

ACCEPTANCE AND CONTINUANCE INTENTION OF WEB-BASED LEARNING TECHNOLOGIES (WLT) USE AMONG UNIVERSITY STUDENTS IN A BALTIC COUNTRY

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Abstract

This paper presents the acceptance and “continuance intention” of use for Web-based learning tools among University students in a Baltic country, namely Estonia. In this paper, we used the technology acceptance model (TAM), which was extended to include two external constructs: the technology and user characteristics. These two constructs were modeled to influence the perceived ease of use, and perceived usefulness constructs in the TAM. Further, another construct - continuance intention - in the information systems (IS) post-adoption literature was linked to the TAM. We used a sample of 72 students from four local higher educational institutions that have experience with a specific Web-based learning tool; i.e. WebCT. Our results indicate that both the characteristics of the technology and user affect perceived ease of use and perceived usefulness. In addition, perceived ease of use significantly affects usage, whilst perceived usefulness did not show any meaningful influence. Our data, in the context of Web-based learning technologies, also indicates that both usage and perceived usefulness influence continuance intention, whilst perceived ease of use does not. To conclude, the implications for both practice and theory are discussed.

1. INTRODUCTION

The use of information and communication technologies (ICT) by higher education institutions across the world is beginning to emerge (Leidner and Jarvenpaa, 1993; Sandholtz et al., 1997; Goldberg, 1997a; Roblyer and Edwards, 2000). Web-based technologies are among the tools gaining popularity (Morss and Fleming, 1998; Mioduser et al. 2000; Tavangarian et al., 2004; Sala, 2003). Over the last decade, higher education institutions across the world have been adopting Web-based learning technologies (WLT) in an effort to create an environment for both students and their instructors to engage in collaborative learning environments (Goldberg, 1997b; Hsu and Backhouse, 2001). In such environments, students can learn at their own speed, give and receive feedback from peers and instructors alike. Examples of WLT software include WebCT and Blackboard. In particular, WebCT provides a wide variety of learning and teaching tools such as course content and syllabi tools, student progress tracking, group project organisation, student self-evaluation, email, and on-line chat. WebCT is easy to use and requires little technical background (Goldberg, 1997a, b; Hsu and Backhouse, 2001; Yohon et al., 2004). However, Mann's (1998) study found that under certain educational conditions, these claims were not supported. Without a doubt, the literature on WLT use in higher education settings is growing (see for example, Morss and Fleming, 1998; Brown, 2002; Kent 2003; Yohon et al., 2004; Sørenbø, 2004).

Our scan of the literature indicated that reports and discussions on the adoption of WLT by faculty members are readily available in the literature than those for students. For example, Kent (2003) studied the usage of WebCT amongst staff of a British University and Yohon et al. (2004) discussed the perceptions of faculty members in a US University with

regard to WebCT. Similarly, Sørøbø (2004) studied the continuance intention of using a WLT by faculty members in Norway. The trend of concentrating on faculty members' perspectives led Keller and Cernerud (2002) to note that the discourse of ICT use in learning (and e-learning) tends to primarily focus on how faculty members employ such technologies. It has to be emphasised, however, that students are key stakeholders in the education sector and their views are as useful as those of faculty members in ensuring the overall success of such technologies in pedagogy. The shortage of literature on students' perspectives of ICT use in learning and in the context of WLT adoption in particular has motivated this current study. The main purpose of this paper is to present the views of University students regarding WLT adoption.

We have not said that there are no studies deliberating WLT issues among students; rather we are saying that such studies are few. A few of the examples include the work of Brown (2002) that studied the acceptance of WebCT in a developing country. Limayem et al. (2003) investigated the adoption and continuance intention among students in a Web-based learning environment. Jones et al. (2004) also attempted to find reasons why students in a Welsh University withdraw from e-learning environments. Our study is similar to the foregoing studies as we intend to focus on the effects of technological and user characteristics in the acceptance of WLT as Brown (2002) did in South Africa. We also investigate the continuance intention of WLT usage among students as Limayem et al. (2003) did in Hong Kong. This study is, however, is different in that it presents the view from Estonia, a country in Central and Eastern Europe (CEE) - a region that has not featured prominently in the IS literature, which has led some IS researchers (e.g. McHenry et al., 1990) to call for research to be extended to this region. With this paper, we hope to answer such a call. Additionally, we will extend the technology acceptance model (TAM), which Brown (2002) used for his study by incorporating a construct - continuance intention - that could give us insights about the post-adoption phase.

