11-1-2009

User Acceptance of Virtual Learning Environments: A Case Study from Three Northern European Universities

Christina Keller
Jönköping International Business School, and Uppsala University, Sweden, kelc@jibs.hj.se

Follow this and additional works at: https://aisel.aisnet.org/cais

User Acceptance of Virtual Learning Environments: A Case Study from Three Northern European Universities

Christina Keller

Jönköping International Business School, and Uppsala University, Sweden

kelc@jibs.hj.se

Abstract:

Virtual learning environments have in recent years become an important tool in higher education, in distance learning as well as on campus. This study analyzes factors influencing acceptance of virtual learning environments among academic staff and students in blended learning environments. Two research questions guided the study: (1) How do organizational and individual factors influence the acceptance of virtual learning environments among academic staff and students? (2) What are the implications for practice in order to create good prerequisites for acceptance of virtual learning environments? The study was performed as a comparative, explanatory case study at three universities providing master education of public health in Sweden, Norway and Lithuania. The findings of the case study showed that the contextual factor of culture was powerful in influencing acceptance of virtual learning environments, positively as well as negatively. High degrees of performance expectancy, results demonstrability and social influence affected acceptance of virtual learning environments positively. The degree of social influence was hypothesized to be transferred by the contextual factor of culture. The organizational culture of universities, expressed as shared values of what is good quality teaching and learning, were found to partly oppose values inherent in the virtual learning environment. Implications for practice are put forward, emphasizing culture as an important factor to consider in the implementation of virtual learning environments.

Keywords: virtual learning environments, technology acceptance, diffusion of innovations, organizational learning

User Acceptance of Virtual Learning Environments: A Case Study from Three Northern European Universities

I. INTRODUCTION

The need for education has changed because of an increased demand for a highly educated workforce who will be expected to learn continuously [Alavi and Leidner 2001]. As a result, online learning is becoming an increasingly important part of higher education in distance learning, as well as on campus. In order to support online learning, various virtual learning environments have been developed, such as WebCT, BlackBoard, and ClassFronter [Ngai et al. 2007]. The introduction of virtual learning environments in higher education presents new challenges as the roles and expectations of teachers and students change [Bennett and Lockyer 2004]. This transition is not always without individual and organizational complications. To be a true mediator of learning, the virtual learning environment has to be accepted by academic staff and students. Acceptance is a prerequisite of intentions to use, and actual use of, information systems [Davis 1989]. Moreover, in an educational context, acceptance of the e-learning environment is an important prerequisite of learning.

The Technology Acceptance Model (TAM), in its original or extended versions, has been used to explain acceptance of virtual learning environments in a number of studies [e.g., Keller and Cernerud 2002; Selim 2003; Ong et al. 2004; Drennan et al. 2005; Saadé and Bahli 2005; Ong and Lai 2006; Ngai et al. 2007]. Although the concepts of TAM, such as perceived usefulness and perceived ease of use, are adequate in explaining the level of individual acceptance of virtual learning environments, the model does not capture factors on an organizational level affecting individual acceptance. Keller and Cernerud [2002] found the degrees of perceived usefulness and ease of use among students to be highly dependent on organizational factors connected to the implementation of the virtual learning environment. Tolhurst and Debus [2002] concluded that students' acceptance of online learning was influenced by epistemological belief inherent in the school culture and gender. Legris et al. [2003], in a critical review and meta-analysis of the TAM, concluded: *"TAM is a useful model, but has to be integrated into a broader one, which would include variables related to both human and social change processes, and to the adoption of the innovation model"* [Legris et al. 2003, p. 191]. There is a need for extending TAM with concepts comprising factors and process on an organizational level.

The aim of the study was to create knowledge about factors influencing the acceptance of virtual learning environments among academic staff and students in blended learning environments in higher education. The aim was fulfilled by a comparative, explanatory case study examining the acceptance of virtual learning environments in public health master education at universities in three Northern European countries: Sweden, Norway, and Lithuania. To explore the influence of organizational factors on acceptance of virtual learning environments, an extended technology acceptance model was applied. The model comprised constructs from Unified Theory of Acceptance and Use of Technology (UTAUT), Innovation Diffusion Theory (IDT) and organizational learning. Hence, the case study aimed to find the answers to two research questions:

- How do organizational and individual factors influence the acceptance of virtual learning environments among academic staff and students?

- What are the implications for practice in order to create good prerequisites for acceptance of virtual learning environments?

II. THEORETICAL BACKGROUND

In this section, the three theoretical perspectives of the case study are presented: organizational learning, technology acceptance and diffusion of innovations.

Perspective I: Organizational Learning

The case study focuses on the organizational learning that occurs when implementing virtual learning environments in order to discern what role organizational learning plays in creating user acceptance. To do this, the organizational learning model by Fiol and Lyles [1985], introducing the typology of **higher-level** and **lower-level learning** is applied.

Fiol and Lyles' contribution to the field of organizational learning builds on a literature review of existing text on the subject. Their definition of organizational learning is wide and comprehensive: *"organizational learning means the process of improving actions through better knowledge and understanding"* [Fiol and Lyles 1985, p. 803]. Lower-level learning occurs within a given organizational structure and leads to the development of rudimentary associa-

tions of behavior and outcomes of relatively short duration. It is a result of repetition and routine and involves association building. Higher-level learning aims at adjusting overall rules and norms rather than specific activities and behaviors. The associations that are a result from higher-level learning have effects during a longer period of time and higher impact on the overall organization. Higher-level learning is a result of the use of heuristics, skill development, and insights, while lower-level learning is a result of repetitive behavior. Organizational learning enables organizations to build an understanding and interpretation of their environment and, as a result, begin to assess possible strategies. It results in associations, cognitive systems, and memories that are developed and shared by members of the organization.

According to Fiol and Lyles [1985], four contextual factors influence the probability that organizational learning will occur: **culture, strategy, structure,** and **environment**. The contextual factors have a reciprocal relation to learning in the sense that they create learning and are a result of learning. Organizational culture consists of shared beliefs, and norms that influence behavior, actions taken, and decisions made [Fiol and Lyles 1985; Williams et al. 1993]. The norms inherent in the organizational culture will influence the behavioral and cognitive development that the organization can accomplish. Correspondingly, a major change in an organization often involves a change in shared beliefs and norms. Organizational strategies determine the goals and actions, and they influence learning by providing a boundary to decision making and a context for the interpretation of the organizational environment. At the same time, the strategic options that are actually acknowledged is a function of the learning capacity within the organization. Organizational structure plays a crucial role in determining learning processes. A mechanistic, centralized structure tends to reinforce past behaviors, while an organic, more decentralized structure tends to allow changes in beliefs and actions to a higher extent [Duncan 1974]. The organizational environment influences and is influenced by the learning that takes place in the organization. If the organizational environment is too turbulent, learning will not occur. On the other hand, if the environment is too stable, there is no inducement to learn, as beliefs, norms, and behaviors never become obsolete [Fiol and Lyles 1985].

In the case study, the organizational learning process of the three university departments will be studied by examining lower-level and higher-level learning. Furthermore, the impact of the four contextual factors of culture, strategy, structure and environment on the acceptance of the virtual learning environment will be investigated.

Perspective II: Technology Acceptance

User acceptance of technology has been studied by a number of research models since the 1970s, the most recent work in the area being the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT was developed by Venkatesh et al. [2003], building on eight user acceptance models having their roots in information systems, psychology, and sociology[1]. When tested empirically by Venkatesh et al. in two different organizations, UTAUT was found to explain 70 percent of the variance of intentions to use and the actual usage of information systems. This is an improvement, compared to the explanation of variance accomplished by previously developed technology acceptance models, which lies between 17 and 53 percent.

The four core constructs of UTAUT are **Performance Expectancy, Effort Expectancy, Social Influence,** and **Facilitating Conditions**. The constructs are independent variables influencing the dependent variables of behavioral intention and usage. Gender, age, experience, and voluntariness of system use have been shown to have an indirect influence on the dependent variables via the four core constructs. Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance. Effort expectancy depicts the degree of ease associated with the use of the system. Social influence represents the degree to which an individual perceives that it is important that others believe that he or she should use the system. Finally, the core construct of facilitating conditions is defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system [Venkatesh et al. 2003].

In the case study, the degrees of performance expectancy, effort expectancy, social influence and facilitating conditions among academic staff and students at the three university departments will be examined.

Perspective III: Innovation Diffusion Theory

Innovation diffusion theory is grounded in sociology. Rogers [1995] defines diffusion as *"… the process by which an innovation is communicated through certain channels over time among the members of a certain system"* (p. 5). Diffusion is defined as a *process*, changing a social system and leading to certain consequences.

---

1. Theory of Reasoned Action, Technology Acceptance Model, Motivational Model, Theory of Planned Behavior, Combined Technology Acceptance Model and Theory of Planned Behavior, Model of PC-Utilization, Innovation Diffusion Theory and Social Cognitive Theory.

