004: 30, 31)

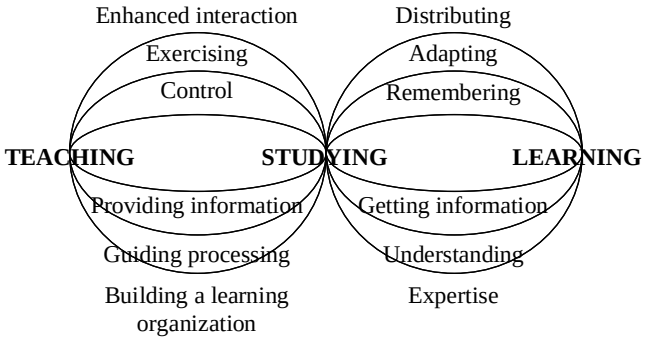

Figure 29. Teaching, Studying and Learning (adapted from Manninen 2004: 33).

According to Tynjälä & Häkkinen (2005), the history of e-learning is short, and it can be characterized by rapid changes in technological development. According to them this has also been the biggest problem in e-learning, because what is

changing rapidly is the technology, not the basic processes of learning. Leidner & Jarvenpaa (1995: 50) see that there are many potential computer-based methods and that the methods can have different outcomes; it is therefore the method of using the technology and not the technology itself that has an effect on classroom activity. They (ibid.) found out in their study on electronic classroom that the most preferred methods were those that not only gave the students interactive use of the computer, but that allowed the students to work independently of the instructor on the computer to encounter their own problems in a classroom environment.

It is rather worrying that e-learning is sometimes interpreted in a narrow sense as referring to process of delivering digital information and study materials to people through the electronic media (Tynjälä & Häkkinen 2005). In a similar manner Leidner & Jarvenpaa (1995: 50) note, that there is a potential for computer-based teaching methods to improve classroom learning but that their potential sometimes remains untapped by the inability to use them effectively; this can be disruptive to the class. According to them (ibid.), the problem is twofold: (a) the computer-based technology itself is a problem because it takes considerable time to set-up, prepare, and use the technology and to change applications during class, and (b) ergonomics is the other considerable problem.

Along with many benefits, new technology has some drawbacks too. One issue quite relevant among those in instructional positions is burnout. Hogan & McKnight (2007) state that burnout is an important concept and has rarely been investigated among higher education faculty. They studied burnout among higher education online instructors in United States using a demographic survey and the Maslach Burnout Inventory-Educators Survey (MBI-ES). Data analysis revealed that online instructors possessed an average score on the emotional exhaustion subscale, high degree of depersonalization, and low degree of personal accomplishment. As such, Hogan & McKnight (ibid.) findings do give some implications about the demands put on online instructors.

A difference must be made with computer assisted instruction (CAI) and other IT mediated means of providing instruction. CAI by definition (Heery & Noon 2001a) is " … *a training technique where the individual is guided by a computer program through the information to be learned. The method is flexible because trainees can progress at their own speed, skip material they are already familiar with, and undertake the training at their own convenience. The programs provide tests and assessment at each stage and provide immediate feedback to the trainee.*" In CAI the main instrument used is a computer program, and it is designed for individual learning.

According to The British Computing Society (2002: 62) *Computer Aided Learning* (CAL) is *the use of a computer to provide instructional information to a student, to pose questions and to react to the student's response* and this includes following definitions:

- *Computer Based Training* (CBT): The use of a computer as an instructional system in a training environment. The approach is the same as computer aided learning but the learning area is confined to a well-defined training objective.

- *Computer Managed Instruction* (CMI): The use of a computer to manage a student's progress through a course of instruction. The student's performance is recorded by the computer and new modules of instruction are defined or delivered as determined by the curriculum. A computer managed instruction system may or may not contain computer aided learning material.

- *Computer Managed Learning* (CML): The use of a computer in a similar fashion to computer managed instruction, but with additional emphasis on providing help which depends upon the responses given by the student. Some computer managed learning systems can build up a detailed learning profile for each student. This profile can be used for both reporting and directing the studies of an individual student.

- *Integrated Learning System* (ILS): A computer system which combines providing the student with instructional material with monitoring the student's success and speed. This enables the computer to adjust the material presented to the student and provide analyses for the teacher.

According to Britain & Liber (1999) Virtual Learning Environments (VLEs) are learning management software systems that synthesize the functionality of computer-mediated communications software (e-mail, bulletin boards, newsgroups etc) and on-line methods of delivering course materials (e.g. the WWW). Dringus & Terrell (1999: 58) define online learning environment (OLE) as: "*a distinct, pedagogically meaningful and comprehensive online learning environment by which learners and faculty can participate in the learning and instructional process at any time and any place. OLEs manifest a variety of technical tools that support instructional delivery and communication in online formats. In addition, dynamic delivery structures are embedded to enhance the instructional, learning and communication processes taking place.*"

Virtual learning environment (VLE) share many similarities with computer aided instruction (CAI). For example, learners can access the material independently; individuals can follow different paths through it, and can utilize different material displays. But the VLE concept is broader than CAI and adds the communication dimension to a previously individualized learning experience. Another separating issue is that in a VLE, the learning process is no longer an individual endeavor, but can incorporate and leverage the many-to-many relations among learners and with instructors. (Piccoli, Ahmad & Ives 2001: 403)

Learning environment might sound as a new and confused concept. This is partly due to the fact that places where older generations have received their education are mostly like schools or such like environments. In this type of environments it is characteristic to see school facilities and equipments as physical framework, teacher as an intellectual resource and books as learning material. Learning environment concept is very young, and it has not been used widely for very long. Apart from this, the definitions used are flexible enough to cover decades, or even centuries old environments where learning has taken place. This is to say, that although the concept might be new, the phenomenon is not. Basis for adapting this concept into use is possibly the overvaluation of school-centered formal learning, which has practically given the legitimating for school institution to be seen as nearly only legitimate learning environment. (Pantzar 1998: 99-100)

Manninen (2000: 34) states, that according to most definitions, open learning environment is a environment, where great effort are given to achieve optimal flexibility for time, place, methods, content and implementation. In principle, focus moves from traditional teacher- or school centered approach to student centered approach. This affects also the role of persons responsible for education, they transform from persons responsible of teaching into designer of learning environment, team member, specialist and tutor.

While online learning is defined as (Heery & Noon 2001b) " … *the delivery of interactive training and educational material via an organization's internal computer network (internet) or the world wide web (internet)*" the e-learning is defined as (Heery & Noon 2001c) "… *the acquisition of competencies, knowledge, and skills through electronic media, such as the internet or a company intranet.*" Here the difference being that online learning focuses on the delivery of content and e-learning on the acquisition of knowledge and skills. According to Auer (2000: 63) virtual working environment can be seen as a domain, which is affected by educational organization-, content provider-, and student domains. Auer (ibid.) also notes that virtual domain reaches far beyond these domains.

Electronic Classroom

Electronic classroom allows bending restrictions of time and place as presented in Table 12. Electronic classroom is "same time, same place" in the same way as the traditional classroom is, where a room and a time is scheduled, and all meet for class. Goal is to maximize the number and richness of the channels of communication and devote the maximum mental and attentional resources that students bring to bear. Rather than replacing face-to-face contact, electronic classroom supplements it by empowering the students and instructors with the additional resources of the computer media. (Norman 1997).

Table 12. The Range of Possibilities for the Electronic Education Environment (Adapted from Norman 1997).

		Place	
		Same	**Different**
Time	**Same**	Classroom instruction	Distance education
	Different	Laboratory sessions	"Virtual" classroom

Khalifa (2001) states that although it is expected that distance education, as well as virtual classrooms are more convenient than traditional learning environments, it has not been resolved whether they are as effective. Khalifa (ibid.) presents a third dimension to be considered along with time and place, which is used learning method. This is due to the fact that the effectiveness of a learning environment is primarily determined by the learning method(s) supported.

Khalifa (2001) notes that stretching both the physical and time barriers, on the other hand, became practical with the Internet. Several Web-based learning applications qualify as virtual classrooms, where the learners can download or navigate learning materials, submit coursework and interact with their instructors and other learners asynchronously. Zhang, Zhao, Zhou & Nunamaker (2004: 75) argue that in an e-learning environment that emphasizes learner centered activity and system interactivity, remote learners can outperform traditional classroom students. The advantages and disadvantages of traditional classroom learning and e-learning are summarized in Table 13.

Table 13. Traditional Classroom Learning vs. e-Learning (Zhang, Zhao, Zhou & Nunamaker 2004: 76).

	Traditional Classroom Learning	**E-Learning**
Advantages	• Immediate feedback • Being familiar to both instructors and students • Motivating students • Cultivation of a social community	• Learner-centered and self-paced • Time and location flexibility • Cost-effective for learners • Potentially available to global audience • Unlimited access to knowledge • Archival capability for knowledge reuse and sharing
Disadvantages	• Instructor-centered • Time and location constraints • More expensive to deliver	• Lack of immediate feedback in asynchronous e-learning • Increased preparation time for the instructor • Not comfortable to some people • Potentially more frustration, anxiety, and confusion

Whether there are differences in results between online learning and traditional learning is an interesting question. Ladyshewsky (2004) conducted an empirical study where online learning (OL) and face to face learning were compared. According to Ladyshewsky (ibid.), it appears that student performance is at least as good as, if not slightly better, in the online learning mode when compared to the face to face mode. Ladyshewsky (ibid.) also states (ibid.) that "When a high degree of pedagogical thought goes into the design and delivery of OL, and is supported by adequate resources, positive educational outcomes can be achieved by students".

Manninen (2004) compares different alternatives between utilizing computer networks and more traditional types of education. The division is done between a) teaching material online and using computer networks as a channel for interaction, and b) fully online and as a part of other studies. Figure 30. illustrates these possibilities.

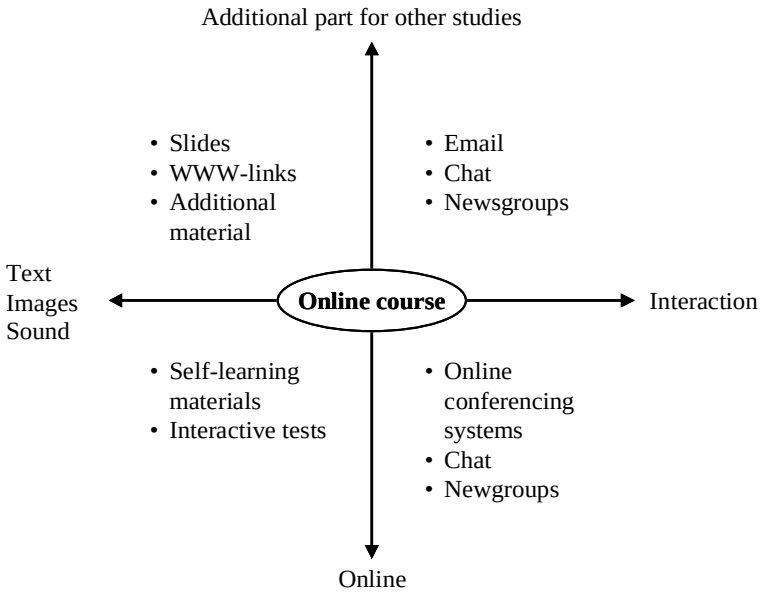

Figure 30. Possibilities for Educational Use of the Internet (modified from Manninen 2004: 29).

Manninen (2004) discusses the use of networks in learning by comparing the used learning materials and teachers' actions in teaching process. In a traditional teaching (e.g., classroom), used course book might dictate very much on how to actually carry out studying process. When teacher pulls away from responsibility for guiding and tutoring students, the responsibility must be transferred to either study materials or to group. In cases, where the material does not restrict teacher that much (or at all), and teacher has a more central role, this can be categorized as critical approach, where target is to increase students awareness on topic under study, by using guiding questions and discussions. These general level classifications are illustrated in Table 14.

Table 14. Provided Support for Student Attending e-Learning (modified from Manninen 2004: 36).