Specifically, the foremost objective of this study is to investigate students' perspective of Web-based learning technologies using WebCT. To that end, we aim at investigating the influence of the individual/user characteristics and technology characteristics in the acceptance and continuance intention of using WebCT among Estonian University students. Also, we will empirically examine the influence or effects of perceived ease of use, perceived usefulness, and usage on continuance intention. Importantly, this present study draws from the work of Brown (2002) that reports the relationships between the influence of individual/user characteristics and technology characteristics in the acceptance of WLT in a developing country. He found that individual and technology characteristics are relevant in the acceptance of WebCT among his research subjects. Thus, we will compare our findings with those in Brown's (2002). Such comparisons and replications are vital in accumulating knowledge and building a cumulative tradition in the information systems (IS) field (Benbasat and Zmud, 1999; Berthon et al., 2002). As such, we hope to add to the cumulative body of knowledge in the IS field regarding the TAM as we present a view from CEE.

Importantly, this study complements other studies in Estonia focusing on e-learning projects assessments. The Estonian eUniversity (2004b) recently carried out a survey to determine the needs of e-studies and e-learning environments among University teachers in the country. Students' views were not investigated. Further, Ifinedo (2005a) highlights the risks in implementing e-learning projects in Estonia from the point of view of IS project managers. Thus, we hope to contribute to knowledge both in terms of practice and theory.

The rest of the paper is structured as follows: Firstly, the literature review, research model and hypotheses are succinctly presented. Secondly, the research methodology is

described. The next section deals with the data analysis. Finally, the discussion and conclusion of the study are presented.

2. LITERATURE REVIEW

There are many competing models in the IS domain for studying user acceptance and adoption (please see, Venkatesh et al., 2003). Amongst the most widely used in the literature is the technology acceptance model (TAM), which was developed by Davis (1989). The TAM proposes that users' acceptance of a new IS can be predicted by the users' perceptions of the ease of use and usefulness of the IS (Davis, 1989; Venkatesh and Davis, 2000). Of note is the fact that researchers using the TAM model (e.g., Davis, 1989; Szajna, 1996; Venkatesh and Davis, 2000; Gefen and Straub, 2000) tend to limit themselves to exploring how users adopt an IS. Such studies overlook the fact that the initial acceptance or adoption is the first step in achieving success with the new IS. Bhattacharjee (2001) and Limayem et al. (2003) have argued for IS continuance intention to be incorporated into studies investigating the adoption of IS to assure overall success with IS acceptance. Bhattacharjee (2001) proposes the post acceptance model (PAM), which borrows from the Expectation-Confirmation Theory in consumer behaviour. The PAM proposes that the user forms an initial expectation of an IS prior to usage, then he or she accepts and uses the IS. Afterwards, he or she develops perceptions about the IS (i.e. perceived usefulness). Next, he or she assesses his or her original expectations, from which a satisfaction level is formed. Finally, a satisfied user forms an IS continuance intention, whilst a dissatisfied user may discontinue the use of the IS.

The *perceived ease of use* construct in the TAM describes, "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p 320). The other construct is the *perceived usefulness*, which describes the user's perceptions of the expected benefits derived from using a particular IS system (Davis, 1989; Venkatesh and Davis, 2000). *Usage* is the dependent variable in the TAM, and it is "theorized to be influenced by perceived usefulness and perceived ease of use" (Ibid, p 320). Other IS researchers have confirmed the relationships in the model of TAM (please see, Szajna, 1996; Straub et al., 1995; Igbaria et al. 1997; Legris et al., 2003). Similarly, researchers in the IS domain have extended the Davis' (1989) original model (please see, Igbaria et al., 1997; Dishaw and Strong, 1999; Venkatesh and Davis, 2000). For example, Igbaria et al. (1997) extended the TAM by adding intra and extra organisational factors such as management support and external training and so on, and Venkatesh and Davis (2000) added job relevance, image, result demonstrability, etc. Consistent with prior studies that have expanded the TAM to suit various research objectives, we will incorporate technology and individual/user characteristics into the TAM as was discussed above. In brief, studies by Szajna (1996), Venkatesh and Davis (2000), Taylor and Todd (1995) and Igbaria et al. (1997) have suggested that such extensions may be useful in improving the explanatory power of the TAM. In this instance, the two endogenous or external constructs influencing the TAM (please see, Figure 1) have been previously used in the context of WLT by Brown (2002).

