

# REFLECTIONS ON TECHNOLOGY ACCEPTANCE IN HIGHER EDUCATION

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## Abstract

*The use of new information technology impacts individual work as well as the whole organization. This paper illuminates some preliminary findings from an ongoing study about impacts of the new educational technology in educational organization and individual work. The main question answered in this article is why has information technology being taken into use in certain higher education cases and by whom? Empirical findings are discussed and compared with technology acceptance model (TAM) and theoretical extension of the model (TAM2). Findings suggest that perceived usefulness plays very crucial role when adapting new technology, but there are also other important factors.*

*Keywords: Impact Research, Web-Based Education, Information Technology, ICT, TAM.*

# 1 INTRODUCTION

Why has information technology being taken into use in higher education? Who are the early adapters of new technological phenomenas and why do they choose to ride the tide of chance? Computer aided instruction (CAI) and web based course tools (WBT) have attracted increasing attention in educational as well as in private sector recently. At present, there are many competing platforms in the market<sup>1</sup>.

Effects of this new technology and a way of work and learning have not earned as much attention as they might deserve. Computing technology has been a major force for change in organizations for over 30 years and throughout that time there has been little evidence that developers of user applications are able to predict or plan organizational outcomes (Eason 2001). One can not deny that when implementing a new system into organization, it quite likely produces consequences which could not be predicted.

## 1.1 Objective

This paper does not try to give full answers, nor to present comprehensive discussion about the use of IT in education. Objective of this paper is to summarise some preliminary findings from an ongoing study about the effects of information technology in education and compare them with TAM (Davis 1989) and TAM2 (Venkatesh and Davis 2000) theories. Similarities and differences are then discussed. The modest objective is to offer some observations about the reasons why people tend to take new technology into use and why they stuck into using it or abandon it.

## 1.2 About the study

The study is based on interviews which took place during spring and autumn 2003. Interviewed persons were chosen based on their background as a former, or present user of web based course tools. Another criteria for selecting these individuals was the fact that they all were working for the same organization, although the goal was to try to reach for as heterogenic group as possible. Whole 20 persons were interviewed, twelve women and eight men.

Original interviews consist of six different themes. Themes were discussed quite freely during the interview. For this article, only the first of the six themes is analyzed. The themes discussed were as follows:

1. Personal user history of web based course tools
2. Ways of using web based course tools
3. User experiences of web based course tools
4. Web based course tools influence on individual work
5. Changes caused by web based course tools
6. Future

Used method, grounded theory, can be presented either as well codified set of propositions or in a running theoretical discussion, using conceptual categories and their properties. Interviews were analyzed using open coding (e.g. to form classifications) and then using axial coding (e.g. to form main and sub categories). Third phase was selective coding, in which the goal is to integrate the core

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<sup>1</sup> <http://www.edutools.info/course/compare/all.jsp>

process into all produced classes. Last phase was to combine produced new concepts and knowledge into previous knowledge. (Järvinen and Järvinen 2000, p. 72-74; Glaser and Strauss 1979, p. 31.)

Findings from interviews were analyzed and compared with TAM (Davis 1989) and TAM2 (Venkatesh and Davis 2000) models. When analyzing findings from interviews, concepts or synonyms for factors introduced in TAM models were looked after. If these were found, track was kept for each factor and this was interpreted supporting previous theory for this part — and vice versa. Other related findings were also reported.

## 2 INFORMATION SOCIETY AND EVOLVING DISTANCE EDUCATION

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

According to 2002-2003 NRI (Network Readiness Index), which is published by World Economic Forum<sup>2</sup>, Finland is holding the first place. A year ago (2001-2002), when the list was hosted by the Center for International Development<sup>3</sup> from Harvard University, Finland was placed third. Then USA and Island held the first and second place. From this viewpoint Finland has very good possibilities and means to utilize ICT in many areas. Both infrastructure and knowledge are present.

When elaborating into information society the very core functions, and society itself do change. According to Mälkiä (1996, p. 410-411) direct changes following this are: a) increased significance of information, formation of information, editing and refining information and transmitting information; b) While the importance of knowledge work increases, so does the importance of education and innovations; c) Society becomes complex, more technical and more computerized. Rapid changes in society have put education into situation, where new means for delivery are needed and therefore it is not surprising that web based distance education has been given very much attention lately.