		Guiding and tutoring material	
		Yes	No
Guiding and tutoring teacher	Yes	Structured and guided studying	Teacher guided course Group for improving awareness
	No	Self-study material based course	Group-process based humanistic course Constructivist self-learning course

Tools available for providing online studying and learning are summarized in Table 15. In this table, first two rows cover tools that require more planning in advance, thus inbuilt guidance within an online course. Two lower rows on the

other hand cover more teacher guided unity. According to Manninen (2004: 34) it appears that a good online course follows a principle of balanced entity, e.g., systematic utilization of these tools in such a manner that these tools support each other. On the other hand, even the most brilliantly designed education materials can fail completely if the same care is not given to the way how they are used (Laurillard 1993: 7).

Table 15. Tools for Studying and Tutoring Using the Internet (modified from Manninen 2004: 35).

	Studying	**Learning**
Study plan + Material	• Schedules • Timetable • Content • Additional materials	• Assignments • Structure
Technology + Context	• Other resources • Tools • Places	• Simulations • Demonstrations
	• Multimedia • Hypertext	
Teacher/Tutor	• Tutoring • Student counselling	• Lectures • Questions • Answers • Teaching
Group	• Groupworks	• Discussions • Dialogy

Dickson & Segars (1999) propose a definition for high-technology classroom. According to them, many institutions of higher education are seeking new forms of organization and methods of delivering knowledge through innovative technology to increase the richness of educational experience as well as to broaden their reach to students across the globe. They also conclude, that in order to be able to fully realize this promise, institutions of higher education must re-examine long held assumptions about partnerships with technology providers in order to make the transition to the world of "virtual" organizations. In Table 16. Dickson & Segars (ibid) illustrate some of the differences between the traditional interface of the physical classroom and emerging virtual classroom. A key aspect of classroom evolution is the role of technology in facilitating the transfer and shared meaning of information and knowledge along with the rethinking of assumptions surrounding communication within the classroom context.

Table 16. Expanding the Reach and Range of Curricula (Dickson & Segars 1999: 153).

Communication	**Interface**	
	Traditional	Contemporary
One to many (broadcasts)	Lecture, syllabus, handout	Web pages, e-mail, video conference
Many to one (reporting)	Reports, exams, class discussion	E-mail, discussion groups, chat rooms, video conference
One to one (sharing)	Office visit, telephone	E-mail
Many to many (collaboration)	Class discussion	Video conference, discussion groups, chat rooms

According to Pulkkinen (2003), the mainstream of research on ICT integration in education from the education point of view has led to an immersion of the learning theoretical foundation of the research into techno-economic paradigms - and in a sense led to fading of broader educational and social perspectives. The mainstream of the research is shadowing the research that has social and cultural approaches and critical research interests related to a changing education system and global educational problems. Pulkkinen also states (ibid.) that although the research puts emphasis on constructive learning theories, techno-economic paradigms of the research field continue the tradition of instructional technology, which is framing the concept of "e-Education". This mainstream is not viable in solving the current problems of education globally.

Approaches on Online Education

In Leidner & Jarvenpaa (1995) study about the use of IT in management school education, they conducted a review of most commonly used learning models. They (ibid.) note that the use of IT in an educational setting will reflect either purposely or inadvertently some model of learning. Although the list of models is not exhaustive, it offers a IS viewpoint on learning models and it is therefore used here. According to them (ibid. 266), learning models are often classified as being behavioral or cognitive. Objectivism, also referred to as the traditional model of learning, is the behavioral model of learning and represents a traditional view of learning. The primary competing cognitive model is constructivism. The constructivist model has a number of derivations including collaborativism and cognitive information processing. The socioculturalism model shares some assumptions and goals with constructivism, but challenges some others. Table 17 summarizes characteristics of these different learning models.

Table 17. Summary Table of Learning Models (Leidner & Jarvenpaa 1995: 270).

Model	Basic Premise	Goals	Major Assumptions	Implications for Instruction
Objectivism	Learning is the uncritical absorption of objective knowledge	Transfer of knowledge from instructor to student. Recall of knowledge.	Instructor houses all necessary knowledge. Students learn best in isolated and intensive subject matter.	Instructor is in control of material and pace. Instructor provides stimulus.
Constructivism	Learning is a process of constructing knowledge by an individual.	Formation of abstract concepts to represent reality. Assigning meaning to events and information.	Individuals learn better when they discover things themselves and when they control the pace of learning.	Learner-centered active learning. Instructor for support rather than direction.
Collaborativism	Learning emerges through shared understandings of more than one learner.	Promote group skills — communication, listening, participation. Promote socialization.	Involvement is critical to learning. Learners have some prior knowledge.	Communication-oriented. Instructor as questioner and discussion leader.
Cognitive Information Processing	Learning is the processing and transfer of new knowledge into long-term memory.	Improve cognitive processing abilities of learners. Improve recall and retention.	Limited selective attention. Prior knowledge affects level of instructional support needed.	Aspects of stimulus can affect attention. Instructors need feedback on student learning.
Socioculturism	Learning is subjective and individualistic.	Empowerment. Emancipatory learning. Action-oriented, socially conscious learners with a view to change rather than accept or understand society.	Goals have distorted knowledge and framed information in their own terms. Learning occurs best in environments where personally well known.	Instruction is always culturally value laden. Instruction is embedded in a person's everyday cultural/social context.

The objective model assumes that an instructor should be in control of the learning environment, that learning is dissemination of knowledge, that dissemination best occurs via abstract representations of the reality, and that learning occurs best in isolated settings. Collaborativism assumes that the control of the learning environment should rest with the peer groups, that learning is the sharing of knowledge representative of disparate points of view, that knowledge is personally experienced but can be shared through collaborating, and that the realism of context

is high in the sense that individual experiences prior to learning are real but low in the sense that the experiences are shared vicariously through discourse. Constructivism assumes that the learner needs to be in control of the learning environment, that learning is the creation of knowledge, and that the realism of the context for learning needs to be high. Cognitive information processing differs from constructivism in emphasizing that learning is the formation of abstract concepts to represent reality and that the context need not necessarily be high in order for such abstraction to occur. Socioculturism assumes that the learner must be in control of learning, that learning is interpretation of knowledge by the learner, that specificity and immersion in experiential activities promote learning, and that learning best occurs in the context in which it will be used. No particular model is the best approach; indeed, different learning approaches will be appropriate depending on the circumstances — course content, student experience, maturity, intelligence, and instructor goals, skills, and preferences, among others. However, the instructor must be cognizant of the choice of a learning model. Moreover, the instructor should be aware of the different learning models and the different outcomes anticipated by the models. The chosen model must take into account the many dimensions of a given course. Information technology can then be a facilitator of the effective application of the learning models. (Leidner & Jarvenpaa 1995: 269-271)

Leidner & Järvenpää (1995) also discuss different IT solutions used in education and their impact on learning. They group existing technologies into four groups, which are: the vision to automate (automated classrooms), the vision to informate up (providing an instructor access to information), the vision to informate down (providing students greater access to information), and a vision to transform (virtual continuous learning spaces).

Leidner & Järvenpää (1995: 272) see that the vision to automate is a perception where IT is a means of replacing expensive, unreliable human labor with information technology, and as such the role of IT is to provide operational savings and improve quality by performing structured, routine, operational tasks reliably and efficiently. They (ibid.) call information technologies whose purpose is to provide tools for manipulating and presenting instructional material in a classroom as classroom automation technology. These include: (1) instructor consoles equipped with presentation software and display controls, (2) instructor consoles and standalone student computers, (3) computer-assisted instruction (drill and practice programs), and (4) distance learning.

The vision to informate up in educational context is defined by Leidner & Järvenpää (1995: 275) as giving the instructor feedback concerning student un-

derstanding of class material in a timely fashion so that the instructor could clarify misunderstandings and misinterpretations. Technological responses of these would be key response pads or e-mail between instructors and their students. Informating down is referred by Leidner & Jarvenpaa (ibid. 276) as the use of technology to provide information to lower levels in an organization. They state, that in the context of education, informating down provides information to students to allow them to critically analyze information or discuss issues among a set of peers. They also (ibid. 276-279) refer these technologies as Information Classroom Technologies, and technologies designed to provide communication facilities to learners are referred to as Communication Classroom Technologies. According to them, examples of information classroom technologies are Learning Networks (e.g. comprised of networked computers with links to shared databases developed by educators at various locations or to external databases), Hypermedia, Simulation Technologies and Virtual Reality. Examples of Communication Technology Classrooms (ibid.) are Synchronous Communication Classrooms (e.g. providing computers on student desks that are networked with software such as Lotus Notes, enabling simultaneous peer-to-peer communication), or Groupware-Supported Synchronous Communication.

The IT vision to transform in educational context according to Leidner & Jarvenpaa (1995: 279) translates as the vision to transform would involve using IT (1) to redraw the physical boundaries of the classroom, (2) to enable more teamwork, (3) to allow learning to be a continuous time-independent process, and (4) to enable multi-level, multi-speed knowledge creation. Examples (ibid. 279-280) of transformation are a synchronous Communication Across Distances (here simplest virtual learning spaces are founded on electronic mail and electronic bulletin boards) or Groupware-Supported Asynchronous Communication Across Distances (when groupware-supported communication classrooms are designed for students to access from remote terminals can also become virtual learning spaces). Taxonomy of electronic classroom types, assumptions, and related models of learning is illustrated in Table 18.

Table 18. Electronic Classroom Types, Assumptions, and Related Models of Learning (Leidner & Jarvenpaa 1995: 281).

Electronic Classroom Type	**Principal Pedagogical Assumptions**
The Vision to Automata	
Instructor Concole	Instructor the centre of the classroom activity. Presentation technologies can make the delivery of information more memorable and interesting.
Instructor Console and Stand-alone Student computers	Student learn better if they can emulate what the instructor is doing on the computer. Learning is more effective when it is interactive.
Computer Assisted Learning	Students benefit when they control the pace of learning. Feedback should be frequent.
Distance Learning	Weakness in education is the lack of availability of good courses and faculty. Accessibility in remote locations or smaller schools can be efficiently provided via telecommunications.
The Vision to Informate Up	
Key Response Pads	The instructor needs feedback. The ability to elicit responses via technology is superior to hand-raising.
Instructor Student E-mail	Feedback, even delayed, is better than no feedback. Limited access to instructors limits communication.
The Vision to Informate Down	
Learning Networks	Delivery of information is pressing problem, but rather the lack of current information from realistic contexts. Students create knowledge through information exploration.
Hypermedia/Internet	Students need to create their own knowledge structures.
Sinulation/Virtual Reality	The more real the content, the more effective the learning. Students should be provided the means to experience the phenomenon during class.
Synchronous Communication Classrooms	Participation is critical to the learning process. Anonymity encourages participation.
Groupware-Supported synchronous Communication Classrooms	Structure imposed on communication is effective in helping students learn. Communication is more efficient when structured.
The Vision to Transform Virtual Continuous Learning Spaces	
Asynchronous Communication Across Distances	Learning is an ongoing process. Time should be flexible. Learning need not be geographically dependent.
Groupware-Supported Asynchronous Communication Across Distances	Ad hoc communication is more effective when supported with a structure.

Leidner & Jarvenpaa (1995: 283) see that the technologies serving the automation function are closely aligned with objectivist theory, in which case the instructor remains the center of attention and in control of the learning process. They argue that where the goal of education is factual/procedural knowledge transfer, the vision to automate can be effective and performance improved. According to them (ibid.) technologies that informate up similarly function to assist the instruc-

tor as the nucleus of class activity but also function to improve the information an instructor receives concerning student comprehension of material. As with the vision to automate, there may be temporary effects on the self-variables as well as improvements in factual and procedural learning, but achieving conceptual learning and higher-order thinking in an informating up environment may be difficult.