Systems characteristics, which for the purposes of this study we took as being comparable to technology characteristics, have been found to influence the use and acceptance of IS (Benbasat and Dexter, 1986; Davis et al., 1989). Systems characteristics in those studies included the quality of the user interface, quality of input and so on. As regards the World Wide Web (WWW), Lederer et al. (2000) identified two variables that significantly predict perceived ease of use of such facilities, i.e., "ease of finding" and "ease of understanding". In Brown's (2002) study, he found evidence showing that these variables significantly influence the perceived ease of use of WebCT. However, he did not investigate the relationships between these variables and perceived usefulness as we intend to do.

Likewise, the characteristics of users of IS have been found to significantly influence the acceptance of an IS (Igbaria, 1990; Compeau and Higgins, 1995). Essentially, prior computer experience and self-efficacy are two of the main variables that have been used to describe user characteristics (Taylor and Todd, 1995; Compeau and Higgins, 1995, Agarwal et al., 2000). Taylor and Todd (1995) found self-efficacy to be important for IS usage. Also, Brown (2002) reported self-efficacy as the variable having the greatest influence for students accepting WebCT in his study.

Computer anxiety describes “the tendency of individuals to be uneasy, apprehensive, or fearful about current or future use of computers” (Igbaria and Parasuraman 1989, p. 375). It is found to influence IS acceptance (Igbaria and Parasuraman 1989; Igbaria, 1990). The self-efficacy and computer anxiety variables are closely related. In the model of computer self-efficacy developed by Compeau and Higgins (1995), they suggested that prior experience with computers is critical in self-efficacy judgments. Igbaria (1990) showed that there is a relationship between computer anxiety, experience and training. He also found a strong direct effect between computer experience and perceived usefulness. In the context of WLT, Brown (2002) found a negative relationship between computer anxiety and perceived ease of use. As discussed earlier, most studies in the IS field investigating IS acceptance and use do not go beyond initial usage. However, Limayem et al. (2003) writing in the context of WLT (using Blackboard) developed an integrative model comprising elements in the Theory of Planned Behaviour (TRA) and the PAM. The development of the TAM by Davis (1989) was influenced by the Ajzen’ (1971) TRA work. In Limayem et al’s (2003) study, a direct relationship between initial *usage* and *IS continuance intention* was investigated and confirmed by statistical analysis – there was a positive and strong relationship between these two variables. Although, the approach where the relationship between these two constructs is studied is akin to the objectives of this study, it differs, nonetheless because we did not focus on all the antecedents in the PAM as Limayem and colleagues did. Our focus is limited to the effect of usage on continuance intention in this exploratory study.

2.1 The Research Framework

The research model of this study is shown in Figure 1. The part indicated with a dashed box represents the TAM. The arrows in Figure 1 indicate the directions of the main hypotheses (H2a – H3c) described in the text below. First, the research model proposes that two external factors; namely, technology and user characteristics will influence perceived usefulness and perceived ease of use. Second, in the TAM the relationships between the constructs of perceived usefulness, perceived ease of use and usage are indicated. Third, the relationships between the three TAM constructs and continuance intention are shown. Continuance intention is the dependent variable in our model.