To be adopted by an organization, an innovation has to be perceived to have certain attributes. Rogers [1995] defined those attributes as relative advantage, compatibility, complexity, trialability, and observability. Relative advantage is the degree to which the innovation is perceived as something better than the idea that it succeeds or substitutes. Compatibility is the degree to which an innovation is perceived as being consistent with socio-cultural values and beliefs, existing ideas, and the needs of its potential adopters. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. Trialability is the degree to which an innovation may be experimented with on a limited basis. Finally, observability is the degree to which the results of an innovation are visible to others.

Within the context of information technology innovations, Moore and Benbasat [1991] adapted the characteristics of Rogers' model of diffusion of innovation in order to study individual technology acceptance. The authors developed a survey questionnaire instrument to measure perceptions of adoption of information technology innovations. The results of the study became a measurement instrument that included the constructs found to have predictive validity regarding rate of adoption of information technology innovations [Moore and Benbasat 1991; Moore and Benbasat 1996; Venkatesh et al. 2003]. The core constructs of Innovation Diffusion Theory (IDT) are defined in Table 1.

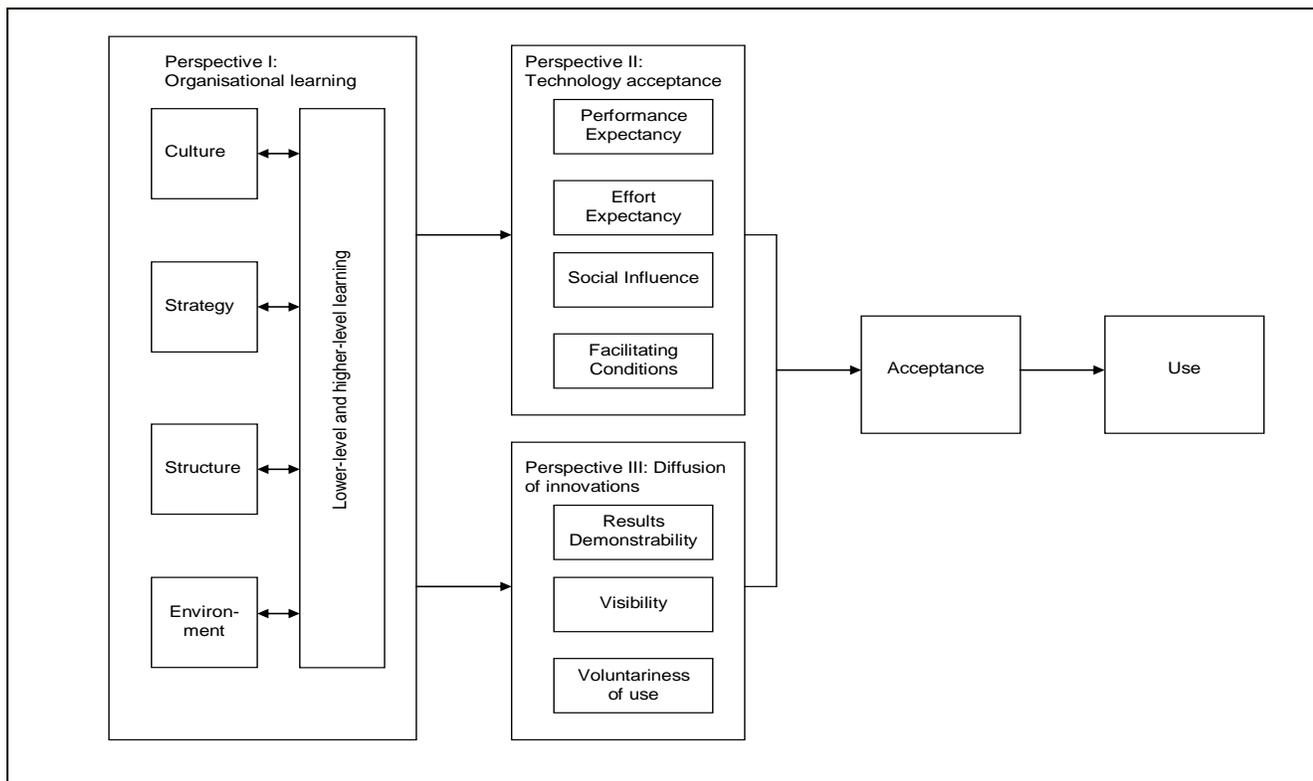| Table 1. Definitions of Core Concepts in Innovation Diffusion Theory According to Moore and Benbasat [Venkatesh et al 2003]	
Core Constructs	**Definition**
Relative advantage	"the degree to which an innovation is perceived as being better than its precursor" [Moore and Benbasat 1991, p. 195]
Ease of use	"the degree to which an innovation is perceived as being difficult to use" [Moore and Benbasat 1991, p. 195]
Image	"the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" [Moore and Benbasat 1991, p. 1995]
Visibility	The degree to which one can see others using the system in the organization" [adapted from Moore and Benbasat 1991]
Compatibility	"the degree to which an innovation is perceived as being consistent with existing values, needs, and past experiences of potential adopters" [Moore and Benbasat 1991, p. 195]
Results demonstrability	"the tangibility of the results using the innovation, including their observability and communicability" [Moore and Benbasat 1991, p. 203]
Voluntariness of use	"the degree to which use of the innovation is perceived as being voluntary, or of free will [Moore and Benbasat 1991, p. 195]

The IDT core constructs of relative advantage, ease of use, image, and compatibility were excluded from the research model as they are included in the core concepts of performance expectancy (relative advantage), effort expectancy (ease of use), social influence (image) and facilitating conditions (compatibility) of UTAUT [Venkatesh et al. 2003]. In the case study, the degrees of the remaining core constructs of IDT, **results demonstrability, visibility,** and **voluntariness of use** among academic staff and students at the three university departments will be examined.

III. RESEARCH APPROACH

Research Model

In the case study, a research model was used that combines elements from organizational learning (Perspective I) according to Fiol and Lyles [1985], UTAUT (Perspective II), and IDT (Perspective III). The research model, building on three presented theoretical perspectives, is presented in Figure 1.

The four contextual factors of **culture, strategy, structure,** and **environment** influences are influenced by the process of **lower-** and **higher-level learning**. The organizational learning, in association with the implementation and use of the virtual learning environment, is hypothesized to influence the degrees of **performance expectancy, effort expectancy, social influence, facilitating conditions, visibility,** and **results demonstrability** perceived in the university organization. Furthermore, the perceived **voluntariness of use** is a result of the organizational learning process resulting in agreements on the use of the virtual learning environment. High degrees of performance expectancy, effort expectancy, social influence, and facilitating conditions are proposed to influence the general acceptance of the virtual learning environment positively. Furthermore, high degrees of visibility and results demonstrability are proposed to influence the general acceptance of the virtual learning environment positively. A high degree of voluntariness of use is proposed to influence the general acceptance of the virtual learning environment among academic staff positively, while it is proposed to influence general acceptance among students negatively.

Perspective I:
Organisational learning

Culture

Strategy

Structure

Environ-
ment

Lower-level and higher-level learning

Perspective II:
Technology acceptance

Performance
Expectancy

Effort
Expectancy

Social Influence

Facilitating
Conditions

Acceptance

Use

Perspective III: Diffusion
of innovations

Results
Demonstrability

Visibility

Voluntariness
of use

Figure 1. Research Model of the Case Study

Academic staff is considered to be an active part of the everyday lower-level and higher-level learning taking place in the university organization. One of the outcomes of this learning process is the organizational culture, defined by Williams et al. [1993] as the commonly held and relatively stable beliefs, attitudes, and values that exist within the organization. Academic staff is a part of the university organization for longer periods of time, while students attend courses or programs and subsequently leave the organization. As a result, academic staff is hypothesized to trans-fer their shared beliefs, attitudes, and values to the students of the university. Moreover, the decisions making the virtual learning environment optional or mandatory for students to use in programs and courses are taken by the academic staff. Hence, the students' survey study focuses on the six remaining core constructs of UTAUT and IDT: performance expectancy, effort expectancy, social influence, facilitating conditions, results demonstrability, and visi-bility. The organizational learning process, influencing and influenced by the four contextual factors, as well as the factor of voluntariness of use, are hypothesized to be transferred by academic staff to students.

Data Collection Methods and Analysis

A comparative, explanatory case study approach was used to analyze the acceptance of virtual learning environ-ments among academic staff and students at the three universities. The unit of analysis was primarily the university department. However, to collect data from the individual research perspectives of UTAUT and IDT, managers, teachers, and students represented their organizational unit as respondents. The research approach was chosen in order to test the theoretical model and to explain differences in degrees of acceptance at the three research sites. Methods for data collection were qualitative, semi-structured interviews with academic staff, a students' survey ques-tionnaire and document studies. The chosen respondents of the interviews were key persons of the implementation process, e.g., deans, project managers, and teachers. To capture the organizational learning process, respondents were asked to describe the implementation process in order to examine decision-making and other significant events. To capture the core constructs of UTAUT and IDT, an interview guide was used (Appendix 1). The inter-views were transcribed. As the research study was theory-based, the transcriptions were analyzed by a template analysis style [Malterud 2001], where the text was organized according to pre-existing theoretical categories to provide descriptions of the organizational learning, degrees of technology acceptance, and the innovation diffusion process.