Technologies that informate down place much of the control of the content and pace of learning in the hands of students. The purpose of instruction moves away from knowledge dissemination toward knowledge creation; however, much of the knowledge is already created (is explicit), but the instructor is no longer the primary creator of the knowledge. Rather, students develop shared tacit knowledge from existing explicit information. Technologies that informate down are most property used in a constructive or collaborative environment, with an emphasis on conceptual learning and higher-order thinking. It can even be argued that such technologies would do little more than frustrate learners in an objective environment —forcing them to search for the right answer when it would be easier to be told. The potential exists for a longer-term effect on the self-variables since the control has been almost entirely shifted to the learner. (Leidner & Jarvenpaa 1995: 283)

The main difference between an e-learning situation and the traditional classroom is the medium over which instruction is transmitted. In a traditional setting, the learning provider has total control over the learning environment — adapting, realigning, and changing whenever necessary. There are many differentiating factors influencing the teaching-learning situation such as the teacher's ability and personality, skills, adapting to the learning environment, and creating support materials. In an e-learning situation, the learning provider is separated from the learner by cyberspace. The ability to adapt, realign, or change is no longer available. Given that technology is equal, the content is the only differentiating factor that separates an effective e-learning initiative from an ineffective e-learning initiative. Unfortunately, in many cases, this is not true. The emphasis on e-learning in the past has been on the "e", which to many means "electronic" or the technology. There is a need to shift the emphasis of e-learning from the "e" (technology) to the learning. (Hamid 2002: 312-313)

In their study on how professionals learn in practice Cheetham & Chivers (2001: 281) identified 12 general types of learning process or 'learning mechanisms', which were: 1) Practice and repetition; 2) Reflection; 3) Observation and copying; 4) Feedback; 5) Extra-occupational transfer; 6) Stretching activities; 7) Perspective changing/switching; 8) Mentor/coach interaction; 9) Unconscious absorp-

tion or osmosis; 10) Use of psychological devices/mental tricks; 11) Articulation; 12) Collaboration.

Based on their findings, Cheetham & Chivers (2001: 285) suggest that much of the learning required to attain full professional competence actually takes place after the completion of formal training. According to them, this conclusion highlights the critical importance of informal learning. They also suggest that different individuals find different kinds of experience formative, and this should caution against being too prescriptive in respect of 'best practice' learning methods. In their study some experiences reported appear to support one particular theoretical position, whereas others support a different, perhaps even contradictory, position. They argue that this shows up the limitations of any single theoretical perspective in fully explaining the complexities of learning. They also suggest that this counters against too rigid an adherence to particular theoretical approaches and the development practices these may have spawned.

Dickson & Segars (1999: 155) provide a different viewpoint on the content of the virtual classroom using two dimensions; (a) learning products (information transfer, skill acquisition, and mental model change) and (b) the catalyst for knowledge acquisition (instructor, learner, and team). These are illustrated in Figure 31. As shown in the figure, the degree of collaboration facilitated by technology defines the primary space of the virtual classroom. Dickson & Segars (ibid) also suggest that instructor-centered classroom models are primarily focused on one-to-many type of communication, while learner-centered models are focused on one-to-many communication flows and many-to-one communication flow.

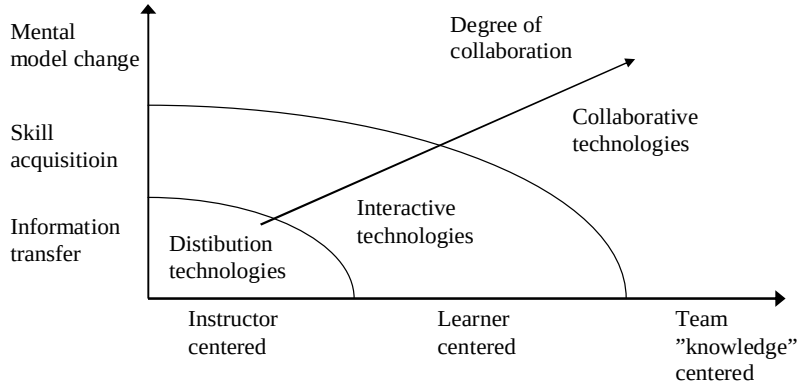

Figure 31. The Context of the Virtual Classroom (Dickson & Segars 1999: 156).

According to Dickson & Segars' (1999) idea, the information technology provides a way for expanding reach from instructor centered models concentrated on information transfer to team centered models, where focus is merely on changing

mental models. As such the interactive technologies are used together with collaborative, team centered working methods. In their study on interaction that promotes network-based studies and what causes lack of interaction Johansson & Ruokamo (2002) found out that students considered interaction with the teacher and other students to be more binding than self-directed study. The expectations and biases of students did not always correspond to the objectives of studies and thus prevented functional interaction in a network.

Browne, Jenkins & Walker (2006) suggest in their study on the use of VLEs by higher education institutions in the United Kingdom, that there is clear evidence of increasing use of VLEs but not of widespread change in pedagogic practice. They also suggest that VLE management is increasingly centralized in all matters considered strategic, with dedicated devolvement occurring for a range of support activities. Here the differences in practice exist between old and new universities. According to them there is in general negligible interest in standards or in institutional collaboration.

In their analysis of three online programs provided at a large mid-west university in US, Kim, Smith & Maeng (2008) found out that the assessment schemes used by online distance education courses do not strictly follow the principles suggested in the literature. The authors also found that the nature of each program (its history, purpose, and learner characteristics) had a significant impact on the assessment methods used. This study raised interesting questions regarding the assessment schemes adopted by the developers of online distance courses. The authors were encouraged, however, by the degree to which formative and authentic assessment methods were used.

The Internet technology has opened up many new exciting avenues for learning providers to explore in trying to promote and encourage learning at all levels. The concept of learning-on demand increases relevancy. The concept of anytime, anywhere learning promotes lifelong learning and makes distance a problem of the past. However, to promote use of an e-learning site and to retain customers at the site, there is a need to redefine the ‘‘e’’ from formally meaning ‘‘electronic’’ to include the meaning of ‘‘experience’’, ‘‘engagement’’, and other high level contexts. Then, there is a chance to provide appropriate attention to content development and to return to the basics and fundamentals of a teacher–learner situation. (Hamid 2002: 315-316)

Howell, Saba, Lindsay & Williams (2004) suggest seven strategies to be followed in order to provide faculty success in distance education. These strategies include: (1) enable colleges and departments to accept more responsibility for distance education activities; (2) provide faculty more information about distance educa-

tion programs and activities; (3) encourage faculty to incorporate technology into their traditional classrooms; (4) provide strong incentives for faculty to participate in distance education; (5) improve training and instructional support for distance education faculty; (6) build a stronger distance education faculty community; and (7) encourage more distance education scholarship and research. As such, these strategies provide a working set of guidelines to be followed when organizing education provided using the Internet.

According to Wolcott & Betts (1999) encouraging faculty to participate in distance education involves the interaction of a number of variables including an individual's locus of motivation, personal values, institutional values, and intrinsic and extrinsic rewards. To recruit and sustain motivated faculty, institutions must offer valued incentives, eliminate disincentives, and provide equitable rewards for distance teaching. Specifically, Wolcott & Betts (ibid.) suggest that institutions should implement the following recommendations regarding incentives and rewards for participation in distance education programs:

- attend more to intrinsic rewards by providing a wider range of opportunities through which faculty can achieve personal satisfaction and professional growth;

- consider individual differences among faculty, recognizing that motivation is not the same for everyone and that it changes over time as faculty members progress in their careers;

- establish policies relating to workload, promotion, tenure, and merit that (a) fairly compensate faculty for work valued by the institution and (b) align external rewards with institutional values; and

- provide faculty development and instructional development programs to increase opportunities for formal and informal recognition, and provide training and other forms of institutional support for distance teaching.

There are several lessons that can be learned from the history of e-learning. First of all, the focus in novel learning environments should be on the basic mechanisms e-learning at work and processes of learning. At their best, e-learning environments have the potential to support cognitive, social, motivational and affective processes of learning. They can also assist in sharing and distributing cognitive load and in bringing thinking out into the open – in other words they can function as a collective memory for a learning community, helping community to store the history of its knowledge construction process for the purposes of revision and future use. (Tynjälä & Häkkinen 2005: 329-330)

Tynjälä & Häkkinen (2005: 330) suggest that to enhance both individual and organizational learning and development e-learning solutions should include the following features:

- support of both individual reflection and collaborative knowledge building or epistemic social practices;
- integration of theoretical knowledge with participants' practical experience;
- learning tasks that lead learners to examine their work in the light of the conceptual tools provided;
- learning tasks that help learners to conceptualise their practical experiences;
- support for the invention and use of boundary objects;
- support for the explication of implicit knowledge;
- encouragement of collaboration and knowledge exchange between different groups of people (different professional groups, people from different domains, experts and novices, for example);
- real dialogue;
- a progressive problem-solving orientation;
- integration of different forms of representation and different forms of learning activities (reading, writing, discussing, using metaphors, audio, visual etc.);
- structured support and guidance for learning in all phases of the learning process; and
- integration of e-learning with face-to-face learning situations whenever possible.

Tynjälä & Häkkinen (2005: 330) conclude, that some of these features are related to software design issues, while some others are purely pedagogical in nature. This is to say, that because software design and pedagogical solutions are interdepended, the design process itself has to be carried out as a collaborative process between experts in learning and experts in software design.

Peterson, Albaum, Munuera & Cunningham (2002) found out in their study about the use of instructional technology in marketing education that important antecedents for the use of instructional technology in higher education are perceived greater effectiveness, perceived enhanced communication, perceived greater efficiency and "appearance" as they used the concept. On the other hand, found consequences were greater efficiency and enhanced communication which both facilitated student learning. In addition to this another consequences were lower student learning and uncertain student learning. These findings and their relations are illustrated in Figure 32.

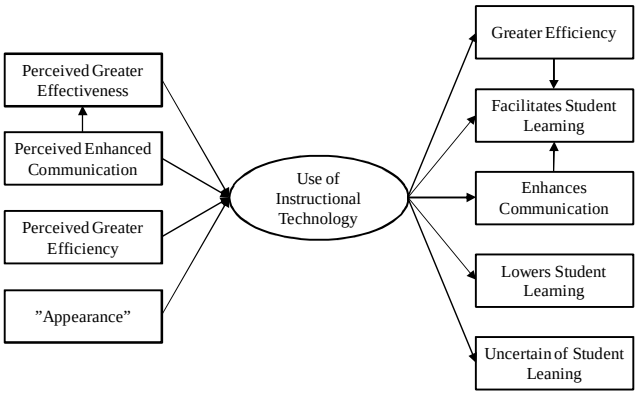

Figure 32. Antecedents and Consequents of Technology Usage (Peterson et al. 2002: 11).

Packham, Jones, Miller & Thomas (2004) made a study about the causes for student withdrawals experienced in the E-College Wales BA Enterprise programme. Authors argue, that analysis of non-completing students revealed that older students (50 plus years of age) were particularly likely to withdraw. In addition, self-employed students witnessed low completion rates whilst successful learners were typically not in employment. This fact suggested that the students must have the sufficient time to undertake the course. Authors suggest, that successful students are able to integrate the programme with their working and family commitments. Moreover, it is essential that students have realistic aspirations about the demands of the course and how they will manage them.

According to Packham et al. (2004: 340) the statistics suggest that students with prior higher education qualifications were less successful in comparison to learners with no previous academic attainment. Authors reason, that this can be related to motivation for undertaking the course. Authors (ibid.) identified eight prime causes of withdrawal. These reasons can be classified as being either extrinsic or intrinsic. Intrinsic factors are internal course related barriers, which universities can influence including technical issues, assessment (quantity and nature of) and

readiness for the course. Intrinsic barriers can be controlled and reduced by improving the reliability and usability of the VLE, improving the design of the course in terms of structure, flexibility and assessment and fully preparing the students for the program. Extrinsic factors are barriers to e-learning that are far more difficult to overcome. These include the student's academic profile, their family situation, employment and nature of job, and available study time. Based on these findings authors (ibid.) presented a comparative framework as illustrated in Figure 33.