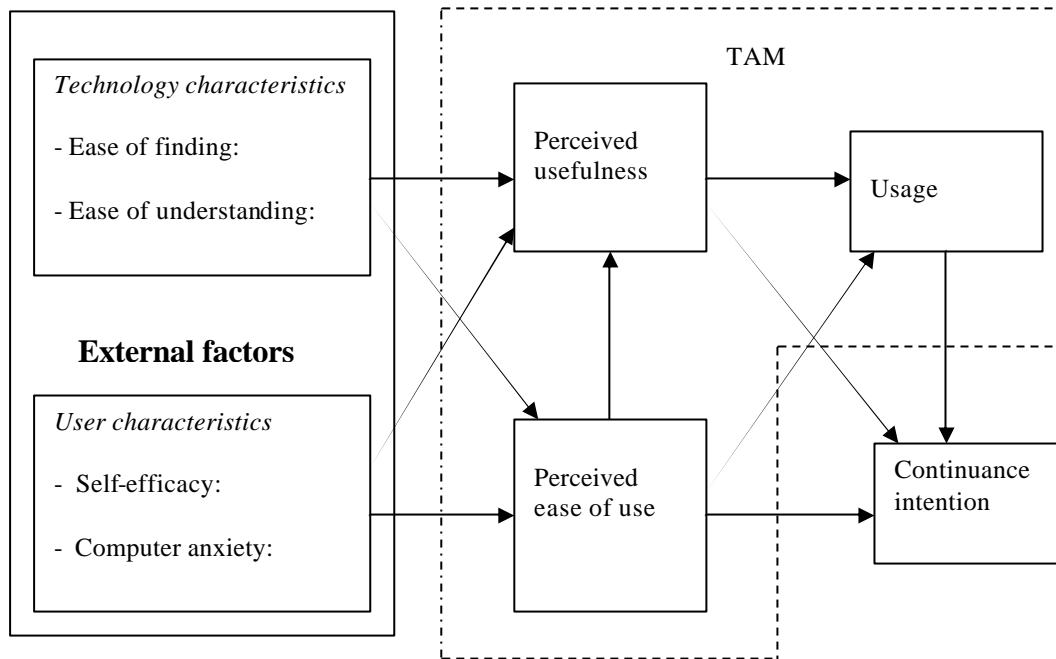


Figure 1: The Research Model

2.2 Research Setting and Hypotheses

The setting of the study is in an emerging economy in Central and Eastern Europe - Estonia - that recently joined the European Union (EU) after several years under the domination of the Soviet Union. It has a population of 1.4 million inhabitants (CIA: World Factbook, 2004). Despite its small size, Estonia leads other CEE countries in terms of the adoption, use of IT and networked economy readiness (WEF, 2004; Ifinedo and Davidrajuh, 2005). This progress also extends to its education sector. Estonia supports ICT use in education (the Tiger Leap Foundation, 1997, Estonian eUniversity, 2004a). The Tiger Leap project aims at providing all educational institutions in the country with computer access and training. Additionally, Estonia has one of the highest Internet connections per population (CIA: World Factbook, 2004; Ifinedo and Davidrajuh, 2005). As such, it would be reasonable to expect high Web use and experience among students in the country. Such a proposition is supported by on-going efforts on the e-learning fronts in Estonia. The country has recently initiated another ICT-based project in the education sector called the UNIVe (Estonian eUniversity, 2004a). It aims at "Increasing the availability of quality education for students and other people willing to learn,...and, educating lecturers of universities to compile and practice quality and efficient e-courses" among other goals (see, Estonian eUniversity, 2004a).

Overall, students in Estonia have adequate exposure to ICT products and usage, which helps in enhancing their abilities and skills on such technological fronts (Nissinen, 2002). A recent survey in Estonia indicated that 70% of University teachers in the sample admitted to using some sort of e-learning tool in their duties (Estonian eUniversity, 2004b). Thus, such exposure would enable students in the country to find it relatively easy to find and understand information on a WLT. Students would not seem to be afraid of using computers and other relevant ICT products as a result of accumulated experience and exposure. Based on this succinct discussion regarding the skills and abilities of the Estonian student on IT/Web usage and exposure as well as other findings in the literature as presented above, we propose the following hypotheses:

- H1a: There will be a positive relationship between ease of finding and perceived usefulness of WebCT.
- H1b: There will be a positive relationship between ease of understanding and perceived usefulness of WebCT.
- H1c: There will be a positive relationship between self-efficacy and perceived usefulness of WebCT.
- H1d: There will be a negative relationship between computer anxiety and perceived usefulness of WebCT.
- H1e: There will be a positive relationship between ease of finding and perceived ease of use of WebCT.
- H1f: There will be a positive relationship between ease of understanding and perceived ease of use of WebCT.
- H1g: There will be a positive relationship between self-efficacy and perceived ease of use of WebCT.
- H1h: There will be a negative relationship between computer anxiety and perceived ease of use of WebCT.

The set of the foregoing hypotheses will be investigated using Pearson's correlation coefficients. Although we take as a cue from Brown's (2002) study by using the approach, our main hypotheses (H2a –H3c) will use a different data analysis, namely, structural equation modelling. Next, we succinctly discuss the main hypotheses.

Studies by researchers (e.g., Taylor and Todd, 1995; Compeau and Higgins, 1995; Igarria, 1990) on the effects of users characteristics on IS acceptance found evidence in support of such associations. Likewise, Benbasat and Dexter (1986) and Davis et al. (1989) offered evidence that the characteristics of the system may influence IS acceptance. In the same vein, perceived ease of use and perceived usefulness have been noted as important predictors of IS usage (Davis, 1989; Adams et al., 1992; Straub et al., 1995; Igarria et al. 1997). With regard to WLT, Lee et al. (2003) found strong relationships between perceived ease of use and perceived usefulness as did Brown (2002). Lee et al. (2003) also found positive relationships between perceived usefulness and usage whereas Brown (2002) did not. In addition, Brown (2002) reported a strong relationship between perceived ease of use and usage; on the other hand, Lee et al. (2003) did not investigate this dimension. Similarly, other conflicting results about the relevance of the TAM in the context of WLT have been advanced. For example, Pan et al. (2003) concluded that the TAM may in fact not be applicable to the higher educational settings. Following overwhelming evidence supporting relationships in the TAM as well as those between some endogenous variables such as user and technology characteristics on TAM constructs, we propose these set of hypotheses below.