The survey questionnaire was distributed to students of the three universities. In order to assess the level of acceptance, students were asked to rate whether they agreed with the statements about the virtual learning environment on a scale from 1 to 5. The items of the survey questionnaire, measuring the six core constructs from UTAUT and IDT, are presented in Appendix 2. The data from the survey questionnaire underwent a reliability analysis using the measure of Cronbach's α to estimate the reliability of the core construct and in order to omit items

of the questionnaire that lowered the reliability. Measures of means and standard distributions were computed for each core construct to compare the responses from the three student populations. The questionnaire also comprised open-ended questions, in which students were asked to state advantages and disadvantages of learning by means of virtual learning environments.

Document analyses were performed in order to capture the contextual factors of the organizational learning process as well as the formal decision process in connection with the implementation of the virtual learning environment. Subsequently, within-case and cross-case analyses were performed. To evaluate the relationships between factors proposed by the research model, a pattern matching logic was used, combining the empirical pattern with the predicted pattern [Yin 2003]. More specifically, the impact of the organizational learning on the core constructs of technology acceptance and innovation diffusion theory was explored.

Research Setting

The research setting was public health master education at three case universities: Nordic School of Public Health, Sweden (NS), University of Tromsö, Norway (UT), and Kaunas University of Medicine, Lithuania (KMU). Table 2 summarizes the data collection at the three research sites.

Table 2. Overview of Data Collection at the Three Research Sites			
Data collection method	Research site	Respondents	Time period
Interview	Nordic School of Public Health	Dean, project manager, and teacher	June and November 2005
	University of Tromsö	Two deans, project manager, two teachers, and two course administrators	June 2005 and February 2007
	Kaunas University of Medicine	Dean, head of distance education center, and teacher	September 2004
Survey questionnaire	Nordic School of Public Health	63 students in six master courses	Fall semester of 2005
	University of Tromsö	Seven students of the master program	Spring semester of 2007
	Kaunas University of Medicine	35 students in three master courses	Fall semester of 2004
Document analysis	Documents from all three research sites were analyzed during the entire case study.		September 2004–April 2007

The academic subject of public health describes and analyses changes of health, of populations, and the determinants influencing health. It also suggests actions to promote and protect health and to prevent disease [Baggott 2000; Detels et al. 2002]. Public health education is offered as university bachelor and master programs by faculties of medicine or social science. Primarily, public health is a continuing education for students with a former profession, such as physicians, nurses, dentists, veterinarians, psychologists, and social workers.

At NS and UT, the virtual learning environment used in the public health master education is Fronter[2]. KMU uses the world market leading virtual learning environment, WebCT. The virtual learning environments are used to support blended learning, defined as a combination of face-to-face instruction with computer-mediated instruction [Graham 2006]. More specifically, in the blended learning environment, lectures, seminars, and group work on campus are mixed with online web-based course work. The virtual learning environments are used in similar ways at the three case universities: storing, accessing, and posting course material and students' assignments. Text-based asynchronous discussions are used to support group work and discussions on course topics. During the data collection (2004–2007) no significant technology changes occurred at the universities regarding use of the virtual learning environments.

---

2. The virtual learning environment was originally developed under the name of ClassFronter.

IV. CASE FINDINGS AND ANALYSIS

Nordic School of Public Health

Nordic School of Public Health (NS) is situated in Gothenburg, Sweden. The school provides master and research education in public health for students from all Nordic countries: Sweden, Norway, Denmark, Finland, Iceland, Faroe Islands, Greenland, and Aland [Nordic School of Public Health 2003]. The teaching languages are Swedish, Norwegian, Danish, and English. There are 400 to 500 students attending public health courses at the school each year. The majority of the students are Swedish or Norwegian. The school traditionally provides courses on campus for a two-week period. During the courses, students are living in a dormitory on campus. The students of NS are professionals employed in, e.g., health care and social care. In recent years, increasing demands of staff having to be on duty has lead to a decreasing number of students at NS.

Perspective I: Organizational Learning

NS has a strong organizational **culture** depicting lectures and seminars on campus as something good, and as something that characterizes the school in a positive way. The strong emphasis on students living on campus during courses emerges as a prominent shared value among most of the academic staff and students. These values and beliefs are perceived as being threatened by the introduction of web-based learning. Managers and implementers assign added value to the virtual learning environment, as a means of increasing the number of students, improving storage and accessing course materials, and improving communication between teachers and students. Some members of the academic staff, on the other hand, perceive the virtual learning environment as a means of less communication between teachers and students as they perceive that it makes teaching more impersonal.

The **strategic** mission of NS is "*that with the Nordic countries as a foundation create and spread multi-professional knowledge improving a good and equal health*" [Nordic School of Public Health 2007a]. The vision of the organization is to be the leading organization of the Nordic countries in public health education and research and internationally renowned. The decision to implement web-based education at NS was made as a strategic means of increasing the number of students and to strengthen the possibilities of the school to survive. The target group for public health master education is typically students employed in professions like medicine, nursing, dentistry, veterinary science, etc. Making public health education accessible to these students means making the constraints of time and space dissolve. Offering distance education means that the trend of decreasing numbers of students could be broken and public health courses could be sold to external health care institutions and organizations.

NS has a unique **structure** among academic institutions situated in Sweden as it is directed by the Nordic Council of Ministers and financed by subsidies in proportion to the gross national product of each Nordic country. The board of NS is appointed by, and is responsible to, the Nordic Council of Ministers. The board consists of five members with deputy members from each Nordic country [Nordic School of Public Health 2007b]. The school is led by the dean. There is a management team comprising the dean, the manager of education, the chief administrative officer, the research training coordinator, and the coordinator of master training. The management team acts as an advisory board to the dean in managing the school as well as to the board [Nordic School of Public Health 2005]. NS is a small educational institution with fifty-eight employees [Nordic School of Public Health 2007c].

The **environment** of NS has changed drastically over the years. NS was the first academic institution offering public health education in Sweden. There were no other competitors until the 1980s, when Swedish universities started to provide public health education on a more general basis. In 2005, ten Swedish universities offered public health education at bachelor or master level [Swedish National Agency for Higher Education 2007]. As a result, the competitive advantages of NS has decreased since the middle of the 1990s.

The **lower-level learning** according to the use of the virtual learning environment has reached an adequate level. As the virtual learning environment was introduced in the master courses, new routines had to be developed to administer the courses. Course administration at NS is accomplished by specifically assigned course administrators, each taking responsibility for a number of courses. The administrative routines of campus courses were originally based on collecting and distributing hard copies of course material. In the web-based courses, all course material has to be provided digitally to be published on the web platform. The transition to new routines has not been problem-free, as the work load of course administrators has increased. In spite of this, a strong loyalty to *"serve the students, the best way that they can"* (project manager, 2005) can be observed among them. In the beginning of the implementation process, formal learning, such as introductory courses, requiring information from helpdesk etc. was the most common way of learning about the web platform. With time, *"talking to colleagues about Fronter"* (teacher, 2005) seems to have increased among teachers and course administrators.

Regarding **higher-level learning**, the decreasing number of students applying for public health education at NS has created an awareness among the management of the school and some of the academic staff that something has to

be done. There is an insight that the strategies and routines of the school have to be changed in order to adapt to the new circumstances and increase the number of students: *"This is a matter of survival for the school"* (dean, 2005). One group among the academic staff, however, seems to keep holding on to the notion that NS could recruit students to education on campus: *"I think that they are stuck in the notion that students should come here. Of course … we have a fantastic environment. And in some way, teachers seem to assume that everything should be done on the premises"* (project manager, 2005).

Perspective II: Technology Acceptance

The **performance expectancy** brought about by the virtual learning environment to the education is not yet discernible. The virtual learning environment was implemented at NS in order to allow for distance education, and distance education wholly provided by means of the web platform has not yet taken place. In spite of this, some advantages are distinguishable: The transition of course material to digital format has led to better and more up-to-date teaching materials as teachers cannot use old hard copies of lecture material and articles anymore. Furthermore, the participation among students speaking languages other than Swedish, Norwegian, and Danish seems to have increased due to the asynchronous communication in the discussion groups of the web platform: *"… we can see that all students are taking part anyway. And that is far from what you see in student groups working on campus. In that case, students from Iceland are more silent and have only worked on their own part [of a group assignment] … I would guess that the students notice and comment on other students' group work in Fronter in a better way than when they are working in the seminar rooms on campus"* (teacher, 2005). The students of NS generally perceive low degrees of performance expectancy, the mean value being 2.44 on a scale from 1 to 5.

Concerning **effort expectancy,** a majority of academic staff perceives Fronter as an information technology that is easy to learn and use. Some of the academic staff have found the web platform difficult to learn, according to low prior knowledge of computer use in general: *"I don't think it [Fronter] is more difficult than any other e-learning system. On the contrary, I think it is easier than many other systems. It is above all those who have no experience of computers, and don't have any knowledge at all, who have a hard time learning Fronter. But they would have had a hard time learning any system …"* (project manager, NS, 2005). It is obvious from the students' survey questionnaire that a number of students find the virtual learning environment difficult to use: *"To attach documents is quite hopeless, it is difficult to find out how to do things, and it complicates my work"* (student, Content analysis course).