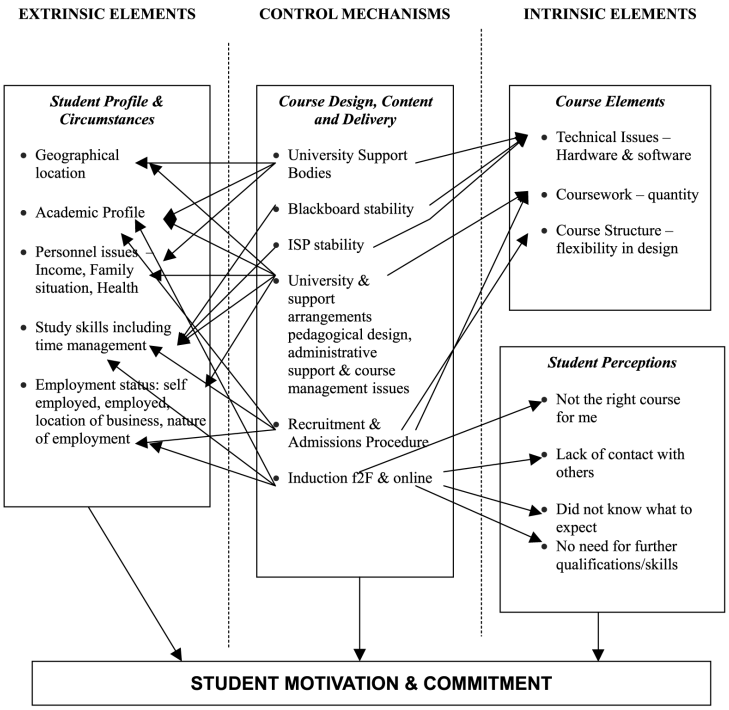

Figure 33. A Conceptual Framework for the Classification of Barriers to Learning on an Online Programme (Packham et al. 2004: 341).

In addition to listing causes of withdrawal, Packham et al. (2004) also propose that insintric and exintric factors are mediated by a control mechanism. This control mechanism includes recruitment, induction, support and management issues, VLE reliability and student support. In addition to the control mechanism it is pertinent to note that underlying factors for withdrawal such as a lack of commitment/ motivation and insufficient academic ability also impact upon retention. It is therefore evident that for a student to be successful on an e-learning course they must be a suitable candidate and be committed to a course of study. Commitment and motivation however, are subjective elements and can only be influenced by a diversity of factors including the student profile, personal circumstances and the perceptions and experience of the learner. The main contribution of their suggested framework is recognizing the existence of intrinsic and extrinsic

barriers to e-learning and the interrelationships with the control mechanisms. Findings reported by Packham et al. (2004) are consistent with previous studies (see Rovai 2003).

Empirical Findings and Educational Technology Literature

It appears that for the most part the focus in providing online education is on communicative functions, e.g collaboratism (Leidner & Jarvenpaa 1995: 270) and not so much on pre-made materials, nor exercises which are objectivist (ibid.) by nature. According to Ministry of Education (2000: 13), special attention is being paid to the content of education and the methods of instruction, as well as educational standards and equality in Finland. Because of this, educational organizations are facing expectations which are becoming all the time more challenging. In order to be able to provide better quality education in a cost effective manner, ICT can be utilized. If considering teacher as "the instructional delivery machine" in a sense Hodas (1996: 205-206) used the term referring to standardization, or uniformity of outcome in education, it could be argued that ICT provides means for automating certain tasks. On the other hand, Leidner & Jarvenpaa (1995: 50) argue, that although there are many potential computer-based methods and that the methods can have different outcomes — it is the method of using the technology and not the technology itself that has an effect on classroom activity.

Norman's (1997) division for time and space are adequate alone for analyzing electronic education environments. Khalifa (2001) suggested additional dimension, learning method, and like Leidner & Jarvenpaa (1995) argue, the method of using technology is of utter importance — not the technology itself. The model Peterson et al. (2002) created in their study about the use of new technology in marketing education does give some implication. They found that important antecedents for the use of instructional technology are perceived greater effectiveness, perceived enhanced communication, perceived greater efficiency and "appearance" as they used the concept. Consequences found were greater efficiency and enhanced communication which both facilitated student learning. Other consequences were lower student learning and uncertain student learning.

Keeping this in mind, findings in this study at hand do give similar implications for the importance of greater effectiveness, enhanced communication and greater efficiency. When looking for the reasons for continuing the use of web based course tools interviewees told among other things following reasons: received positive feedback, learning results have been very good, pilot course turned out fine, very easy to update course materials, makes teachers' job easier, flexibility from time and place, one can concentrate more into content than technology and

reflecting experiences through discussions. These results are in line with the findings of Peterson et al. (2002) — as did the reasons for not to use web based course tools. Reasons were uninterested students, wages were not adequate when compared to workload and teaching method is not suitable for courses with many students.

Question whether or not to continue to use WBT system in one's work also in the future was interesting. Majority of interviewees were going to continue to use system also in the future and the reasons for this were basically good experiences and good results. Reported reasons for not to use system, were inadequate compensation for required work, uninterested students and unsuitability for large courses. Interestingly enough, only four interviewees had themselves attended virtual courses in a role of student. One could argue here that how well this totally new approach towards education can be applied into use if teachers themselves have not seen the reality of online courses before hosting one? One possible explanation could be the age distribution between interviewees, e.g., the last time they have been attending courses as a student.

Empirical findings suggest that the need for course administration in virtual education is greater than in ordinary face-to-face teaching, which allows more room for improvisation. This might be related to the fact that all teaching personnel are familiar with standard face-to-face teaching and lecturing. New technology might require more efforts from them in order to work efficiently — or this is just noticed more easily because of new way of doing things. It was also noted that during more traditional type of course it is possible that course might change on its way, but when virtual courses are in question, this is not possible. This indicates that in virtual education pre-planning is seen as more crucial than in more traditional forms of teaching.

Although Zhang et al. (2004) noted that e-learning requires more preparation than traditional classroom teaching, findings of his study suggest that first times when taking WBT systems into use the workload appears to be a lot heavier than later on. Reason is that when one has learned the system, made pedagogical choices, course material and practices are in order, it is easier later on. Basically underlying guideline appears to be, that investment in WBT will start to produce benefits only after online course is being run several times. On the other hand, great investments on chosen technology are likely to encourage continued use of it.

Quite often the Internet has been presented as a medium, which will free us from the restrictions of time and place. Findings of this study implicate that with the assistance of WBT system it is possible to break free of the restrictions of place, but not so easily of time. According to Kitchin (1998: 387) space and time remain

significant for three main reasons; First, cyber spatial connections and bandwidth are unequally distributed both within and between western countries, and in comparison to developing countries. Second, whilst information on-line might seem geographically dislocated, information is only as useful at the locale within which the body resides; Third, cyberspace depends on real-world spatial fixity — the points of access, the physicality and materiality of wires.

Collis & van der Wende (2002) suggest that adopting ICT into use in higher education appears to be slow change process, with no radical indications. Results of this study suggest that the use of WBT has increased steadily, not dramatically. Best use appears to be for sharing routine type of information. The motivation of students was noted as a problem, and this results a question; how to motivate on-line course students to study eagerly? This issue appears to be a question that is more likely related to pedagogical approach used. It appears that although constructivist approach towards learning is commonly used approach in online education, it does not fit all situations. Cheetham & Chivers (2001: 285) suggest that one should exercise caution against being too prescriptive in respect of 'best practice' learning methods, because people are different and these differences are present also in learning. Also Kilpinen (2004) suggests that learners learn in a different ways.

An interesting issue emerged during interviews. It was assumed that problems related to WBT system used (e.g. WebCT) are mostly due to person changes in organization, e.g., valuable knowledge is lost every time this happens. This appears to be an important observation. The significance of capable IT or pedagogical support for WBT related problems is an important issue, not to be taken lightly.

So far it appears that the organizations can not make the most out of ICT. For example, one interviewee explicitly stated that in their case there is no collaboration in virtual education, although they do have collaboration in research, while there were others who themselves had collaborative arrangements in education. Collaboration was seen as a reasonable approach because of economic questions. Although co-operation and networks between universities are a common trend in education, and online education is about to become a standard channel for providing education, it appears that old working routines have been conflicting with new technologies and practices. This is due to the fact that people seem to have very different mental impressions of WBT. It seems that this is possible especially in situations where working is done mostly solo, and there is no co-operative arrangements in education. As long as there are only one teacher tutoring a online course, the collaboration is not likely to occur, but if there were for example two

teachers assigned for every course in order to back each other in case of sickness or some other hindrances the collaboration should grow as a natural part of work routines.

4.5 Concluding Summary

The overall research problem of this study was: "*Under what circumstances is the adoption of ICT successful (in higher education) and what impact does it have on individual work and organization?*" The research problem is two fold, questioning a) the successful adoption setting and b) the impacts of ICT. As a result this study provides answers to research problem, suggestions for practice and two theoretical models for IT adoption (in higher education).

Research problem was broken into three research questions. First research question was: "*What are the circumstances which enable the adoption of new ICT into use in higher education?*" Basically this is a question about the context where interviewees were working. It appears that circumstances that support the adoption of ICT are taking place on two levels; personal and organizational. Gallivan (2001) suggests that adoption should be studied as two-stage process. Also Jeyaraj et al. (2006) use two levels for summarizing prerequisites for successful adoption. On personal level conscious choice to use IT in education, better than average IT skills and familiarity with the Internet applications. Interviews suggest that there are some indications for the significance of previous encounters and experiences with new technology. Jeyaraj et al. (2006) state that the best predictors of individual IT adoption include Perceived Usefulness, Top Management Support, Computer Experience, Behavioral Intention, and User Support. On organizational level functional IT infrastructure and organized IT support are favorable conditions for ICT adoption.

Jeyaraj et al. (ibid.) list the best predictors of IT adoption by organizations as Top Management Support, External Pressure, Professionalism of the IS Unit, and External Information Sources. Results indicate that on general level WBT is a natural extension for those who are already using IT in education as long as it is technically possible. There are obvious similarities with results, but differences need a closer look. First, it appears that the context where this study has been conducted has its characteristics; Jeyaraj et al. (ibid.) study covered context for private sector organizations, while my study was conducted in educational organization. In addition to this the teachers work in higher education is usually quite lonesome work and this has both benefits and drawbacks. For example, usually "academic freedom" is associated with freedom in planning and organizing teachers' own

courses without administration dictating how to do things. On the other hand this culture might influence how the role of administration is seen by teaching personnel. Markus (1983) suggested that people or groups resist systems because of an interaction between characteristics related to the people and characteristics related to the system. It appears that both of these issues have impact on adoption of WBT systems. Empirical findings do give some implications that the characteristics related to people are a little stronger, but not the only issues of importance.

The change to virtual education does not seem to happen automatically, like in the "magic bullet theory". Change needs change agents, but not as radical ones as described by Markus & Benjamin (1997). One function of Learning Center appears to be to act as a change agent, or as a supporting organizational unit for change agents or as broker technicians (Barley 1996) of new educational technology. Jeyaraj et al. (2006) noted that Top Management Support stands as the main linkage between individual and organizational IT adoption. This is supported by the empirical findings of this study. On the other hand, innovation characteristics and organizational characteristics were listed (ibid.) as independent variables, which are good predictors of both individual and organizational IT adoption. These are important issues and apparently WBT systems in question and higher education context are to be taken into account.

Second research question was: "*How is the new ICT utilized on individual level in higher education?*" It appears that people adopt and use technology in different ways. Original reasons for taking unfamiliar new technology into use did also vary. Based on the interviews, it appears that WBT system is best used as an information channel, or as a medium for delivering course materials or exercises. Interviewees presented many other uses for WBT system, but these mentioned ones were apparently the most important ones. Empirical findings suggest, that WBT systems cause changes, but not exactly like Huber (1990) predicted. IT will provide means for accessing and processing data very fast and accurately. In case of virtual education, organization design has changed, a new organization unit was founded (e.g., Learning Center). Findings of this study also indicate that in general level WBT tools are a natural extension for those who are already using IT in education (whether it is the use of presentation graphics during lectures, the Internet resources or the use of personal email for interaction with students) as long as it is technically possible. Huber (1990) appears to be missing one very important issue in his suggested framework, namely cases where advanced technology is not being adopted into use, although it is available. It appears that Huber's theory has the pro-innovation bias (Jeyaraj et al. 2006) to tackle with, e.g., idea that "all adoption is good". It appears that the most popular feature among interviewees was the possibility for automated submission of assignments into a

system, which in turn would keep record on deadlines as well as on returned works. Second highest ranking was given to possibility for online discussion and third on ranking was the possibility for administering and monitoring users during the course. Most of the features, or tasks were concentrated on managing and administering courses and on communicative features. Collaborative, purely maintenatively, or resource centered functions were mentioned, but not so often.