- H2a: Technology characteristics will have a positive effect on perceived usefulness of WebCT
- H2b: User characteristics will have a positive effect on perceived usefulness of WebCT
- H2c: Perceived ease of use will have a positive effect on perceived usefulness of WebCT
- H2d: Perceived usefulness will have a positive effect on usage of WebCT.
- H2e: Perceived ease of use will have a positive effect on usage of WebCT.

Furthermore, Sørenbø (2004) in the context of WLT found perceived usefulness not to be a non-significant predictor in comparison to satisfaction, which is another antecedent in the PAM; on the other hand, Limayem et al. (2003) found perceived usefulness to be significant in IS continuance. Relatedly, 61% of the sample (195 participants) in a recent e-learning survey in Estonia also suggested that faculty members who use WLT have intentions to continue using such tools (Estonian eUniversity, 2004b). Thus, it may be a reasonable conjecture to make that students, who have been working with their instructors over the years following the introduction of the various ICT-based initiatives in the country's educational sector (the Tiger Leap Foundation, 1997, Estonian eUniversity, 2004a; Nissinen, 2002), would share the same optimism. Thus, we formulate the following predictions:

- H3a: In the context of Web-based learning where WebCT is used, usage will have a positive effect on continuance intention.
- H3b: In the context of Web-based learning where WebCT is used, perceived ease of use will have a positive effect on continuance intention.
- H3c: In the context of Web-based learning where WebCT is used, perceived usefulness will have a positive effect on continuance intention.

3. RESEARCH METHODOLOGY

3.1 Respondents and Method

This empirical study is exploratory in nature. A convenient sample of 72 students coming from four tertiary institutions in Estonia is used. The universities are as follows: The Estonian Business School, Tallinn University of Technology, Tartu University and Estonian IT College. The research approach is judgmental sampling (Neuman, 1997), i.e., the author self-administered a two-page long questionnaire (please see the Appendix) to students having experience with WebCT. The questionnaire was translated into Estonian in accordance with Brislin's (1986) suggestions for research conducted in a different culture. The questionnaire was test-piloted by four local students whose comments assisted the quality of the final instrument administered. Importantly, the test-retest reliability of this study is high. In comparison to a previous comparable research conducted by the researcher (Ifinedo, 2005b), the findings in both cases yielded analogous interpretations even when the data analysis techniques differed.

In this study, we arbitrarily classified our respondents into two groups. Namely, students in the IT and Engineering disciplines, which we labelled "IT savvy" (N=30), and the others as "non-IT savvy" (N=42). Please see Table 1 for detail of each group on some variables. The objective of the study is to elicit views of students that have used WebCT; hence, we did not investigate the views of "non-adopting" students. SPSS 10.0 and PLS Graph 3.0 were used for data analysis. A One-way ANOVA test between the two groups of students indicates statistical differences in all the indicators but six¹. The demographic profile of all the respondents is shown in Table 2.

¹ The One-way ANOVA test result is excluded due to space limitations but is available from the author upon request. The six items are EOU4, EOU5, CAX1, CAX2, CAX3 and USG1.

Table 1: The Breakdown of the Respondents and the Correlations Results

Measures and constructs	IT savvy students (Mean)	Non-IT savvy students (Mean)	All students (Mean)
Ease of finding (EAF)	5.90	4.57	5.13
Ease of understanding (EOU)	5.73	5.1	5.36
Self-efficacy (SEF)	6.43	5.31	5.78
Computer anxiety (CAX)	1.73	2.13	1.97
Perceived usefulness (PUS)	4.09	3.28	3.62
Perceived ease of use (PEOU)	5.96	4.65	5.12
Usage (time spent) (USG1)	3.33	3.40	3.37
Usage (frequency) (USG2)	3.90	4.29	4.13
Continuance intention (CONX)	6.19	4.77	5.36

Pearson Correlations between the External Factors and the Acceptance Constructs (N=72)						
	EAF	EOU	SEF	CAX	PUS	PEOU
Ease of finding (EAF)	1.000					
Ease of understanding (EOU)		1.000				
Self-efficacy (SEF)			1.000			
Computer anxiety (CAX)				1.000		
Perceived usefulness (PUS)	.454**	.563**	.584**	-.046	1.000	
Perceived ease of use (PEOU)	.603**	.740**	.604**	-.145		1.000

**p < 0.05 level (Two-tailed significance)

We performed an exploratory factor analysis with SPSS 10.0 for the four variables in the technology and user characteristics constructs. Our test result indicates that the items measure what they are formulated to measure². We also used the same software to calculate Pearson's correlation coefficients between items in the technology and user characteristics constructs and perceived usefulness and ease of use, as was discussed above. Please see lower part of Table 2 for the correlations results.