## 3 ADOPTING NEW TECHNOLOGY

A lot of research has been done to understand how to make implementation process of IT system as fluent as possible. Underlying problem here is the fact that although technology might be brilliant there are people using it and these do not always mix. The technology acceptance model (TAM) created by Davis (1989) tries to explain the adoption process and underlying influencing factors in technology acceptance. Most important thing Davis found in his research was that perceived usefulness and perceived ease-of-use are the primary drivers of technology adoption. Later on the model has been used widely in IS research (Adams, Nelson and Todd 1992, Hu, Chau, Sheng and Tam 1999, Brown, Massey, Montoya-Weiss and Burkman 2002).

Venkatesh and Davis (2000) developed later theoretical extension into the original TAM model created by Davis. They named this new and improved model TAM2. TAM2 introduces several new concepts into the theory. Fig 1. illustrates this model. *Subjective Norm* presented refers to person's perception that most people who are important to him or her think that he or she should or should not

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2 www.weforum.org report available from

[http://www.weforum.org/pdf/Global\\_Competitiveness\\_Reports/Reports/GITR\\_2002\\_2003/Finland.pdf](http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/GITR_2002_2003/Finland.pdf)

3 www.cid.harvard.edu and www.weforum.org report available from [http://www.weforum.org/pdf/gcr/gitrr/gitrr2002\\_execsumm.pdf](http://www.weforum.org/pdf/gcr/gitrr/gitrr2002_execsumm.pdf)

perform the behaviour in question (Fishbein and Ajzen 1975, p. 302, quoted in Venkatesh and Davis 2000). *Voluntariness* refers to the extent which potential adopters perceive the adoption decision to be non-mandatory (Agarwall and Prasad 1997, Hartwik and Barki 1994, Moore and Benbasat 1991, quoted in Venkatesh and Davis 2000). *Image* refers to the degree in which the use of an innovation is perceived to enhance one's status in one's social system (Moore and Benbasat 1991, p. 195, quoted in Venkatesh and Davis 2000). *Experience* refers to increasing experience when using a target system. *Job Relevance* refers to individual's perception regarding the degree to which the target system is applicable to his or her job. *Output Quality* refers to the fact, that people will take into consideration how well the system performs those tasks in question. *Result demonstrability* is defined as tangibility of the results using the innovation, which will directly influence perceived usefulness (Moore and Benbasat 1991, p. 203 quoted in Venkatesh and Davis 2000). *Perceived Usefulness*, *Perceived Ease of Use*, *Intention to Use* and *Usage behaviour* are presented as in the original TAM. (Venkatesh and Davis 2000, p. 187-192.)

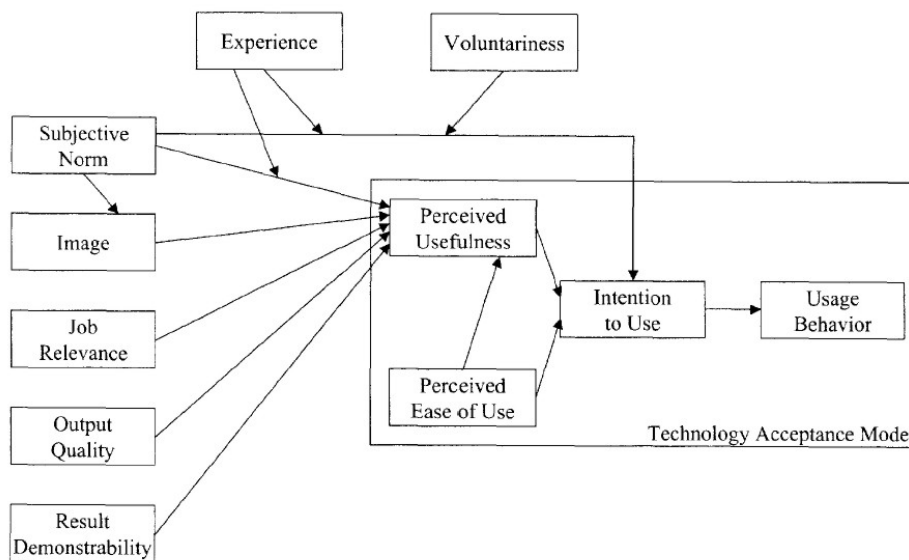


Figure 1. TAM2 model (Venkatesh & Davis 2000, p. 188).

Findings in the research of Venkatesh and Davis (2000) were that TAM2 extends TAM by showing that subjective norms exerts a significant direct effect on usage intentions over and above perceived usefulness and perceived ease of use for mandatory systems. Consistent with theory, basic TAM relationships were all supported, with full mediation by intention and no moderation by either voluntariness or experience. Subjective norm-intention relationship was significantly moderated by both experience and voluntariness. This mirrored the fact that subjective norm significantly affects intention directly only when usage is mandatory and experience is in the early stages. The subjective norm-usefulness relationship was significantly moderated by experience. Image-usefulness on the other hand was not. The effect of job relevance and output quality on perceived usefulness was interactive. (Venkatesh and Davis 2000, p. 197-198.)