While VLE:s can provide a great variety and enhancements for education, the computer skills of teachers and students play an important role. The way how WBT is used for online courses appears to be highly dependent on users' computer literacy, and in particular on capability for making most out of target system. This refers to interpretive flexibility, which can be defined as "*the capacity of a specific technology to sustain divergent opinions*" (Sahay & Robey 1996: 260). According to Doherty, Coombs & Loan-Clarke (2006) interpretive flexibility has long been recognized as playing an important role in explaining how technical artifacts are socially constructed. In the scope of this study, while referring to interpretative flexibility, it can be argued whether an experienced user can get more out of the system than a novice user? Depending on the skill level of the user, the target system may manifest itself differently to different users. Another question is whether to consider experience as either general IT literacy or system specified IT literacy.

Interviews showed that nearly all forms of digital media were covered (video, sound, pictures, animations, web pages, documents and pure text) in online education. Although WBT tools are very versatile in features, other supporting tools were used to support individual work. Here two examples were mentioned; concept maps and email lists, where the latter was taken into use for replacing technology that did not work. These results suggest that WBT does offer a very comprehensive toolbox for distance, as well as for multiform education. It also indicates that depending on task in hand or user habits, other supportive ICT tools can be used in collaboration with WBT.

To consider reasons why teacher might, or might not adopt available new technology can be approached using the model proposed Peterson et al. (2002) in their study about the use of new technology in marketing education. They found that important antecedents for the use of instructional technology are perceived greater effectiveness, perceived enhanced communication, perceived greater efficiency and "appearance" as they used the concept. Consequences found were greater efficiency and enhanced communication which both facilitated student learning. Other consequences were lower student learning and uncertain student learning. Keeping this in mind, findings in this study at hand do give similar implications

for the importance of greater effectiveness, enhanced communication and greater efficiency. In other words, it appears that perceived benefits of available technology are important when judging adoption decision.

Teacher's role in virtual context appears to have changed from traditional authority to be more like a tutor or coach. Based on the findings of this study, this seems to apply in most cases. Problems concerning technology were surprisingly few, although both students and teachers had encountered some minor problems with technology. Copyright related problems were addressed during the interviews, as was the workload. In many cases the material production is done in collaboration in a closed virtual environment with participating students. This is shared expertise in action, like one interviewee stated. It was also stated that WBT is a tool for sharing knowledge, and that it also offers freedom of time for students who could not otherwise attend classes. Interestingly enough a great weight can be put on personal contacts when trying out new technology, namely in one case where a lot of collaboration was done with other teachers, it was stated that experimenting on these new systems had been based on personal contacts.

When analyzing interviews of this study, the way how women had made decision to adapt new technology seemed to be decision, which was made after very thorough thinking. The fact was that all women did have pedagogical studies behind them, and they were in many ways interested in improving their working and teaching methods. Such a simple and clear motive behind men's decision in taking new technology into use was not that clear but it implies that most significant factor is more concrete solution for a technical problem. Difference between men and women could be expressed in a form of question. Women could ask:" *What good for my work process could follow from using this technology?*" while men could ask:" *How do I resolve this problem using technology at hand?*" Although there does not seem to be major differences in a way how men and women actually use technology, there seems to be clear distinction in approaches toward technology. For women the exploitation of highly developed interactive communication seemed to be the most important factor, while men seemed to be oriented to more technical details.

In this study there seems to be noticeable difference for what purpose the technology is being used, as well as in favored functions offered by technology. This difference can be presented in a form of x- and y-axis, as Figure 34 illustrates. Y-axis presents functionalities favored and consists of two polarities, which are technical functions and communicational functions. X-axis presents purpose, for which technology is considered. Here also two polarities are represented, which are general interest, or "general good" and specific problems. In general, men

seem to be populating mostly upper right corner, while women seem to populate lower left corner.

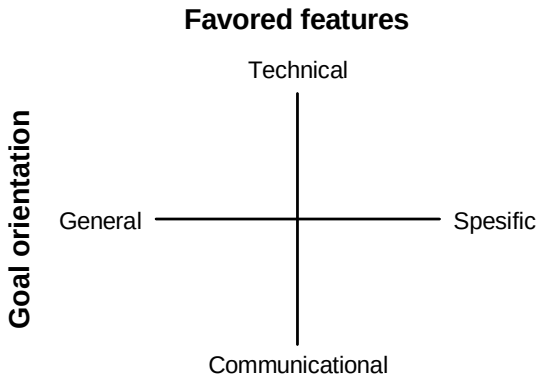

Figure 34. Differing Interest Areas Between Genders.

Interviews showed that WBT can be seen as flexible and can be used to support many different types of approaches towards teaching. As a flexible technology, WBT can be used in many ways, thus offering either marginal support for traditional education or full toolbox for virtual education, or something in between, which appears to support the perception of interpretative flexibility (Sahay & Robert 1996) of technology. Cordella & Simon (2001: 190) used two concepts for analyzing technology adoption in organizations; technology inscription and organizational inscription. First concept meaning the rigidity of the technology, and the latter the level of freedom or rigidity in organizational procedures. In the scope of this study the technology inscription and organizational inscription appears to be low in nature, allowing users a lot of freedom in the actual use of WBT, or supporting systems. In general, interviews showed that people adapt and use the same technology in different ways.

Third Research question was: "*What are the effects (changes) new ICT has upon individual work processes and on organizational context in higher education?*" Teacher's role in virtual context appears to have changed from traditional authority to be more like a tutor. Based on the findings of this study, this seems to apply in most cases. Problems concerning technology were surprisingly few, although both students and teachers had encountered some minor problems with technology. Copyright related problems were addressed during the interviews, as was the workload. In many cases the material production is done in collaboration in a closed virtual environment with participating students. This is shared expertise in action, like one interviewee stated. It was also stated that WBT is a tool for sharing knowledge, and that it also offers freedom of time for students who could not otherwise attend classes. Interestingly enough a great weight can be put on per-

sonal contacts when trying out new technology, namely in one case where a lot of collaboration was done with other teachers, it was stated that experimenting on these new systems had been based on personal contacts.

Concerning issues reported by interviewees were questions related to immaterial questions, especially copyright and plagiarism. It appears that for those who see copyright issues as a threatening problem, the choice of used technology under virtual education is not that easy. In the case of copyrights, the choice is done between open or closed WBT system. When regulations and practices become clearer, this issue is probably no longer that crucial. Concern of the Internet plagiarism was also issued. Present technology has made it possible for students to easily exercise plagiarism, which in turn forces teachers to re-evaluate the way how to design exercises and course works. Technological determinism was also seen as concerning matter along with hype around virtual education. It was also reported that the division of labor between University's Computer Center and Learning Center were not at all as clear when it comes to WBT support, and on technical issues related to virtual education.

Interviewees reported that on personal level there are now more virtual contacts, i.e. students do not contact university personnel face-to-face as often as they used to, but instead use email. In the beginning all efforts put on virtual education were very lonesome work, but these days teaching methods and solutions developed back then have grown to be an interesting topic for others. It was also reported that when compared to past, a lot more time is being spent in front of a computer. Due to technological changes, there has been a need for developing working routines for everyday work. It was also reported that at present, there are efforts for increasing virtual education, which is seen as an important factor.

It was reported that computer literacy has improved among teachers as well as among students. Also the role of the university administration had become more visible on issues on virtual education. The university's general policy and IT strategy clearly include virtual education among areas which are given high priority. Highly visible example of this is the Learning Center project, which was seen as a very important motor for promoting virtual education in the area. It was also reported that there are several projects going on, which are related to virtual education.

It was noted that funding for projects on virtual education is possible to get, but not that easy. This is to say, that the option is available for those willing to utilize it. The same thing applies to information concerning virtual education. Information is available, but it is a question of one's personal interests whether or not to use it.

As a summary for presented research problem, the circumstances enabling the most efficient adoption of ICT can be traced to take place on two levels; personal and organizational. On personal level a conscious choice to use IT, better than average IT skills and familiarity with the Internet applications and make a good foundation for successful adoption of ICT. Also favorable previous encounters and experiences with new technology have also some significance. On organizational level it appears that working IT infrastructure is crucial along with organized IT support. Impacts of ICT on personal level concentrated on communication, where contacts are increasingly taking virtual form and increasing amount of time is being spent in front of the computer. It also appears that in the beginning efforts put on virtual education are very lonesome work. Endeavors of this type require development of personal work routines for managing everyday work and emphasis on immaterial issues was reported. On organizational level the role of university's administration has become more visible on virtual education and both university's general policy and IT strategy clearly include virtual education among areas which are given high priority. There are also going on several projects which are related to virtual education and there is funding and information available about virtual education for those willing to utilize it. Because of the virtual education, the situation between certain organizational units had become a little bit confused because it was hoped that the roles need to be clearer.

4.6 Enhanced WBT Adoption Model for Higher Education

It appears that the adoption of IT system is usually considered as a process that happens once, and if successful the system is taken into use for good. On a general level this might be the case, but on individual level (e.g. micro level) IT adoption should be considered as an iterative, self correcting process, where person is learning from his/her mistakes. Also the environment, where person works influences the adoption and use of IT. On a general level this should be considered as an iterative learning process, because on personal level knowledge about what works and what does not work cumulates upon experience. This learning is personal, individual development. This includes also a possibility for change, where the goal is to improve personal performance. Data-driven WBT adoption model for higher education presented in Sub section 3.4.1 is actually a description about IT adoption process taking place on individual level, but like TAM (Davis 1989) or TAM2 (Venkatesh & Davis 2000) it does not include a feedback loop that is essential for learning.

According to Argyris (1993: 5), two types of learning are necessary in all organizations; single-loop learning and double-loop learning. Single-loop learning corrects errors by changing routine behavior and it is incremental and adaptive. Double-loop learning corrects errors by examining the underlying values and policies of the organization. Argyris (1977) uses thermostat analogy for illustrating the difference between single loop and double loop learning; Single loop learning can be compared with a thermostat that learns when it is too hot or too cold and then turns the heat on or off. The thermostat is able to perform this task because it can receive information (the temperature of the room) and therefore take corrective action. If the thermostat could question itself about whether it should be set at 68 degrees, it would be capable not only of detecting error but of questioning the underlying policies and goals as well as own program. That is a second and more comprehensive inquiry; hence it might be called double loop learning.

All four general theories of organizational change by Vande de Ven & Poole (1995) include iterative process. This applies also on Feldman's (2000) performative model of routine. In addition, Huy's (2001) contributions are based on Van de Ven & Poole's (1995) teleological model, so even there the iterative process forms the very foundation for presented ideas. Because data-driven IT adoption path theory lacks the iterative loop, the idea of iterative process is applied here to enhance theory. This reflective "feedback loop" is inspired by Argyris (1977) double loop learning and Kolb's (1984) model for experiential learning. This is natural way to work for teacher who is teaching the same course many times on a row, and is required every time to decide how to actually implement the course and which tools to use. A dashed arrow is used to illustrate this feedback loop, and it is referred as "IT adoption loop", as shown in Figure 35. This feedback loop suggests that while ICT experience cumulates in the process self reflection has impact also on perceived usefulness of target system.

Only three of the interviewed had fully virtual courses, while all others had more traditional education supporting web based education, or used web based educational environment to support their more traditional education in different ways. This implies that technology is quite flexible and it is possible to adapt it differently depending on situation. Because of this, the concept "flexibility of technology" recognized in data-analysis is reassessed here, although it was not included in the data-driven model. Cordella & Simon (2000) presented two concepts, which will supplement nicely proposed theory. These concepts are "technology inscription", which refers to the rigidity of used technology in constraining the users in the way they are related to the technical object and "organizational inscription", which refers to the level of freedom or rigidity in organizational procedures or, in other words, the extent to which organizational agents are allowed

to reshape the ways in which the technical objects are used with respect to organizational rules. Freedom in the data-driven model describes degree of freedom person experiences, and even if person can made up his/her mind freely, organizations IT policy, regulations and practices eventually influence this indirectly. For example, certain systems or practices are simply not allowed because of risk for compromising computer security. This is included in the enhanced theory as organizational inscription as presented in Figure 35. The flexibility of technology is included into theory as technology inscription. Literature based additional concepts in presented enhanced theory are highlighted using dashed lines. The whole enhanced theory is presented in Figure 35.