The degree of **social influence** at NS is low, in spite of the management having supported the use of the virtual learning environment throughout the implementation process. Particularly the dean has stressed the strategic importance of web-based learning to reach a higher number of students. The board was continuously informed about the development process. Among academic staff, the support of web-based learning varies. One group is positive, while another group is negative. Among the negative group, staff consider it not prestigious to use the web platform; generally, teaching on campus is regarded as more prestigious than web-based learning. There are also opinions of public health being a subject in which lectures and face-to-face seminars are especially important. Also students perceive the social influence to use the virtual learning environment as being low: *"Fronter does not have a high status among the staff"* (student, Public health, basic course). The degree of perceived social influence among students was 2.42 on a scale from 1 to 5.

The perceptions of **facilitating conditions** at NS are ambiguous. On one hand, there is a perception of adequate support to students and academic staff. On the other hand, the technical problems have been substantial. When Fronter was put into use, it was difficult to log on and to access material on the web platform. This was perceived as very annoying. The problems were mainly due to users logging on to the web platform using different program language versions simultaneously. The web platform was not adopted by the supplier to a multi-lingual use: *"It was a case of bad programming. And we suffered from it, because we didn't understand, and Fronter didn't understand. But anyway, they succeeded [to solve the problem] three weeks later …"* (teacher, 2005). With the exception of these initial problems, the cooperation with the supplier of the web platform is satisfying. Apart from these problems, pedagogical and technical support was provided throughout the implementation process. Teachers and students know who to contact if problems occur. Students and teachers are offered introductory courses on the use of the web platform. Course administrators are offered courses on the features of the web platform, specifically tailored to their needs. Consequently, facilitating conditions is the core construct that takes on the highest value in the students' survey questionnaire; 3.01 on a scale from 1 to 5.

Perspective III: Innovation Diffusion Theory

The degree of **results demonstrability** is low, but there are hints of an increased activity in students' group work in Fronter compared to group work on campus. It seems that the contribution from each student in the group is more tangible when it is written and posted in a discussion forum. This has presumably given rise to a more equal participation among the students of the group. The asynchronous communication in the discussion forum gives time for

reflection and allows students to take the time they need to write their contribution to the group work and to comment on other students' group work. In spite of this, among students results demonstrability is ranked lowest of the core constructs, with the mean value of 2.28 on a scale from 1 to 5.

Teachers, course administrators, and students are able to observe others using the virtual learning environment on courses and workshops arranged by the teaching and technical support team. Students are also able to observe other students when working together in the computer labs on campus. The comparatively high degree of visibility among students is confirmed in the students' survey questionnaire, where **visibility** is ranked as the second core construct, taking on a value of 2.66. Teachers and course administrators belonging to the group positive toward Fronter use are, to an increasing extent, beginning to learn about the web platform in more informal ways, by talking to each other and helping each other out. The degree of visibility of the web platform among teachers negative to web-based learning seems, in contrast, to be low.

When it comes to **voluntariness of use,** the management team of NS makes annual decisions about in which courses Fronter should be used in distance or blended education. In these courses, the use of the web platform is mandatory for teachers and students. In all other courses, storage of course material on the web platform is mandatory and use of other functions of the web platform, optional.

University of Tromsö

The University of Tromsö is the northernmost university in the world, situated 350 kilometers above the Arctic Circle. It is the smallest university in Norway, with 6,300 students and 1,800 employees [University of Tromsö 2005]. The teaching languages are Norwegian and the Sámi language. Courses for foreign students are taught in English. The Institute of Community Medicine is responsible for two master programs in public health, one program comprising two years and 120 points, the other program, being based on prior vocational experience, comprises one and a half years and 90 points [Institute of Community Medicine 2005a]. Since 2003, the institute offers a two-year master program in public health. The program is partly web-based with each course including mandatory meetings on campus lasting two or three days.

Perspective I: Organizational Learning

The organizational **culture** at the institute is characterized by two significant shared values. First, academic freedom gives teachers the right to be critical; even to organizational change. Second, teaching on campus is considered to be more effective than distance education. The notion of academic freedom seems to prevent organizational learning to some extent, as teachers stress their right to being critical of organizational changes and resist being told by others what to learn. As a result, all training sessions on the features of the platform and planning of web-based courses had to be perceived as voluntary. A project group was created, consisting of staff using Fronter as a natural extension of their everyday jobs. Formal planning and meetings were avoided; instead, teachers were invited to informal discussions where suggestions were made on how to use Fronter in public health master courses. As the virtual learning environment is a means of distributing distance education, teachers regarded it as a mediator of education inferior to education on campus.

The faculty states as its **strategic** goal that it should be an important actor in research and teaching. Furthermore, the faculty has a mission to establish a high level, nationally and internationally, concerning quality of research and teaching [University of Tromsö 2006]. The Institute of Community Medicine studies the connection between people's health and society at large. Both teaching and research activities reflect the university being situated geographically and culturally in the arctic area [Institute of Community Medicine 2006]. To implement e-learning was a strategic decision in order to raise the number of applicants to public health master education. The number of applicants had decreased from about sixty students per year to ten. According to the dean, e-learning had to be implemented in one way or another; otherwise the institute would not have any students. Moreover, for the northernmost university in the world, e-learning is a useful tool for the institute in overcoming constraints of geographical space, both in education and research.

The University of Tromsö has a traditional university **structure** of five faculties: Law, Science, Medicine, Social Sciences, and the Norwegian College of Fishery Science. The Institute of Community Medicine is one of four institutes belonging to the Faculty of Medicine. The institute is led by a board comprising the head of the institute and eight elected delegates: five teachers/researchers, one delegate representing technical-administrative staff and two students [Institute of Community Medicine 2005b; 2005c]. The number of employees at the institute is 105 [Institute of Community Medicine 2005d].

During recent years, there have been a number of important changes in the **environment** of the educational organization. The number of students has decreased rapidly. The target group of students applying for public health education has changed, implying that the share of professional physicians among students has decreased. The new target group of public health education has not performed equally well according to grades, pace of study, and the number of students taking degrees. Furthermore, a two-year master program in public health has been developed to comply with the Bologna agreement.

The rules and routines of course administration and teaching were changed, as the blended learning model of the new master program in public health was introduced. Hence, **lower-level learning** has been accomplished on an adequate level. Course material is produced in digital format to be published in Fronter. Students' assignments are posted as files in the virtual learning environment, and not as hard copies in post boxes. Courses on how to use Fronter were arranged by the university center of continuing education for teachers and students. Teachers also help each other informally in learning the features of the platform and in organizing maps and material. It seems as if teachers and students have learned to master the features of Fronter that are used in the courses adequately and perceive the new routines positively.

Higher-level learning in connection with the introduction of the virtual learning environment has taken place, but not without initial difficulties. Among teachers at the institute, learning on campus is considered to be a better and more effective way of teaching than distance learning. In the beginning of the implementation process, the web platform was considered as something imperfect because it was associated with distance learning. As the implementation process proceeded, the awareness of the platform as a necessary means of giving a master program by distance grew, and the initial resistance faded. However, the transition from face-to-face to electronic communication with students changed the roles and routines of teachers considerably. This was an important and not in any sense trivial change that was *"… bothersome for a while"* (dean, 2005). The critical view of distance education is consistent within the organization, but the web platform has with time become acknowledged as a useful tool in the public health master program: *"It [Fronter] doesn't make me a better teacher in any way, but the technology works …"* (teacher, 2005).

Perspective II: Technology Acceptance

The perceived **performance expectancy** at UT is mainly associated with providing distance education, and, somewhat unexpectedly, pedagogical advantages of text-based asynchronous communication between teachers and students. A web platform is a necessary prerequisite for giving a two-year master program as distance education, as it offers the means of communication with students between sessions on campus. Furthermore: *"We had to implement e-learning, otherwise we wouldn't have any students"* (dean, 2007).

Fronter is perceived as a useful channel of information from teachers to students, and as a way for students to deliver their course assignments. Students acknowledge the usefulness of the virtual learning environment by ranking performance expectancy highest among the technology acceptance core constructs; 3.71 on a scale from 1 to 5. Having to publish on the web platform has also led to better quality of teaching materials, as old material had to be transformed to digital format. Text-based asynchronous communication enhances learning and reflection and allows for a deeper exchange of knowledge than on campus. It is also easier to give and receive information through text messages, than having to assemble students in certain places at a certain time. The discussion forum is not used to any large extent as a pedagogic means in the public health master courses. Neither is chat. It has been hard to create lively online discussions, as the interaction in the discussions quickly wears off. In one of the course groups, telephone conferences have been introduced as a means of communication between students. The notion of the virtual learning environment is one of a good formal information channel, but nothing more: "*Fronter is a good way of delivering information to students"* (teacher, 2007).

Regarding **effort expectancy**, Fronter is generally perceived as being easy to learn and use, as it is highly intuitive and self-instructing. Only minor difficulties could be discerned due to the use of the platform, such as teachers using different logical structures in creating and naming virtual maps containing course material. This sometimes makes it hard for students to find documents. General guidelines for logical structures of course material maps were given in the beginning of the implementation process, but the adherence to these guidelines have somewhat declined: *"Certain anarchy can be noticed, after all we are academics!"* (teacher, 2007). Teachers and course administrators state that students, from time to time, are uncertain whether their assignments have been delivered to the teacher or not, as the platform does not confirm the posting of documents.