Table 2: Demographic Profile of Respondents

		Number	Percent
Gender	Male	32	44.4
	Female	40	55.6
Age	Less than 25 years	63	87.5
	26-39 years	9	12.5
Education (level)	Year 1	13	18.1
	Year 2	22	30.6
	Year 3	13	18.1
	Year 4	24	33.3
Study programme (Department)	Business / Economics studies	36	50
	Information Technology	16	22.2
	Mechanical Engineering	9	12.5
	Philosophy	6	8.3
	Electrical Engineering	5	6.9
Years of experience with the Internet	1-2 yrs	1	1.4
	2-3	5	6.9

² The test result is excluded due to space limitations but is available from the author upon request.

	3-4	9	12.5
	4-5	23	31.9
	more than 5 yrs	34	42.7
Diversity of Web use		Mean	Standard deviation
	Web browsing	5.13	1.79
	downloading	5.00	1.50
	email	5.61	1.57
	chat room	5.53	1.99
	discussion lists	3.32	1.52
Each task was anchored on a Likert scale ranging from 1 (Never use it) to 7 (Use a great extent).			

3.2 Research Constructs and Analysis

The questionnaire included constructs that have been validated previously in the literature. It contained multiple measurement items that relate to each of the constructs in the research framework in Figure 1 above. The scales include the following: *Ease of finding* (EAF) and *ease of understanding* (EOU) consists of three (3) and five (5) items, respectively. These items were taken from the work of Lederer et al. (2000) and Brown (2002). *Self-efficacy* (SEF) consisted of three items from the following sources: Compeau and Higgins (1995), Agarwal et al. (2000) and Brown (2002). *Computer anxiety* (CAX) has four (4) items that come from Igarria (1990) and Brown (2002). Three (3) items were used to measure *perceived usefulness* (PUS), and four (4) items for *perceived ease of use* (PEOU). Together, these seven items come from the work of Davis (1989) and Brown (2002). The *usage* (USG) scale consists of two (2) items from Adams et al. (1992) and Igarria (1990). Finally, *continuance intention* (CONX) comprises two (2) items from Bhattacharjee (2001) and Sjørebø's (2004). All the items were operationalized using a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree) except for the scales for WebCT usage, which were presented with five (5) and six (6) options. Please see the Appendix.

The PLS (Partial Least Squares) procedure is a second-generation multivariate technique used to estimate structural models (Chin, 1998; 2000). PLS is capable of testing complex models consisting of multiple interactions measured with multiple indicators. Unlike, the traditional multiple regression analysis that is less efficient in assessing measurement errors, PLS recognizes two components of a casual model: the measurement model and the structural model.

The measurement model consists of relationships among the conceptual factors of interests (the observed items or variables) and the measures underlying each construct. This model demonstrates the construct validity of the research instrument, i.e. how well the instrument measures what it purports to measure. The two main dimensions are the convergent validity and the discriminant validity. First, convergent validity assesses the extent to which items on a scale are theoretically related. Chin (1998) recommends items loadings of greater than 0.70. Second, discriminant validity is assessed by checking the extent to which items measure a construct. This is assessed by checking the square root of the average variance extracted (AVE) for each construct. Fornell and Larcker (1981) recommend values higher than 0.50.

On the other hand, the structural model gives information as to how well the theoretical model predicts the hypothesized paths or relationships. PLS software provides the squared multiple correlations (R^2) for each endogenous construct in the model and the path

coefficients. The R^2 indicates the percentage of a construct's variance in the model, whilst the path coefficients indicate the strengths of relationships between constructs (Chin, 1998). Most importantly, PLS has the ability to handle non-normality in data distribution and it is good for small to medium sample sizes (Chin, 1998). Our small sample size of 72 subjects makes PLS and structural modelling an appropriate approach for our data analysis. The structural and measurement models of our research model are discussed below.