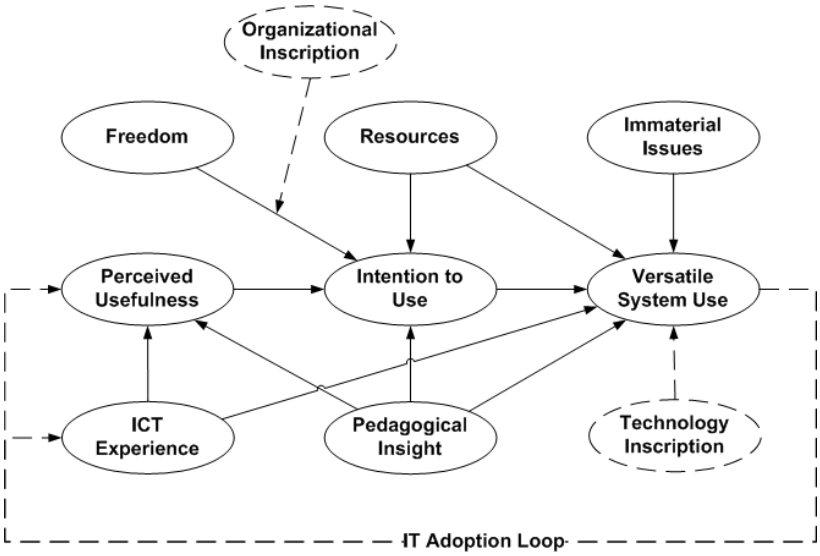

Figure 35. Enhanced WBT Adoption Model for Higher Education.

Considerable research has focused on the relationship between computer experience (or IT literacy) and attitudes. In their empirical study Garland & Noyes (2004) did find out that computer experience is a poor predictor in explaining computer attitudes. In this study previous ICT experience appears to have significance for IT adoption. ICT experience and IT literacy are related to each other. When asked to define one's IT skills, all interviewed did see themselves possessing at least satisfactory skills. Most of them saw themselves having average or better skills. This was not that surprising, because WBT does require some level IT skills to be used. Based on the empirical findings of this study, one can not make such claims as: "the most important factor to ensure technology acceptance is easiness of use". People do naturally hope for systems which are easy to use, but this does not prevent them from using systems — as long as they see clear advantages in using it. Whether these advantages are general, or influence on personal work, does not play that important role.

Empirical findings imply that although online education was not the easiest solution, it did provide benefits, and was taken into use for this reason. It also seems that when being familiar with IT is a lot easier to adapt new technology and ways of work. Collis & van der Wende (2002) suggest, that ICT in teaching and learning is serving as a complement to already existing instructional tools. This appears to apply also in this case. Technology does not seem to replace old work processes with new one's, but instead it changes them.

It also seems that if the first encounters with new technology are very bad there is a concrete risk for rejecting technology. If this happens, the "IT adoption loop" presented in Figure 35 breaks and user will abandon the IT system in question. In general sense, empirical finding implies, that web based educational tools are seen only as a tools for completing tasks and making work easier. The tool is not emphasized; the focus is instead in actual work process.

Only few of the interviewed had themselves attended virtual courses in a role of student. One could argue here that how well can this totally new paradigm of education be applied into use if teachers themselves have not seen the reality of online courses before hosting one? Another interesting occurrence was new co-operation arrangements. This new technology had indeed made possible new forms of collaboration, but unfortunately these were not very common practice. Six out of twenty interviewed had some sort of co-operative arrangements which were possible because of used technology.

5 CONCLUSIONS

In this final chapter implications to science and practice are discussed, and then followed with limitations and methodological discussion. Finally avenues for new research are discussed. Implications to science are presented in Section 5.1 and following Section 5.2 covers contributions to practice. Methodological discussion and limitations of the study are covered in Section 5.3. Finally promising new research avenues are discussed in Section 5.4.

5.1 Implications to Science

This study can be described as an explorative journey, where original research settings and questions were constantly questioned and refined. Research problem and research questions have been discussed in detail, and although original goal was to study successful implementation of ICT, the outcomes of this study are far richer than that. Research method used in this study did not follow too rigorously any method guide, but instead it combined several approaches. By doing this, focus was put on theory creating approach, where induction was given great importance. When using this approach it was possible to make theoretical contributions in addition to finding answers to research questions. Scientific contributions of this study are three fold. First, this study contributes new results in the form of theoretical IT adoption theories. Second, this study contributes results that support previous research; especially IT adoption and IT impact studies. Third, this study contributes results that are conflicting with previous research.

The main research problem of this study was: "Under what circumstances the adoption of ICT is successful (in higher education) and what impact it has on individual work and organization?" This problem is two fold, where it first questions successful ICT adoption settings and second, impacts of ICT. It appears that circumstances that support ICT adoption are *conscious choice, better than average IT skills, familiarity with the Internet applications, functional IT infrastructure* and *organized IT support*. First three are taking place on personal level, while last two take place on organizational level. This suggests that circumstances supporting successful ICT adoption can be tracked down to two levels; personal and organizatorial. This finding is supporting Jeyeraj et al. (2006) two levels for successful ICT adoption, and including both micro and macro levels (see Markus & Robey 1988) into discussion.

While some argue that IS discipline should be outlined and focused very tightly (Benbasat & Zmud 2003), some have opposite ideas (Agarwall & Lucas 2005;

Alter 2003). Results of this study suggest that most beneficial approach would be to take into consideration both. In this study the factors supporting ICT adoption were tracked into both, micro and macro levels. Outlining the focus too strictly would not have given as rich and comprehensive picture of ICT adoption process that is taking place. Presented results in this study do suggest, that a more beneficial approach on outlining and focusing the IS discipline would be not to be too strict and not to focus too strictly.

Although previous studies (Garland & Noyes 2004) suggest, that computer experience is a poor predictor in explaining computer attitudes, finding that previous ICT experience has significance for IT adoption is suggesting the opposed. Another interesting result in my study was that WBT system provides flexibility in a sense, that it is possible to adapt the system to be used in different pedagogical combinations. While this supports the interpretative flexibility of technology (Orlikowski 1992b), it also increases confirmation for technological inscription (Cordella & Simon 2000). Reason why these results are somewhat conflicting with previous research might be due to the fact that this study was conducted within one Finnish university, and thus results can not be directly generalized to cover all universities. On the other hand, the significance of computer experience in this context is not a subject that has been studied too much.

While the use of WBT was seen as time consuming, and the workload during online courses was seen as considerable, findings in my study do not clearly support Hogan & McKnight (2007) concern for burnout risk, but instead they do point to this direction. One possible reason for results, that do not clearly support previous research, might be the point of time when the empirical data was collected. In year 2003, online education and WBT systems were still very new things at the studied university. During that time the experiences related to the excessive use of WBT systems, or workload issues related to this, were just distant (and maybe not so probable) possibilities in horizon. Because online education was not very old practice at that time, issues of this type were very likely to escalate in near future, although those were not current concerns.

While Norman (1997) suggested, that electronic classroom allows bending restrictions of time and place, findings of my study suggest that this is not that simple. If the online (or blended) course is designed to be simple enough, this is more likely. Finding of my study suggest that majority of WBT users (e.g. teachers) were mostly using features helping in administrative everyday work in addition to asynchronous tools, while synchronous features were not used likely often. This result suggests that freedom of place is more likely to occur than freedom of time, and expands Norman's (1997) classification.

When this study was started, e-learning was still a new thing. Now the situation has somewhat stabilized. It would be very likely, that changes like this will affect the decisions journal editors will make, when judging suitable articles for their journals. Because of this research articles around the use of online learning systems and restrictions of time and place are not popular topics anymore. Results of this study do show that there is still more to study in this area, and it has become even more important these days.

Finding that virtual education was seen as very lonesome work and that WBT adoption does not happen overnight provides support for Markus & Benjamin (1997) conception that the IT-enabled change in organizations does not happen autonomously, following the "magic bullet theory". Instead it requires change agents, although not necessarily as aggressive ones as outlined by Markus & Benjamin (1997). Examples of change agents were not originally from higher education, but presented theory seems suitable also for this context.

Results suggest that impacts of ICT are diverse. It appears that because of advanced ICT, teacher's role in virtual context appears be changing. In the past teacher's role used to be more authority like, but because of new communication technology, it is shifting to be more tutor like. In addition to this, the contacts are also taking place increasingly in virtual form. New technology has also resulted new positions and organization unit (Learning Center) was founded. While WBT systems enabled a new ways for providing education, it caused a need for support and special skills. Organization responded to this with new organization units and new persons with new responsibilities, in order to guarantee stability in organization. All these changes were responses to other changes and as such increase the confirmation for Leavitt's (1965) theory, where the main idea is how the organization maintains stability when there are changes taking place.

Results of this study have obvious similarities with previous IT adoption studies. Similarities with Rogers' (2003) diffusion of innovation theory were not that clear, but the phenomena referred as assimilation gap by Fichman & Kemerer (1999) was present, thus providing support for that theory. It appears that first users of WBT could be categorized as innovators, but it also appears that there is more in the picture that meets the eye.

Why the WBT adoption was not more common among university teachers? It appears that it is not technological skills that make the difference, although good IT skills make the adoption easier. Even more interestingly the importance of pedagogical insight must not be overseen. If pedagogical benefits are obvious, these work as a motivator for teacher. While teachers have a lot freedom about the way how they plan their courses, online education is still very lonely work, and even if

a good work practice is established, how could it spread in this environment? It might be that traditional working practice within university, while on the other hand encouraging research and experiments, is also hindering the diffusion of new innovation. On the other hand, the study was conducted in 2003 and back then WBT systems had been around only for a while, and the common enthusiasm for virtual education was yet to come.

This study provides a data-driven theoretical WBT adoption model for higher education (Sub section 3.4.2), where empirically validated concepts are presented. In this conceptual model predeterminants for intention to use target system are individual's freedom (e.g. freedom to decide and make a choice) and perceived usefulness of used technology. Also previous ICT experience is suggested to have significance on perceived usefulness. Versatile system use follows Intention to use. Versatile system use and perceived usefulness are affected by pedagogical insight. Versatile system usage is also affected by the immaterial issues. This model was referred as "WBT adoption model for higher education". Later data-driven theory was compared with existing literature and enhanced. Resulting theory was presented as "enhanced WBT adoption model for higher education" (Sub section 4.6).

These theoretical contributions are supporting partially TAM (Davis 1989) and TAM2 (Venkatesh & Davis 2000), and in addition provide few additional concepts to be considered, while studying IT adoption in higher education. In addition to this, Kolb's (1985) learning model is used here to enhance data-driven theory, as are two additional concept "technology inscription" and "organizational inscription" by Cordella & Simon (2000).

Neither TAM or TAM2 include learning, that is included in enhanced WBT adoption model. It is also quite common to presume, that IT adoption is a simple process that takes place only once, and as a result the system is adopted into use for good (like TRA, TAM, or TAM2). This is not the case, and enhanced WBT adoption model shows on the individual level, that this is a decision which is made everytime when the system is taken into use. A good example is a teacher who tutors a course using WBT system, and when it is time to teach the same course again to a different group, he/she have to consider once again whether to use or not to use the system. This decision is influenced by the learning that has happened during the use of target system. Because of this, the presented theory contributes new elements into IT adoption thinking in higher education context.

Change appears to take place both from bottom-up and top-down, where first is taking place in the form of pioneering teachers, who are willing to take a risk and to test new technologies and the latter in the form of university policies and rec-

ommendations. On organizational level ideal model referred as teleology by Van de Ven & Poole (1995) appears to provide a framework for understanding this process on organizational level. On the other hand, this causes changes and organization needs to adapt itself in order to cope with these. For the changes in organization, which are not taking place top-down Huy's (2001) proposed ideal type of socializing is best. While change in university appears to be continuous, albeit based on some strategic decisions, it is also supporting Huy's (ibid.) ideal type of socializing in addition, this in turn provides a great way for understanding change in university and the role of change agents. On personal level Kolb's (1984) learning model can be used to understand the process teacher undergoes every time he/she needs to make a decision how to actually realize a course he/she is responsible for.

Early job design models (Buchanan 1979) did not prove out to be very useful for understanding ICT adoption process in higher education, but the job characteristics model of work motivation (Buchanan 1979: 71, orig. Hackman, Oldham, Janson & Purdy 1975: 62) raises into focus the significance of high inner motivation that is necessary for high quality work performance, high job satisfaction and low turnover and low absenteeism. University teachers have quite much freedom about how to organize their work, and for the most part their decisions are for the most part quite autonomous.