According to **social influence**, the management has supported the use of Fronter throughout the implementation process: *"This is the system that we are going to use. It is an inherent part of working and studying at the university"* (dean, 2005). At the beginning of the implementation process, there was resistance among teachers toward using a virtual learning environment in blended education. The resistance was not due to negative feelings about educa-

tional technology in general, but to the sense of being forced to use a particular technology in particular ways at particular times. The resistance toward using Fronter as a part of the public health master program has vanished with time. Nonetheless, the use of Fronter is not very prestigious. High social prestige among colleagues at the institute is connected to conducting research. As a result, being a researcher is more prestigious than being a teacher, and Fronter is considered as a part of teaching. Among students, social influence is ranked as number five of the six core constructs, with a value of 3.37 on a scale from 1 to 5. This implies that social influence is not the most prominent factor favoring the virtual learning environment.

Staff experiences a very high degree of **facilitating conditions,** due to the university center of continuing education, which offers regular technical and pedagogical support. The supply of courses and support seems to be almost too high for teachers to participate in and appreciate to its full extent. The teachers of the institute are generally skilled in using computers and statistical application programs. To teachers using advanced application programs on a daily basis, participating in training on relatively simple software, as the features of the virtual learning environment, might seem trivial. As a result, few teachers participate in such courses. Apart from the services of the university center of continuing education, teachers and students also have access to the organization for IT support at University of Tromsö. Students are also offered introductory and continuing courses on the use of the web platform on a regular basis. The degree of facilitating conditions takes on the value of 3.48 on a scale from 1 to 5 among students.

Perspective III: Innovation Diffusion Theory

The degrees of **results demonstrability** are intermediate among academic staff, and high among students. Blended education has not led to higher performance among students. On the contrary, the performance of the students has declined since the start of the new master program. This is not due to the use of Fronter or the pedagogical model of distance education, but more to changes in prior education, professions and knowledge among students. The majority of students are no longer physicians, but professionals such as nurses, physiotherapists, etc. The new student population has less prior knowledge, which has led to lower performance in the master courses compared to previous student populations. It is generally acknowledged in the organization that Fronter is a useful tool in submitting information and teaching materials to students, and receiving assignments from students. Also, the pedagogical advantages of written communication as a means of learning are appreciated by teachers. The virtual learning environment is acknowledged as a useful tool in master education by students, ranking the degree of results demonstrability to 3.61 on a scale from 1 to 5.

There is an adequate degree of **visibility** at the institute as teachers and administrators are generally conscious of Fronter and how it is used in the master program. Students are able to observe other students using the web platform on introductory courses, arranged by the institute and university center of continuing education. Teachers and administrators generally seem to be able to observe colleagues using the platform. Teachers help each other in learning the features of the platform and in organizing maps and material: *"We learn from each other, we have always done that …"* (teacher, 2005). Thus, the visibility of other teachers using the platform is high in informal, everyday situations. There is also a wish among teachers to be able to observe each other's courses in the virtual learning environment. This is not possible due to security reasons, as teachers have access only to their own courses: *"This is very annoying. It is probably due to a misunderstanding about what computer security is. We have to be more open. To see the courses of other teachers would be good and instructive"* (dean, 2007). Conclusively, there is a wish for even higher visibility in the everyday use of the web platform. There are also lively coffee room discussions at the institute on the pedagogical applications of Fronter. Students' perceptions of visibility take on the value of 3.19 on a scale from 1 to 5. Visibility is the lowest ranked core construct among the students of UT.

When it comes to **voluntariness of use**, the use of Fronter is mandatory in courses of the master program in public health for both teachers and students. It is mandatory for teachers to publish course materials and for students to post assignments on the web platform. No hard copies are made of course materials, and all student assignments, with the exception of master theses, are posted in Fronter.

Kaunas University of Medicine

Kaunas University of Medicine (KMU) is the largest institution for medical and public health education in Lithuania. It is an autonomous university, financed mainly by the Lithuanian state [Kaunas University of Medicine 2005a]. KMU is also a World Health Organization collaborating center for research and training in epidemiology and the prevention of cardiovascular and other chronic non-communicable diseases [Kaunas University of Medicine 2003]. The total number of students in 2003 was 3,400. The principal language of teaching at KMU is Lithuanian, but foreign students are instructed in English. KMU has five faculties: the Faculty of Medicine, Odontology, Pharmacy, Nursing, and Public Health. There are 109 teachers employed at the faculty [Kaunas University of Medicine 2005b]. The Faculty of Public Health offers one Bachelor program, two Master programs and one Master of Management Continuing Training program in Public Health. Continuing training courses are provided for different target groups of

public health and medical professionals. The majority of participants in the courses are family doctors, public health professionals and health care managers [Kaunas University of Medicine 2003].

Perspective I: Organizational Learning

When asked about the reason for the introduction of web-based learning at KMU, the dean states: *"This is the future of education, something new to offer our students"* (dean, 2004). From this statement, it is evident that the organizational **culture** of KMU denotes concepts like "future" and "new" with positive connotations. This could be interpreted as a sign of an organizational culture promoting changes and innovations. There is a focus on the opportunities provided by the web platform; to reach more students, and to give international courses in cooperation with other universities. Disadvantages of web-based learning and resistance to new educational technology are clearly not the focus of attention at KMU. Learning face-to-face on campus is regarded as an indispensable part of undergraduate courses, as well as in courses where the subject matter is abstract, e.g., human relations management. The subject matter of these courses is considered to require discussions face-to-face. Course content comprising concrete topics are considered to be suitable to deliver by means of the virtual learning environment, e.g., courses in epidemiology and law.

The general aim of the faculty's **strategy** is to strengthen its leading position in the education of public health specialists and to become an internationally acknowledged multidisciplinary public health training centre [Kaunas University of Medicine 2003]. The university board has made a strategic decision to focus on web-based education in order to provide opportunities for the university to develop further. The strategic plan of KMU states that in 2007, 40 percent of the continuing courses should be provided by the web. In 2005, teachers were able to use multi-media technology in their daily work and have a generally good knowledge of computer use. To accomplish this, a distance education center was created to offer pedagogical and technical support.

Kaunas University of Medicine has a traditional university **structure.** The Faculty of Public Health consists of five departments: Social Medicine, Preventive Medicine, Philosophy and Social Sciences, Environmental and Occupational Medicine, and Family Medicine. The faculty employs 109 teachers [Kaunas University of Medicine 2005b] and is led by the dean. The faculty board comprises five members: the dean of the faculty, and academic staff from the different departments, besides student representatives.

According to the **environment,** the Baltic region has experienced rapid political and economic change over recent years. Both economy and society are in transition from being a former Soviet republic to becoming a European country. There is an inherent will to develop education and research and to seek collaboration, nationally and internationally. The faculty has made several agreements on collaboration and guidance in creating a public health infrastructure and educating public health professionals in some of the former south-eastern Soviet republics, e.g., Kazakhstan.

Regarding **lower-level learning**, the changes of routines according to the introduction of distance learning by means of WebCT seems to focus more on instructional design than on course administration and storage and delivery of documents. Teachers have to develop new routines and ways of working to adapt to web-based learning. Administrative staff is not concerned by the change in the same way. There are formal possibilities of learning about the design of web-based courses, as the center for distance learning provides technical and pedagogical support in this respect. On the other hand, the learning seems to be focused more on the actual creation of courses in the virtual learning environment, than learning from introductory courses on its use.

Higher level-learning, such as the internalization of new missions and new definitions of direction, seems to be taken on readily at KMU. The focus of research and education is external, as there is an explicit will to become an actor of the educational market of the European Union and to be a member of international communities and organizations. There seems to be a genuine realization at KMU about the strategic importance and inherent possibilities of web-based learning. The implementation of the virtual learning environment seems to have taken place without much resistance from the majority of the academic staff. However, a minor group of teachers do not acknowledge it, due to reluctance to learn new educational technologies.

Perspective II: Technology Acceptance

According to **performance expectancy**, the students have responded positively to the introduction of web-based learning at KMU. They experience this kind of learning as more personal than traditional face-to-face teaching on campus. With the introduction of web-based learning comes the opportunity of getting in contact with teachers on an individual basis and receiving feedback from teachers directly by e-mail: *"The students say: Now, at last we can speak to teachers one to one. And I ask them: Couldn't you do that before?"* (dean, 2004). This one-to-one inter-

action is not common in traditional courses on campus. The positive perception among students is discernable also in the responses of the students' survey questionnaire where performance expectancy takes on the value of 4.35. However, the workload of teachers has increased due to answering e-mails from students. Another disappointment of web-based learning is that it has been unexpectedly hard to create lively discussions on course topics in WebCT. Another advantage brought by the technology is that students can participate in continuing courses while being able to live in their hometown and work full-time in their everyday profession. Web-based learning is also perceived as a useful pedagogical tool in courses on campus with course content focusing on a profound understanding of concepts and relations between concepts. The text-based asynchronous communication allows for pondering and reflecting on this type of course content in a way that cannot be achieved by face-to-face teaching on campus.