#### 4 INTERVIEWS AND INSIGHTS

Interviews showed that people adapt and use technology in different ways. Original reasons for taking unfamiliar new technology into use did also vary. The heterogeneity of users was quite evident, although there were no real borders between different disciplines in adapting new technology. There might have been some special requirements for the actual ways of technology use in teaching though.

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

Most important reasons for adapting new technology and work processes seemed to be interest for subject matter, to try new things, to pursue new benefits, to solve a problem at hand and to utilize web resources in education. Almost all of the interviewed had at least some pedagogical studies behind them, only two men did not have any pedagogical background. For women the exploitation of highly developed interactive communication seemed to be most the crucial factor, when men seemed to be oriented to more technical details.

#### 4.1 Reflecting interviews using TAM and TAM2

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

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

Job relevance and result demonstrability seemed to play important role, but there were also cases where these were not perceived. Result demonstrability seemed to be extremely important when judging whether or not to continue using system. Subjective norm did not present itself in the form it was introduced in TAM2, but when superior did suggest experimenting using web based course tools it did take place at least in one case. Image and output quality were noticeable, but seemed not to be critical factors. All factors introduced in TAM2 were noticeable at least in some degree, but in none of the cases were all factors clearly present at the same time. These findings suggest that there seems to be personal differences in approaches towards technology.

#### 4.2 Flexible technology, rigid users?

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

Only few of the interviewed had themselves attended virtual courses in a role of student. One could argue here that how well can this totally new paradigm of education be applied into use if teachers themselves have not seen the reality of online courses before hosting one? Another interesting occurrence was new co-operation arrangements. This new technology had indeed made possible new forms of collaboration, but unfortunately these were not very common practice. Six out of twenty interviewed had some sort of co-operative arrangements which were possible because used technology.

Model Peterson et al. (2002) created in their study about the use of new technology in marketing education does give some implication. They found that important antecedents for the use of instructional technology are perceived greater effectiveness, perceived enhanced communication, perceived greater efficiency and “appearance” as they used the concept. Consequences found were greater efficiency and enhanced communication which both facilitated student learning. Another consequences were lower student learning and uncertain student learning.

Keeping this in mind, findings in this study at hand do give similar implications for the importance of greater effectiveness, enhanced communication and greater efficiency. When looking for the reasons for continuing the use of web based course tools interviewed told among other things following reasons: received positive feedback, learning results have been very good, pilot course turned out fine, very easy to update course materials, makes teachers job easier, flexibility from time and place, one can concentrate more into content than technology and reflecting experiences through discussions. These results are in line with the findings of Peterson et al. (2002) — as did the reasons for not to use web based course tools. Reasons were uninterested students, wages were not adequate when compared to workload and teaching method is not suitable for courses with many students.

When asked to define one’s IT skills, all interviewed did see themselves possessing at least satisfactory skills. Most of them saw themselves having average or better skills. There seems to be none with poor IT skills, but on the other hand web based course tools do require some level IT skills to be used.

## **5 CONCLUSION**

Based on the empirical findings of this study, one can not make such claims as: “the most important factor to ensure technology acceptance is easiness of use”. People do naturally hope for systems which are easy to use, but this does not prevent them from using systems — as long as they see clear advantages in using it. Whether these advantages are general, or influence on personal work, does not play that important role.

Findings here do imply that there were no situation, when web based education had been the easiest solution, but on the other hand it did offer other benefits and was taken into use for this reason. It also seems that when being familiar with IT it is a lot easier to adapt new technology and ways of work. Technology does not seem to replace old work processes with new one’s, but instead it changes them. In one interview argument “it is more important to provide content than compare tools” took place. In other words, tools have matured so that there are enough usable software products on the market and it is up to an individual to make good use of those.

It also seems that if the first encounters with new technology are very bad there is a concrete risk for rejecting technology. It also seems that web based educational tools are seen only as a tools for completing tasks and making work easier. The tool is not emphasized; the focus is instead in actual work process.

In conclusion, acceptance and adaptation of new technology into use is a complex, difficult and important phenomenon. This study gives some implications over the phenomenon in educational context, but still many questions remain mystery. When studying technology in organizations it is not enough to concentrate only on technology, but instead to focus on the whole.

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