5.2 Implications to Practice

Based on the findings of this study following recommendations for practice can be suggested. Teachers should put their best efforts on guaranteeing that when organizing virtual education, feedback channels are open already from the very beginning. This ensures that the suggestions for further development or technical problems can be dealt with as soon as possible.

Because it was evident, that immaterial issues are a significant concern for many, university administration should take action and provide general recommendations and guidelines for organization policy. According to the notice given by the Tieteentekijöiden liitto (Finnish Union of University Researchers and Teachers, FUURT) in 7th of November 2006, it is forbidden to use video recordings of university lectures without the permission of lecturer. Apparently the practices exercised in different higher education organizations have differences, and this type of notice is seen as necessary. In order to overcome this problem a common guidelines for practice and formal agreements concerning immaterial issues as well as financial compensation are to be encouraged.

Another issue to be noticed by university administration is workload related to online courses. In order to cope with these, a course assistant practice is to be recommended. Also collaborative arrangements in online course production and/or hosting between departments or universities should be carefully considered, because this provides a way for providing online courses in a cost effective way.

When implementing a new ICT system, it is recommended that the targeted end users are familiarized with the benefits and possibilities of system in such a manner that it is easy to see what benefits the system really has to offer. It is also easier to start with persons with previous ICT experience. The implementation is most successful, when those using system have certain degree of autonomy over their own work and final decision whether or not to adopt new ICT system, making them more committed in the process. It is therefore suggested, that Computer Center and Learning Center should strengthen co-operation in order to be able to communicate good practices and benefits of new innovative technologies to end users in a better way. Also the specialized knowledge nested in Computer Center should be brought out to the larger audience in such a way that it is easier even for novice users to pick up new influences. In this way the awareness about available possibilities will diffuse in the organization more efficiently.

Knowledge dissemination about proven and tested practice on online courses is to be encouraged. Learning Center should provide a public forum, where experiences and case examples about online courses can be shared. A common problem in pilot projects is neglected documentation, and this forum could provide an alternative solution for this problem. It is essential to build a body of knowledge of how to use educational media, so that teaching profession knows what it is doing and why.

When implementing WBT systems or any other new ICT, it is advised to really carefully to asses what the technology in question is capable of and what benefits it has to offer. This study suggests, that potential benefits are seen as more important factor that, for example, the ease of use. In implementation the end user motivation is easier keeping this in mind.

5.3 Methodological Discussion and Limitations of the Study

According to Töttö (1999: 281), thinking that research methods are independent of problem, and everyone can choose method that best suits oneself and use it in every situation, is simply misguided. Järvinen (2004b) suggests, that research

question should be guiding the selection of an appropriate research method. Often used division in research is to make a difference between qualitative and quantitative, depending on used data gathering and analysis methodology. The taxonomy of research methods by Järvinen (2004a; 2008b) suggests that the difference on empirical studies should be based on whether the study is theory testing, or theory creating. This study is theory creating study and empirical data used is qualitative by nature. When generating theory based on data, and when research settings are new, a data-driven approach for analysis appears to offer all the tools necessary for carrying out the research successfully.

Gregor (2002) identified five different theory types of theory that are seen as relevant to information systems. These theory classifications were then refined and developed further in her later work (Gregor 2006). Type I is *theory for analyzing*. This descriptive theory says "what is". The theory does not extend beyond analysis and description. No causal relationships among phenomena are specified and no predictions are made. Type II is *theory for explaining*. This type of theory says "what is", "how", "why", "when", and "where". The theory provides explanations but does not aim to predict with any precision. There are no testable propositions. Type III is *theory for predicting*. This type of theory says "what is" and "what will be". The theory provides predictions and has testable propositions but does not have well-developed justificatory causal explanations. Type IV is *theory for explaining and predicting*. This type of theory says "what is", "how", "why", "when", "where", and "what will be". The theory provides predictions and has both testable propositions and causal explanations. Type V is *theory for design and action*. This type of theory says "how to do something". The theory gives explicit prescriptions (e.g., methods, techniques, principles of form and function) for constructing an artifact.

Colquitt & Zapata-Phelan (2007: 1286) have a different approach, when they recognize five different types of articles upon introducing a taxonomy that reflects the theoretical contribution of empirical articles along two dimensions: theory building and theory testing. These types are: 1) *Reporters*, empirical articles that possess relative low levels of both theory building and theory testing; 2) *Testers*, empirical articles that contain high levels of theory testing but low levels of theory building; 3) *Qualifiers*, empirical articles that contain moderate levels both theory testing and theory building; 4) *Builders*, articles that are relatively high in theory building but relatively low in theory testing, and; 5) *Expanders*, articles that are relatively high in both theory building and theory testing. According to them (ibid.) builders include inductive studies that focus on new constructs, relationships, or processes, while expanders focus on constructs, relationships, or

processes that have not been the subject of prior theorizing, but they conduct that examination while testing some existing theory.

Table 19 shows a simplified two-by-two frequency table of possible research questions used in social sciences. What -questions are the most fundamental ones. Without answers to these questions about conceptual meaning of phenomena under study, no research is possible. How much -questions are possible only after what-questions. It is possible to measure something only after one has decided what to measure. How-questions are dealing with processes and are somewhere between descriptive and explanatory research. Why-questions are easy to ask, but difficult to answer. To this type of questions a causal explanation is being sought. (Töttö 1999: 284-285).

Table 19. Two-by-Two Frequency Table of Research Questions (adapted from Töttö 1999: 284).

Approach\Goal	**Descriptive**	**Explanatory**
Qualitative	WHAT?	HOW?
Quantitative	HOW MUCH?	WHY?

To be able to justify approach taken in a research, approach by Burrel and Morgan can not be left unnoticed. In the original work of Burrell and Morgan in 1979, four paradigms for social science research were introduced. Their theoretical construction was based on two dimensions, which were subjective — objective and regulation — radical change. According to them these four paradigms should be viewed as contiguous, but separate. Contiguous because the shared characteristics, but separate because the differentiation is, of sufficient importance to warrant treatment of paradigms as four district entities. They also state that the four paradigms define fundamentally different perspectives for the analysis of social phenomena. (Burrell & Morgan 1988: 21-23)

Although being very much used approach, Burrell and Morgan's model is in some ways insufficient. This is a reason why Deetz (1996) introduced a model that at the same time both criticizes and extends legacy of Burrell and Morgan. Deetz criticizes subjective-objective problem in Burrell and Morgan's model for three things. First, the meaning of the objective-subjective labels is already socially contrived. Deetz treats the claim of objectivity or subjectivity as a rhetorical move in research program's system of justification rather than as a useful descriptive label. Deetz also states that not all research is both subjective and objective. He sees that subjectivity and objectivity just are not very interesting ways of thinking about research program differences. Secondly, the subjective-objective conception, rather than describing a meaningful difference, reproduces a neo-

positivist philosophy of science and obscures the nature of other research programs. Thirdly, the retention of the conception of subject-object separation has led to the continuation of rather misleading conflicts and equally misleading presumed relations between so-called qualitative and quantitative research. (Deetz 1996: 193-194)

Deetz introduces two new dimensions of contrast, where the fist dimension focuses on the origin of concepts and problem statements as part of the constructive process in research. Here differences among research orientations can be shown by contrasting "local/emergent" research conceptions with "elite/a priori" ones. The second dimension focuses on the relation of research practices to the dominant social discourses within the organization studied, the research community, and/or wider community. Figure 36 illustrates these dimensions. (Deetz 1996: 195)

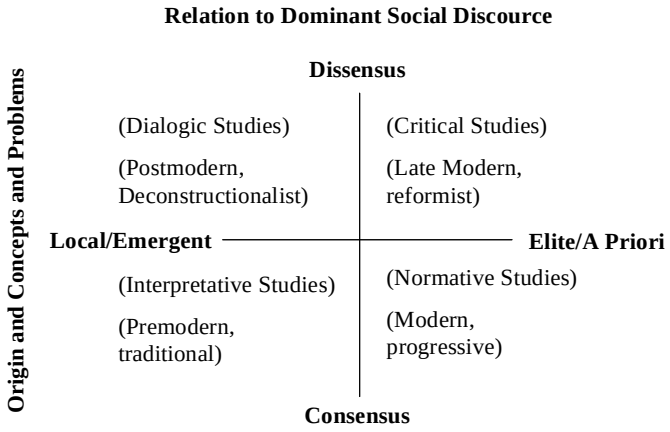

Figure 36. Contrasting Dimensions from the Metatheory of Representational Practices (Deetz 1996: 198).

This study at hand is clearly a study that has its roots in local/emergent category. According to Deez (1996) The local/emergent pole draws attention to researchers who work with an open language system and produce a form of knowledge with less lofty claims. In addition (ibid.), central to researchers work is the situated nature of the research enterprise. When judging whether this study is to be situated in consensus or dissensus poles in origin of concepts and problems – category this study quite naturally falls into category of consensus. This is due to the fact that the used research approach is interpretative one and already in a research question formulation underlying assumption is that new technology and changes quite naturally shake existing structures, at least in some degree.

When using qualitative approach, and especially interpretative one, it is possible that researchers analyzing same data might end up into different conclusions. This is dependent on the research questions, though. From a positivistic viewpoint and research setting this is not acceptable way, but one must see the reason why this type of approach is used in theory creating qualitative research. Goal is not to test forehand defined variables, but instead to build a new theory which is firmly grounded into empirical data. This leads inevitable back to dichotomy between qualitative and quantitative research and to the fact that why-questions must be answered before how much-questions can be stated (see Töttö 1999: 284). In this sense qualitative research should always precede quantitative research in some form. When considering the theory types proposed by Gregor (2006), this study can be described as theory for explaining (type II), although it also has elements to be considered for theory for explaining and predicting (type IV). And when considering theory types proposed by Colquitt & Zapata-Phelan (2007), this study fits best the description of theory type of builders.

Generalizability of research findings is an issue to be taken into account when conducting a case study, especially in case of educational organization. According to Yin (1994: 31-32), in case studies one should aim to make analytical generalizations. Generalization does have some shortages though. According to Lee and Baskerville (2003: 241), it is possible to develop a theory that is generalizable in a case study within the case setting, but that theory may never be generalized to a setting where it has not yet been empirically tested and confirmed. Their message is simple; there is only one scientifically acceptable way to establish a theory's generalizability to a new setting: Theory must survive an empirical test in that setting. On the other hand, Lee and Baskerville (ibid. 235-237) see analytical generalization as a well founded way to make generalizations.

Lee & Hubona (2009) have discussed the scientific rigor in Information Systems research. According to them (ibid. 246) formative validity of a theory is an attribute of the process by which a theory is formed (or built) and summative validity is an attribute of the sum result or product of the process, namely, the theory. They argue that a theory achieves formative validity by following one or another accepted procedure in the process of its being formed. In addition, they argue that, a theory, once formed, achieves summative validity by surviving an empirical test that uses the logic of modus tollens.

Formative validity for this study was reached by following guidelines research method books provided as faithfully as it was possible. Lee & Hubona (2009: 246) also argue that for a theory to have formative validity in grounded-theory research, the theory's variables or constructs must emerge from the data, rather

than be taken entirely from a previously published theory and imposed on the current set of data. In this study, the used research approach follows this logic, and ensures formative validity also this way.

In situations, where researcher has close ties to subject under study, it is always justified to question the objectivity of researcher. On the other hand, when analyzing gathered data, it is easier to make analysis and to "read between lines", e.g. to make more precise interpretations from gathered data. In this particular research the researcher was working for the same university during the period when empirical data was gathered. He has also been involved in the development of virtual education within the discipline of computer science, thus having deeper insight over the subject than a researcher coming from outside could ever gain.

For theory creating research higher education offers very comprehensive environment, which is very rich in details. Consequently, due to this setting researcher has to be aware that there are certain problems when analyzing the generalizability of case based theory. Nevertheless, having prior knowledge about research environment is a benefit for exploratory study, where sensibility in data analysis is a key factor. It is also a lot easier to carry out interviews in environment, where the researcher is not being seen as a foreigner entering otherwise uniform academic community.