Regarding **effort expectancy,** academic staff seem to perceive the virtual learning environment as hard to use. In contrast, there are no indications of students perceiving the virtual learning environment as hard to learn or use. Accordingly, to participate in a web-based course at KMU seems to be easy. On the other hand, there are indications that creating a web-based course is more difficult. To develop new course material takes a lot of time. The support organization has created a HTML template to help teachers develop their course web pages. In spite of this, it is not always experienced as easy to create a web-based course: *"I did everything by myself, it was most trying…"* (teacher, 2004).

The **social influence** to use the virtual learning environment is strong. To support distance learning is very prestigious, while it is supported by the management of the faculty and by the coming management of the university. Teachers are partly recruited on the basis of their positive attitude to distance learning. There is a shared belief that web-based learning is something good, which offers new possibilities of development at the university. Among students, social influence takes on a value of 3.55. There is resistance toward the use of web-based learning among a minor group of the academic staff, comprising teachers who have been employed for a long time, and reluctant to learn new educational technologies. They are, by no means, forced to use WebCT, but as much of the developmental work at the faculty builds on the use of web-based learning, they take the risk of being excluded.

The **facilitating conditions** are somewhat insufficient when it comes to technical infrastructure as there is a shortage of student computers, both on campus and at the work places of students of continuing courses. It is not uncommon that computers at work places are shared by many employees. The distance education center at KMU provides resources and pedagogical and technical support in developing web-based courses. The development of each course is organized in three stages: instructional design, subject matter, and technological adaptation. First, the instructional and pedagogical design of the course is decided on. Second, subject matter experts develop the course content. Finally, the technical experts adapt the course material to the web platform and publish the course. The support provided by the distance education center is focused on the production of web-based courses, and not on providing courses on the use of the web platform. Students are provided with online courses and manuals on the use of the virtual learning environment. The perception of facilitating conditions among students shows a mean value of 4.34.

Perspective III: Innovation Diffusion Theory

According to **results demonstrability**, the notion that text-based asynchronous communication facilitates learning by providing more time for reflection than lectures on campus seems to be recognized by teachers. Among students, the advantage of a more personal communication one-to-one with teachers is widely known. The most generally known advantage in the organization is the possibility of participating in continuing courses by distance, and the development of teaching and research that could be achieved by means of the web platform. The advantages of using web-based learning to bring more students to continuing courses are not, however, acknowledged by the teachers. There is a notion among teachers that the number of students is more or less fixed. Apart from this, the advantages of the web platform seem to have been easy to explain to students and academic staff. This is also confirmed by the students, who rank results demonstrability as the second highest ranked core constructs, with a mean value of 4.49.

Regarding the core construct of **visibility,** the academic staff and the students of the faculty are in general conscious about WebCT, its use, and its purpose. This consciousness seems mainly to be focused on the web platform as a means of providing continuing courses and a tool for cooperation with other universities, nationally and worldwide. On the other hand, the visibility of observing each other using WebCT on an everyday basis seems to be low among teachers. As there are no traditional on-campus introductory courses on the features of the web platform, academic staff and students do not have the possibility to observe and learn from others using WebCT on such courses. Among students, visibility is the lowest ranked core constructs, with a mean value of 3.11.

When it comes to **voluntariness of use**, the faculty board decided that distance learning should be used. Teachers are encouraged to use it, but no one is forced. As a result, the use of WebCT is optional for teachers. Once a teacher decides to use distance learning in a course, the use of WebCT is then mandatory for the students.

V. CROSS-CASE ANALYSIS

In Table 3, a comprehensive systematic summary is made of the cross-case analysis according to factors influencing the acceptance of virtual learning environments among academic staff and students.

Table 3. A Synthesis of the Cross-Case Analysis			
Factors	**NS**	**UT**	**KMU**
General degree of acceptance	Low	Medium	High
Cultural keywords	Teaching on campus	Academic freedom	New, future
Structure	Small Nordic university organization	Large traditional university organization	Large traditional university organization
Strategic impact	Strong	Strong	Strong
Environmental keywords	Increasing competition	New educational structure	Transition of economy and society
Quality of lower-level learning	Adequate	Adequate	Adequate
Pace of higher-level learning	Slow	Medium	Fast
Performance expectancy	Low (staff and students)	Medium (staff) High (students)	High (staff and students)
Effort expectancy	High (staff) Low (students)	High (staff and students)	Low (staff) High (students)
Social influence	Low (staff and students)	Medium (staff and students)	High (staff and students)
Facilitating conditions	High (staff) Medium (students)	Very high (staff) Medium (students)	Medium (staff) High (students)
Visibility	Medium (staff) Low (students)	Medium (staff and students)	Low (staff) Medium (students)
Results demonstrability	Low (staff and students)	Medium (staff) High (students)	High (staff and students)
Voluntariness of use	Once web-based learning is implemented in a course or a program, use of the web-platform is mandatory for both teachers and students.		

The degree of acceptance of the virtual learning environments varies among academic staff and students at the three universities. It is experienced as low at NS, medium at UT, and high at KMU. At NS, the advantages of the virtual learning environment are not yet discernable. At UT, the virtual learning environment is perceived as being a good way of delivering information to students. At KMU, the virtual learning environment is perceived to be highly useful in education and collaboration with other universities. The high correspondence of degree of acceptance between academic staff and students of the same university is noteworthy, and confirms the hypothesis that academic staff transfers their shared beliefs, attitudes, and values to the students. A comparison of students' responses to the survey questionnaire is made in Table 4.

Table 4. Comparison of Students' Responses to the Survey Questionnaire at the Three Universities.			
Core Constructs	**Mean NS (ranking)**	**Mean UT (ranking)**	**Mean KMU (ranking)**
Performance expectancy	2.44 (3)	3.71 (1)	4.35 (3)
Effort expectancy	2.41 (5)	3.63 (2)	4.52 (1)
Social influence	2.42 (4)	3.37 (5)	3.55 (5)
Facilitating conditions	3.01 (1)	3.48 (4)	4.34 (4)
Results demonstrability	2.28 (6)	3.61 (3)	4.49 (2)
Visibility	2.66 (2)	3.19 (6)	3.11 (6)

Students from Norway and Lithuania show the same patterns of ranking of the core constructs, ranking performance expectancy, effort expectancy, and results demonstrability relatively high and facilitating conditions and visibility lower. The students of NS show the opposite pattern. The particularly negative perceptions of the students of NS seem to be due to the culture of teaching on campus, which regards the virtual learning environment as something negative. Lithuanian students regard the web platform as a means of improved communication with teachers. Students of NS, on the other hand, seem to associate the web platform with reduced communication with teachers: *"Fronter could **never** substitute the inspiration and response that you get from meeting teachers/tutors and other students face-to-face. Fronter is aimed at cognitive tasks, not for building relations"* (student, Content analysis course, NS, 2005). Norwegian students seem to regard the web platform as an adequate tool for storage and retrieval of course material, and for postings of assignments, nothing more and nothing less.

The impact of the organizational culture on the acceptance of the virtual learning environment is thus prominent at all three universities, but influences acceptance in different directions. At the NS, a strong organizational culture favoring education on campus is inherent and works against the acceptance of the virtual learning environment. At UT, the organizational culture focuses on academic freedom. This initially hampered the acceptance of the virtual learning environment, as academic freedom was brought up as an excuse for resisting organizational change. In contrast, the organizational culture at KMU depicts concepts like "new" and "future" as something positive. The organizational culture at the Lithuanian university seems to work in favor of innovations, including the virtual learning environment.

Regarding structure, to be a small university with a low organizational complexity did not seem to influence the degree of acceptance of virtual environments in any positive way. The highest degree of acceptance was found at the larger of the two traditional universities, KMU, while the lowest degree of acceptance was found at the smallest university, NS.

At all three universities, the decision to implement web-based education was a part of the strategic considerations of the university management. At NS and UT, the decisions were made in order to increase the number of students. At KMU, the decision to implement web-based learning was made in order to allow the university further opportunities to develop. Hence, the strategic impact of web-based learning was strong at all three universities, but this was not, in itself, a guarantee for a high degree of acceptance among academic staff and students.

The environment surrounding higher education has been turbulent in all three countries, but for different reasons. NS have experienced a drastic increase in competition from Swedish universities offering public health education. At UT, a new two-year master program in public health was developed to comply with the Bologna agreement. Finally, in Lithuania the economic and social transition affects all levels of society, including higher education.

The lower-level learning, e.g., the development of new routines and learning about the features of the virtual learning environment seems to have taken place on an acceptable level at all three universities. The differences between the three universities are, however, prominent when it comes to the pace of higher-level learning, interpreted as insights, collective consciousness and new definitions of direction due to web-based learning. At NS, higher-level learning has taken place among the university management and the project group, but is nonexistent among some of the academic staff. As the implementation process proceeded at UT, academic staff began to appreciate the virtual learning platform as a useful tool in education. At KMU, the insight of the virtual learning platform as a means of development and new directions seems to have been adopted readily and rapidly.

Drawing on the findings of the cross-case analysis, it can be hypothesized that an organizational culture depicting the virtual learning environments as something positive leads to a higher pace of higher-level learning, which subsequently leads to higher degrees of social influence, performance expectancy, and results demonstrability. These three individual factors seem to be particularly significant in creating generally higher degrees of acceptance among academic staff and students.