Table 3: Psychometric Properties of Measures and Constructs

Construct	Item	Weight	Loading	St. Error	t-value	Composite reliability
Technology characteristics (AVE = 0.648)	EAF1	0.1726	0.7426	0.0320	5.4001	0.936
	EAF2	0.1843	0.8645	0.0299	6.1707	
	EAF3	0.1827	0.8636	0.0236	7.7366	
	EOU1	0.1624	0.8674	0.0148	10.9835	
	EOU2	0.1369	0.8483	0.0186	7.3478	
	EOU3	0.1470	0.8007	0.0199	7.3825	
	EOU4	0.1308	0.7722	0.0198	6.5911	
User characteristics (AVE = 0.629)	SEF1	0.1344	0.6803	0.0302	4.4434	0.922
	SEF2	0.1674	0.7343	0.0276	6.0590	
	SEF3	0.1872	0.8389	0.0216	8.6605	
	CAX1	0.1675	0.8434	0.0200	8.3863	
	CAX2	0.1658	0.8285	0.0282	5.8810	
	CAX3	0.2005	0.8237	0.0271	7.3979	
	CAX4	0.2350	0.7864	0.0317	7.4057	
Perceived ease of use (AVE = 0.732)	PEOU1	0.2797	0.8037	0.0714	11.2561	0.916
	PEOU2	0.2422	0.8640	0.0457	18.9045	
	PEOU3	0.3053	0.9008	0.0210	42.8258	
	PEOU4	0.3415	0.8519	0.0372	22.8740	
Perceived usefulness (AVE = 0.815)	PUS1	0.3554	0.9004	0.0300	30.0409	0.930
	PUS2	0.3737	0.9352	0.0164	57.0995	
	PUS3	0.3789	0.8722	0.0360	24.2192	
Usage (AVE = 0.914)	USG1	0.4942	0.9513	0.0182	52.2206	0.955
	USG2	0.5513	0.9611	0.0116	82.7979	
Continuance intention (AVE = 0.908)	CONX1	0.5349	0.9547	0.0157	60.7527	0.952
	CONX2	0.5146	0.9510	0.0188	50.7130	

3.2.1 Assessing the Measurement Model

The results in Table 3 shows that the measures and constructs examined in this study are robust in terms of internal consistency as indicated by the composite reliability. We have values that are consistently above 0.9, which exceeds 0.7 in Nunnally's (1978) guidelines. It worth mentioning that composite reliability is similar to Cronbach Alpha (see Barclay et al, 1995). Further, the items loadings meet Chin's (1998) guideline of between 0.60 and 0.70. Further, each AVE for a construct exceeds the 0.5 guideline as suggested by Fornell and Larcker (1981). Table 4 presents the inter correlations among the study constructs, AVE and the square root of AVE. The AVE values are greater than the off-diagonal correlations; i.e.,

no correlations were equal to or greater than the squared root of AVE (leading diagonal). This suggests that our measures are distinct and unidimensional. In sum, the convergent and discriminant validity in this study are psychometrically sound.

Table 4: Correlations of Latent Constructs (The elements in the leading diagonal are the square roots of AVE)

	AVE	TechX	UserX	PUS	PEOU	USG	CONX
TechX	0.648	0.805					
UserX	0.629	0.721	0.793				
PUS	0.815	0.673	0.717	0.903			
PEOU	0.732	0.485	0.460	0.650	0.856		
USG	0.914	0.428	0.474	0.503	0.714	0.956	
CONX	0.908	0.536	0.559	0.562	0.545	0.737	0.953

3.2.2 Assessing the Structural Model

The evaluation of the structural model is concerned with the explanatory power of variables or constructs in the study. As was mentioned, it is estimated by the paths coefficients and the size of the R^2 values. The values in Figure 2 are generated by PLS Graph 3.0. The test of significance of all the paths was done using the bootstrap resampling procedure with 200 resamples. As shown in Figure 2, technology characteristics and user characteristics have positive effects on perceived usefulness as hypothesized. The path coefficients are 0.217, 0.382, respectively. Perceived ease of use has a strong effect on perceived usefulness with a path coefficient of 0.375. Together these three constructs account for 66% in the variation of perceived usefulness. Also, technology characteristics and user characteristics have positive effects on perceived ease of use, as hypothesized. The path coefficients are 0.323, 0.249, respectively. Together, these two constructs account for only 26% in the variation of perceived ease of use.