The study focuses on studying ICT usage in higher education and thus the results are valid directly primarily in higher education context. Empirical data in this case study has been collected in one university, and this too puts some restrictions for the generalizability of results. Findings presented here do offer an interesting starting point for further studies on ICT usage and adaptation. When choosing persons for interviews, the students were excluded and this might make the results slightly one-sided. When discussing about workload issues on online courses with interviewees, the responses covered student viewpoint to a certain degree. It needs to be kept in mind that this is very subjective viewpoint, and because students were not directly studied here, the results on this are suggestive at best.

Interviews were carried out as one time interviews. Because the research process has been carried out during several separate periods, it was not practically possible to go back to field to conduct supplementary interviews. Some of the interviewees had changed jobs or were otherwise difficult to reach. This has put some limitations for the possibilities on data analysis. In this study the adopters of WBT system were studied, leaving non-adopters understudied. This pro-adopter bias (Jeyaraj et al. 2006) must be taken in account when evaluating findings of this study and their generalizability.

Markus (2004) pointed out, that the risk that people will not use information technology and related work practices is not thoroughly addressed by the discipline of IT project management, which focuses on project cost, project schedule, and solution functionality. While focusing on adoption of new IT innovations in educational organization, there is always a problem with those refusing to take new systems into use. Reasons for this might vary, but it is a problem to be aware of.

5.4 New Research Problems

It is recommended that future adoption studies should focus more on studying implementing technology innovations within organizations. Most of the studies concentrate on individual (micro) level, neglecting organizational (macro) level. In addition, this study focused on studying the adoption and impacts of ICT and it was conducted in an environment, where users of target systems were studied. This leaves one very important dimension unstudied, namely those who are not using systems at all — or those who have used systems and chosen not to use them. These issues should be studied in parallel with adoption studies concentrated on those using systems. This is to say that the tradition of IT adoption studies is highly encouraged to continued and expanded to cover also the new emerging areas where IT is being taken into use.

The efficient adoption of IT innovations is an issue of continuing interest. This important topic needs a lot more attention, and theoretical framework based on empirical findings in this case study should be validated also in other contexts. This applies also on enhanced theoretical framework presented in this study, where additional concepts were derived from suggestive findings and related literature. In addition to previous, suitable follow up study for this study would be a statistical, theory-testing research to be made within the same context for further validating and generalizing presented theoretical contributions. This way it should be possible to produce even more sophisticated theoretical contribution for predicting adoption success.

Another emerging issue is the IS viewpoint on ICT in educational organizations, which is to be encouraged. eLearning and WBT related issues are quite often dominated by pedagogical approach although IT is an integrated part of the whole. Because of this, a candid dialogue and interdisciplinary research is a necessity (see, for example, Doctoral Programme for Multidisciplinary Research on

Learning Environments[147]). It has been realized a long time ago in IS discipline, that interdisciplinary research in suitable areas provides advantage in research.

When introducing new information technology into organization, a risk that people will not use it nor related work practices is always present. Therefore it is suggested, that already when designing information systems, or planning a field study, this issue should be taken seriously. This is an issue of great importance, and this study has shown that this is still an issue to take a closer look at.

Research on online education and on virtual education in general is an important area for a number of reasons. All the time increasing number of people are taking university courses or studying for a degree while working full time. Present working life is also expecting everyone to update and improve their skills while at the same time working full time. Virtual education is one possible way to provide solutions for this. Virtual education provides also cost effective means for providing education and training in situations, where students are spatially located very far from each others and it would be otherwise impossible to organize education that takes place face-to-face. ICT mediated education is also providing students a cutting edge in IT literacy, which in turn gives them skills necessary to manage their future working space.

According to IT strategy of ministry of education (Opetusministeriö 2006) it is suggested that based on a study a recommendation about few platforms suitable for different environments shall be made. Goal was to provide from two to three different alternatives. There is apparently a noticeable shift towards open source taking place in higher education eLearning platforms. According to a recent study by IT-PEDA & VirtuaaliAMK (2007), higher education in Finland is quite committed on open source based development, although there are also commercial alternatives in use. This indicates that change is taking place, and this needs more attention for future research.

[147] http://www.edu.utu.fi/tutkijakoulut/opmon/ (cited July 26, 2007).

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APPENDICES

1. Tutkimuslupahakemus (Application for research permission).
2. Haastattelurunko (Interviewstructure).
3. Subcategories and number of coded sources and references for construct Freedom.
4. Subcategories and number of coded sources and references for construct ICT Expertise.
5. Subcategories and number of coded sources and references for construct Immaterial issues.
6. Subcategories and number of coded sources and references for construct Intention to use.
7. Subcategories and number of coded sources and references for construct Pedagogical insight.
8. Subcategories and number of coded sources and references for construct Perceived usefulness.
9. Subcategories and number of coded sources and references for construct Resources.
10. Subcategories and number of coded sources and references for construct Versatile system use.
11. Relations between concepts and number of coded sources and references.

Appendix 1

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TUTKIMUSLUPAHAKEMUS

8.5.2003

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Tutkimuslupahakemus

Haen tutkimuslupaa tutkimukselle, jonka aion suorittaa Vaasan yliopistossa. Tutkimuksen kohteena ovat uuden opetusteknologian aiheuttamat vaikutukset opetusorganisaatioissa. Aikomuksenani on kerätä ensisijaisesti haastatteluita käyttämällä tietoa ja kokemuksia henkilöiltä, jotka ovat työssään käyttäneet verkko-oppimisympäristöjä ja käyttää tätä dataa materiaalina tutkimuksessani.

Haastateltujen lähtötiedot tullaan säilyttämään luottamuksellisina, eikä raporteista voi yksittäisiä henkilöitä tunnistaa. Sellaiset kohdat, joiden voi ymmärtää aiheuttavan keskustelua, annetaan haastateltujen kommentoitavaksi ennen julkaisemista. Haastatteluihin osallistuminen on täysin vapaaehtoista.

Olen jatko-opiskelijana Vaasan yliopiston tietotekniikan laitoksella ja tutkimus on osa väitöskirjatyötäni.

Kunnioittaen,

Jyri Naarmala

Appendix 2

Uuden opetusteknologian aiheuttamat vaikutukset opetusorganisaatiossa

Haastattelurunko

Taustatiedot

- Syntymävuosi
- Sukupuoli
- Koulutus
- Valmistumisvuosi
- Nykyinen työ (nimike, työpaikka, oppiaine, laitos, TDK)
- Oma tietotekninen osaaminen.

Teemat

1. Verkko-opetusympäristöjen henkilökohtainen käyttöhistoria
   - Kertoisitko miten aloitit verkko-opetusympäristöjen käytön työssäsi ja mitä aloituksesta tähän hetkeen on tapahtunut?
2. Verkko-opetusympäristöjen käyttötavat
   - Kertoisitko miten ja mihin tarkoitukseen käytät verkko-opetusympäristöjä
3. Käyttökokemukset
   - Kertoisitko millaista sinun verkko-opetusympäristön käyttäminen on?
4. Verkko-opetusympäristöjen vaikutus omaan työhön
   - Kertoisitko miten verkko-opetusympäristön käyttö on vaikuttanut työhösi ennen ja nyt?
5. Verkko-opetusympäristöjen aiheuttamat muutokset
   - Kertoisitko millaisia muita verkko-opetusympäristöstä aiheutuneita muutoksia olet havainnut?
6. Tulevaisuus
   - Kertoisitko mitä on tapahtumassa aivan lähitulevaisuudessa työpaikallasi verkko-opetuksen suhteen?
   - Mitä toiveita sinulla on kehityksen suunnasta seuraavien 2-5 vuoden ajalle?

Appendix 3

Subcategories and number of coded sources and references for construct *Freedom*.

Category	Sub category 1	Sources	References
Freedom	*Bounded rationality*	3	4
	Individualism	3	5
	Opportunity	2	2

Appendix 4

Subcategories and number of coded sources and references for construct *ICT Expertise*.

Category	Sub category 1	Sources	References
ICT Experience	*Perception of ICT influence*	3	4
	Perception of personal ICT competence	20	22
	Perception of students' ICT literacy	9	12
	Perception of teachers' ICT literacy	2	2

Appendix 5

Subcategories and number of coded sources and references for construct *Immaterial issues*.

Category	Sub category 1	Sub category 2	Sources	References
Immaterial issues	*Course materials*	Material production during course	5	7
		Self produced course materials	8	9
		Third party produced materials	3	3
	IPR issues	Actions	3	4
		Agreements	3	3
		Conflicts	8	11
	Online learning environment	Closed environment	3	4
		Open environment	1	6
	Plagiarism		4	5

Appendix 6

Subcategories and number of coded sources and references for construct *Intention to use*.

Category	Sub category 1	Sources	References
Intention to use	*Continuity*	3	5
	Evolving practice and change	4	4
	Perception of others atittudes	2	3
	Professional Curiosity	8	9
	Quest for excellence	4	5

Appendix 7

Subcategories and number of coded sources and references for construct *Pedagogical insight*.

Category	Sub category 1	Sources	References
Pedagogical insight	*Convenience*	12	19
	Critical insight on virtual education	6	7
	Educational methods	12	27
	Emphasizing content	7	10
	Involving and encouraging students	3	5
	Pedagogical interest	10	14
	Perception of student workload	6	7
	Personalization	4	4
	Providing students important skills	7	10
	Social learning	4	4

Appendix 8

Subcategories and number of coded sources and references for construct *Perceived usefulness.*

Category	Sub category 1	Sub category 2	Sources	References
Perceived usefulness	*Cost effectiveness*	Better results, lesser investments	5	6
		Transferring printing costs to students	2	2
		Working from home	2	2
	Critical issues	Challenges in teaching	8	12
		Improvement requirements	3	6
		Technological challenges	8	31
	Professional self-development	Challenges	3	5
		Networking and collaboration	12	28
		Personal self-development	6	9
		Professional self-development	7	15
		Regulating own work	3	3
	Providing support to students	Flexibility of studies	3	5
		Freedom of place	6	7
		Freedom of time	3	3
		Freedom of time and place	7	12
		Information retrieval of students	2	2
		Making students work easier	5	6
	Useful IT	Established practice	1	2
		IT as a tool for communication	8	12
		IT makes life easier	7	12
		Online resources	6	7
		Perception of usefulness	3	3
		Pragmatic insight on technology	4	4
		Useful educational technology	5	7

Appendix 9

Subcategories and number of coded sources and references for construct *Resources*.

Category	Sub category 1	Sub category 2	Sources	References
Resources	*Economical issues*	Compensation for work	9	12
		Critical economical issues	2	2
		Funding for development projects	6	7
	Encouragement	Encouraging practice	13	23
		Feedback	2	2
		Peer support	8	10
	Support	Critical technical issues	6	13
		Organizational support	5	5
		Pedagogical support	8	10
		Supporting department	11	18
		Technical support	14	39
	Technology resources	Datacommunication	2	2
		Role of technology	16	53
		Supplementary IT solutions	11	20
		Technical resources	4	8
	Time resources	Allocated time resources	10	12
		Required time resources	12	21
	Work management	Personal work management	7	18
		Stability	3	4
		Workload	16	48

Appendix 10

Subcategories and number of coded sources and references for construct *Versatile system use*.

Category	Sub category 1	Sub category 2	Sources	References
Versatile system use	*Blended learning*		13	21
	Expectations for practice		3	8
	Expectations for technology		2	6
	Job development	Changing role	6	8
		Continuous development	6	8
		New skills	6	8
		Old traditions	3	3
	Mostly used sytem features		19	43
	New projects		10	24
	Personal solutions for supporting work		2	3
	Tools and methods to be avoided		3	3
	Work management		2	3

Appendix 11

Relations between concepts and number of coded sources and references.

From Name	Type	To Name	Direction	Sources	References
Freedom	Influences	Intention to use	One Way	7	9
ICT Experience	Influences	Perceived usefulness	One Way	5	6
ICT Experience	Influences	Versatile system use	One Way	5	7
Immaterial issues	Influences	Versatile system use	One Way	5	5
Intention to use	Influences	Versatile system use	One Way	4	9
Pedagogical insight	Influences	Versatile system use	One Way	8	15
Pedagogical insight	Influences	Perceived usefulness	One Way	7	13
Pedagogical insight	Influences	Intention to use	One Way	5	8
Perceived usefulness	Influences	Intention to use	One Way	9	11
Resources	Influences	Versatile system use	One Way	13	26
Resources	Influences	Intention to use	One Way	3	5