VI. CONCLUDING DISCUSSION

In this section of the case study, the answers to the two research questions are presented and discussed:

- How do organizational and individual factors influence the acceptance of virtual learning environments among academic staff and students?

- What are the implications for practice in order to create good prerequisites for acceptance of virtual learning environments?

Factors Influencing Acceptance

Regarding the four contextual factors of organizational learning, culture was found to be the most influential factor in affecting the levels of acceptance of the virtual learning environments at the three universities. The strategic impact of the implementation process being equally important, and the quality of lower-learning being equally adequate, the pace of higher-level learning is slower and the general level of acceptance lower at NS and UT, compared to KMU. It is reasonable to wonder if this difference could be because of national culture.

Hofstede [2001] has developed four widely used constructs to distinguish national cultures on the basis of over 100,000 responses in multinational organizations: power distance, collectivism-individualism, masculinity-femininity, and uncertainty avoidance. It is reasonable to believe that these constructs might play a role in adopting information technology [Leidner and Kayworth 2006]. The construct of power distance is defined as: *"The extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally"* [Hofstede 2001, p. 98]. DeVreede et al. [1998] found that a high degree of power distance influenced acceptance of group support systems positively. The authors claimed that this was due to subordinates being less likely to question decisions made by management in high power distance cultures. Although Lithuania is not specifically examined by Hofstede, it could be hypothesized that differences in, e.g., power distance between the countries could affect levels of technology acceptance. Scandinavian countries generally show considerably low degrees of power distance [Hofstede 2001], implying that acceptance of innovations imposed solely by the management of an organization is less likely to occur.

The most powerful core constructs in creating high general degrees of acceptance of the virtual learning environments at the studied university departments were performance expectancy, results demonstrability, and social influence. The positive influence of performance expectancy comes as no surprise. A number of studies on technology acceptance have verified the explanatory value of the original core construct from TAM, perceived usefulness, on acceptance of virtual learning environments [Selim 2003; Ong et al. 2004; Drennan et al. 2005]. As results demonstrability (tangibility and communicability of usefulness) could be regarded as another side of performance expectancy (the individually perceived usefulness), it is reasonable that the two core constructs correspond well to each other. Social influence represents the expectations from others on an individual to use technology. In a study on cultural aspects of UTAUT, Bandyopadhyay and Fraccastoro [2007] found that social influence based on culture provided additional explanatory power concerning consumers' intentions to use technology. This is in accordance with the findings of the case study, where the social influence to use the virtual learning environment was stronger at the Lithuanian university than at the two Scandinavian universities, and contributed in creating higher degrees of acceptance. The core constructs of effort expectancy, facilitating conditions, and visibility did not seem to contribute to the same extent to create positive perceptions of the virtual learning environment.

Implications for Practice

Culture and its impact on the acceptance of the virtual learning environment is a crucial issue that can predict the success or failure of the implementation process [Leidner and Kayworth 2006]. This proposition was confirmed by the findings of the case study. The shared values of academic staff and students in the university organization must be considered an influential factor by managers and implementers of virtual learning environments. In particular, it is important to delineate what staff and students regard as teaching and learning of good quality. If this kind of teaching and learning could not be accomplished by the virtual learning environment, acceptance among academic staff and students will be very hard to achieve.

Performance expectancy, results demonstrability, and social influence were found to be most influential among the core constructs in creating a generally high degree of acceptance of virtual learning environments. Consequently, it is important for managers and implementers to ensure that academic staff and students perceive tangible usefulness and added value from the use of the virtual learning environment early in the implementation process. It is also essential that the implementation process is supported throughout the whole university organization and that the use of the virtual learning environment is seen as prestigious. Moreover, resistance among staff and students should be recognized and dealt with constructively. Resistance to the implementation of the virtual learning environment due to cultural values incurs costs in time, energy, and money. Conflicts due to resistance deprive the university organization of time and energy that otherwise could have been focused on improving the quality of learning in other ways. If conflicts and resistance among users are not dealt with, the university organization has to seriously consider if the effort of implementing virtual learning environments is worth the costs.

The core constructs of effort expectancy, facilitating conditions, and visibility were not found to be equally influential in generating generally high levels of acceptance of the virtual learning environment. This does not, however, mean that efforts to provide ease of use, support, and visibility of use should be neglected. To perceive the virtual learning environment as easy to use, to get sufficient pedagogical and technological support, and to be able to observe

others using the environment is important in itself, but not enough to put users "over the edge" when it comes to achieving a high degree of acceptance. Ease of use, support, and visibility should be provided and facilitated by managers and implementers, but will only be necessary prerequisites in creating acceptance, and not sufficient in themselves.

Then, what actions can academic staff take to enhance the acceptance of virtual learning environments? The answer to this question might be to use the virtual learning environments regularly in courses to support learning in ways that bring added value to the educational situation, e.g., for accessing and bringing structure to course content and for text-based asynchronous interaction. The notions of virtual learning environments as providers of text-based asynchronous communication between teachers and students, and as means of storage, posting, and assessment of course material seem to be generally acknowledged and appreciated by academic staff and students. On the other hand, the virtual learning environments are considered to be incapable of building relationships, and creating lively discussions. To counteract this notion, it is important for implementers and university teachers to consider the cognitive and relation-building opportunities provided by synchronous media and tools combining video, audio, and text, inherent in the virtual learning environments. Possibly, the use of synchronous, richer media could create a more dynamic and vivid learning environment by providing learning in real-time, more equaling the talk face-to-face. It is also important for implementers to consider that information technology that facilitates interaction without specifying their parameters (e.g., the features of the virtual learning environment that allows asynchronous and synchronous interaction) demands other kinds of implementation strategies than information technology executing discrete tasks [McAfee, 2006]. The use of, e.g., chat or videoconferencing might be perceived by teachers as a new and unknown way of using information technology. As a result, teachers need demonstrations on how the technology could be used for pedagogical purposes. To use the virtual learning environment in ways that brings added value (i.e., performance expectancy and results demonstrability) to learning will almost certainly also increase the prestige (i.e., social influence) in using virtual learning environments.

Finally, academic staff value informal learning about the virtual learning environment from colleagues. Consequently, it is important for managers and implementers to provide such opportunities. It is also essential not to prevent colleagues from viewing each other's course material by restricting the access to courses in the virtual learning environment. In that way, a lively learning community can be created in the virtual learning environment that both academic staff and students will accept.

ACKNOWLEDGEMENTS

REFERENCES

Editor's Note: The following reference list contains hyperlinks to world wide web pages. Readers who have the ability to access the web directly from their word processor or are reading the paper on the web, can gain direct access to these linked references. Readers are warned, however, that:
1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

Alavi, M., and D.E. Leidner (2001). "Research Commentary: Technology-Mediated Learning—A Call for Greater Depth and Breadth of Research," *Information Systems Research,* 12(1), pp. 1–10.

Baggott, R. (2000). *Public Health—Policy and Politics.* Basingstoke, Hampshire: McMillan Press.

Bandyopadhyay, K., and K.A. Fraccastoro (2007). "The Effect of Culture on User Acceptance of Information Technology," *Communications of the Association for Information Systems,* 19(2007), pp. 522–543.

Bennett, S., and L. Lockyer (2004). "Becoming an Online Teacher: Adapting to a Changed Environment for Teaching and Learning in Higher Education," *Educational Media International* 41(3), pp. 231–244.

Davis, F.D. (1989). "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly,* 13(3), pp. 319–340.

Detels, R., J. McEwen, R. Beaglehole, and H. Tanaka (eds.) (2002). *Oxford Textbook of Public Health*. Oxford: Oxford University Press.

DeVreede, G., N. Jones, and R.J. Mgaya (1998). "Exploring the Application and Acceptance of Group Support Systems in Africa," *Journal of Management Information Systems,* 15(3), pp. 197–234.

Drennan, J., J. Kennedy, and A. Pisarki (2005). "Factors Affecting Student Attitudes toward Flexible Online Learning in Management Education," *Journal of Educational Research*, 98(6), pp. 331–338.

Duncan, R.B. (1974). "Modifications in Decision Structure in Adapting to the Environment: Some Implications for Organizational Learning," *Decision Sciences*, 5(4), pp. 705–725.

Fiol, C.M., and M.A. Lyles (1985). "Organizational Learning," *The Academy of Management Review,* 10(4), pp. 803–813.

Graham, C.R. (2006). "Blended Learning Systems. Definition, Current Trends and Future Directions" in Bonk, C.J., and C.R. Graham (2006) *The Handbook of Blended Learning. Global Perspectives, Local Designs.* San Fransisco: Pfeiffer, pp. 3–21.

Hofstede, G. (2001). *Culture's Consequences. Comparing Values, Behaviors, Institutions, and Organizations Across Nations.* Thousand Oaks: Sage Publications.

Institute of Community Medicine (2005a). "Studietilbud" [Education], http://www.uit.no/samfmed/studietilbud (current 28 July 2005).

Institute of Community Medicine (2005b). "Organisasjonskart ISM" [Organizational Chart, ISM], http://uit.no.samfmed/administrasjon/27 (current 24 April 2007).

Institute of Community Medicine (2005c). "Instituttstyret" [The Board of the Institute], http://uit.no/samfmed/administrasjon/SubjetIs=701&FromSubject=0 (current 24 April 2007).

Institute of Community Medicine (2005d). "Om Instituttet" [About the Institute], http://www.uit.no/samfmed/om_oss?Language=no (current 28 July 2005).

Institute of Community Medicine (2006). "Curious about Community Medicine?" http://uit.no.samfmed/ (current 24 April 2007).

Kaunas University of Medicine (2003). *Faculty of Public Health*, Kaunas: Kaunas University of Medicine.

Kaunas University of Medicine (2005a). "History and Rectors of Kaunas University of Medicine," http://www.kmu.lt/index.php?cid=904 (current 16 April 2007).

Kaunas University of Medicine (2005b). "Faculty of Public Health" http://www.kmu.lt/index.php?cid=902 (current 16 April 2007).

Keller, C., and L. Cernerud (2002). "Students' Perceptions of E-learning in University Education," *Journal of Educational Media,* 27(1–2), pp. 55–67.

Legris, P., J. Ingham, and P. Collerette (2003). "Why Do People Use Information Technology? A Critical Review of the Technology Acceptance Model," *Information & Management*, 40(2003), pp. 191–204.

Leidner, D.E., and T. Kayworth (2006). "A Review of Culture in Information Systems Research: Toward a Theory of Information Technology Culture Conflict," *MIS Quarterly*, 30(2), pp. 357–400.

Malterud, K. (2001). "Qualitative Research: Standards, Challenges and Guidelines," *The Lancet,* 358, pp. 483–488.

McAfee, A. (2006). "Mastering the Three Worlds of Information Technology," *Harvard Business Review*, 84(11), pp. 141–149.

Moore, G.C., and I. Benbasat (1991). "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation," *Information Systems Research,* 2(3), pp. 192–222.

Moore, G.C., and I. Benbasat (1996). "Integrating Diffusion of Innovations and Theory of Reasoned Action Models to Predict Utilization of Information Technology by End-Users" in Kautz, K., and J. Pries-Heje (eds.). *Diffusion and Adoption of Information Technology.* London: Chapman and Hall Publishers, pp. 132–145.

Ngai, E.W.T, J.K L Poon, and Y.H.C. Chan (2007). "Empirical Examination of the Adoption of WebCT Using TAM," *Computers & Education,* 48(2), pp. 250–267.

Nordic School of Public Health (2003). *NHV 50 år. Jubileumsskrift [Nordic School of Public Health 50 years. Anniversary Publication],* Göteborg: Nordiska högskolan för folkhälsovetenskap.

482

Nordic School of Public Health (2005). "Management team," http://www.nhv.se/customer/templates/InfoPage.aspx?id=23 (current 28 July 2005).

Nordic School of Public Health (2007a). "Vår verksamhetsidé" [Our Mission Statement], http://www.nhv.se/customer/templates/InfoPage_11.aspx (current 24 April 2007).

Nordic School of Public Health (2007b). "Styrelsen" [The Board], http://www.nhv.se/customer/templates/InfoPage_21.aspx (current 24 April 2007).

Nordic School of Public Health (2007c). *Årsberättelse 2006 [Annual Report 2006]*, Göteborg: Nordiska högskolan för folkhälsovetenskap.

Ong, C-S., J-Y. Lai, and Y-S. Wang (2004). "Factors Affecting Engineers' Acceptance of Asynchronous E-learning Systems in High-Tech Companies," *Information & Management*, 41(6), pp. 795–804.

Ong, C-S., and J-Y. Lai (2006). "Gender Differences in Perceptions and Relationships Among Dominants of E-learning Acceptance," *Computers in Human Behavior*, 22(5), pp. 816–829.

Rogers, E.M. (1995). *Diffusion of Innovations* (4th edition). New York: The Free Press.

Saadé, R., and R. Bahli (2005). "The Impact of Cognitive Absorption on Perceived Usefulness and Perceived Ease of Use in On-line Learning: An Extension of the Technology Acceptance Model," *Information & Management*, 42(2), pp.317–327.

Selim, H.M. (2003). "An Empirical Investigation of Student Acceptance of Course Websites," *Computers & Education*, 40(4), pp. 343–360.

Swedish National Agency for Higher Education (2007). "Folkhälsovetenskap" [Public Health], https://www.studera.nu/sokutb/amnen/amnen/folkhalsovetenskap.shtml (current 19 April 2007).

Tolhurst, D., and R.L. Debus (2002). "Influence of Prior Knowledge, Attitudes, Ability, and Activity Structure on Students' Learning and Use of Software," *Journal of Educational Computing Research*, 27(3), pp. 275–313.

University of Tromsö (2005). *Universitetet i Tromsö. Verdens Nordligste Universitet–Studietilbud 2005/2006 [University of Tromsö. The Northernmost University in the World. Educations 2005/2006]*, Tromsö: Universitetet i Tromsö.

University of Tromsö (2006). "Det medicinske fakultet" [Faculty of Medicine], http://uit.no/medfak (current 24 April 2007).

Williams, A., P. Dobson, and M. Walters (1993). *Changing Culture: New Organisational Approaches.* London: Institute of Personnel Management.

Venkatesh, V., M.G. Morris, G.B. Davis, and F.D. Davis (2003). "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly,* 27(3), pp. 425–478.

Yin, R.K. (2003). Case *Study Research. Design and Methods.* (2nd edition). London: Sage Publications.

APPENDIX 1. INTERVIEW GUIDE, PERSPECTIVE II AND III

Core Construct	Questions used in estimating constructs
Performance expectancy	What advantages has the virtual learning environment (VLE) brought to the education? Has using the VLE increased possibilities of communication with colleagues? Has using the VLE increased possibilities of communication with students?
Effort expectancy	Do you find the VLE easy to use? Is your communication with the VLE clear and understandable? Is the VLE generally considered to be easy to learn among staff and students?
Social influence:	Do the university board and management support the use of the VLE? Do staff in general support the use of the VLE? Is there resistance among staff towards the use of the VLE? Is it more prestigious for staff to use the VLE, than not to use it?
Facilitating conditions	Is there a technical infrastructure supporting the use of the VLE? Are there resources available for pedagogical and technical support? Are there resources available for staff and students to learn to use the system? Are there specific persons or groups available for assistance when problems occur using the VLE?
Results demonstrability	Has the performance of the students generally improved because of the use of the VLE? Is it generally known in the organization what advantages the VLE has brought? Is it easy to explain the advantages of the VLE to students and staff?
Visibility	Are members of the university organization in general aware of the VLE and its use? Do they know that the VLE exists and what purpose it serves? Are students and staff able to observe others using the VLE?
Voluntariness of use	Is the use of the VLE mandatory for teachers and students?

APPENDIX 2. ITEMS OF STUDENTS' SURVEY QUESTIONNAIRE, PERSPECTIVE II AND III

Core Construct	Statement
Performance expectancy	I find the virtual learning environment (VLE) useful in my education. Using the VLE improves my educational performance. Using the VLE increases the possibilities of communication with other students. Using the VLE increases the possibilities of communication with teachers/tutors. Using the VLE fits my style of learning and studying.
Effort expectancy	I find the VLE easy to use. Using the VLE is never frustrating. It was easy to learn and understand the VLE. My interaction with the VLE is clear and understandable. I can without effort get the VLE to do what I want it to do. It is easy to remember how to perform tasks in the VLE. To use the VLE does not require a lot of mental effort.
Social influence	Teachers/tutors encourage my use of the VLE. Other students encourage my use of the VLE. The university in general has supported the use of the VLE. Using the VLE improves my prestige among teachers/tutors. Using the VLE improves my prestige among other students.
Facilitating conditions	I have the knowledge necessary to use the VLE. The VLE is compatible with other application programs that I use. A specific person or group is available for support when problems occur.
Results demonstrability	The VLE enables me to accomplish my educational tasks more quickly. Using the VLE makes it easier for me to plan and control my course work. I would have no difficulty explaining the advantages of the VLE to others.
Visibility	I have seen what teachers/tutors accomplish using the VLE. I have seen what other students accomplish using the VLE. I have had the opportunity to try or learn the VLE before I actually had to use it.

LIST OF ACRONYMS

IDT   Innovation Diffusion Theory
KMU   Kaunas University of Medicine, Kaunas, Lithuania
NS   Nordic School of Public Health, Gothenburg, Sweden
TAM   Technology Acceptance Model
UT   University of Tromsö, Tromsö, Norway
UTAUT   Unified Theory of Acceptance and Use of Technology
VLE   Virtual Learning Environment

ABOUT THE AUTHOR

Christina Keller is an Assistant Professor and Researcher in Information Systems at Jönköping International Business School and Uppsala University, Sweden. She received her PhD in Information Systems from Linköping University with the thesis "Virtual Learning Environments in Higher Education—A Study of User Acceptance." Her research interests include e-learning, design science research, and information technology innovations in. She has authored or coauthored about thirty peer-reviewed articles on e-learning published in, for example, the Journals of Learning, Media and Technology, Journal of Educational Computing Research, Educational Media International and proceedings of the European Conference on Information Systems.

Communications of the Association for Information Systems