Further, perceived ease of use has a significant effect on usage of WebCT (path coefficient = 0.676). Inconsistent with our hypothesis (H2d), perceived usefulness does not have a significant effect on WebCT usage with a path coefficient of 0.072. Perceived ease of use and perceived usefulness explained 51% of the variance in the usage construct. The two constructs of perceived usefulness and usage have positive effects on continuance intention as hypothesized. The path coefficients are 0.312, and 0.672, respectively. The perceived ease of use of WebCT among our research subjects seem to indicate that our hypothesis (H3b), which suggests a positive effect on continuance intention, is not valid. The path coefficient between the two constructs is -0.127. Lastly, taken together, all the constructs in our research model explained 60% of the variation in the model. In addition, many of the structural paths in the model are meaningful. Chin (1998) suggests path coefficients of between 0.20 and 0.30 and measures that have accounted for 50% or more of the variance in the latent variable or model. In our case, the weakest variance explained is seen for the influence of technology and user characteristics on perceived ease of use; i.e. 26%. This perhaps can be explained by the fact that other factors such as peer pressure, facilitating conditions and so on that have been found to influence the use of IS (Igarria et al., 1997; Dishaw and Strong, 1999; Gefen and Straub, 2000; Venkatesh et al., 2003) are not included in this exploratory study. Nonetheless, the generated results lend themselves to meaningful interpretations.

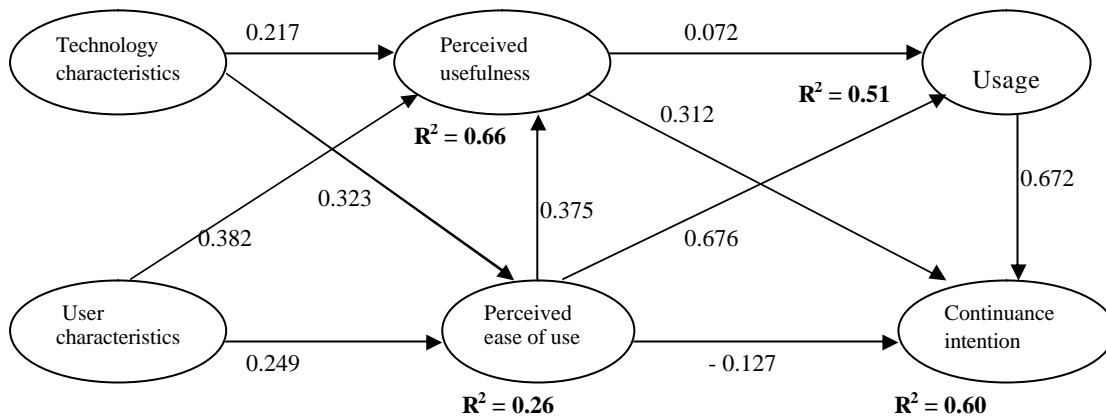


Figure 2: The Results of PLS Graph 3.0 Analysis

4. DISCUSSION AND CONCLUSION

This study examines the acceptance and continuance intention of Web-based learning tools in the context of a country in EE that is making progress with the spread and promotion of e-learning environments amongst its students and citizens. The study focussed on a WLT, i.e. WebCT, which is widely used for supporting Web-based learning environments. Overall, our study is motivated by the need to present a (student) perspective and country study (Estonia) that has not prominently featured in the literature. As such, we suggested that few studies have discussed students' perspectives regarding the adoption of WLT, and we also noted the limits of studies involving the TAM – they often don't go beyond the initial usage phase. In this study, first, we thus focussed on two external factors; namely, technological and user/individual characteristics that could affect the acceptance of WebCT. Second, we developed a theoretical model that builds on the TAM, and PAM. In the case of the PAM, we used only one variable, i.e. continuance intention, which we used to extend the original TAM. By doing that, our research model, to the best of our knowledge, is among the very few to investigate post-adoption in the TAM.

The majority of the hypotheses pertaining to the relationships between items or variables in the external factors and WebCT acceptance were supported by the data. Our data indicates that ease of finding and ease of understanding both have significant positive relationships with perceived ease of use and perceived usefulness. This finding supports other work where the influence of these two variables on constructs of the TAM have been investigated. For example, Lederer et al. (2000) and Brown (2002) found these two variables to influence perceived ease of use significantly. Additionally, the strength of the significance (Pearson's correlations) in the two studies mentioned indicates that ease of understanding has a greater influence on perceived use of ease than ease of finding. Our test results support such patterns. Similarly, we found that self-efficacy has positive relationships with the two TAM constructs in support of our hypotheses (H1c - H1g). We also noticed there are no significant relationships between computer anxiety and the two TAM constructs. However, the directions of the relationships seem to be consistent with our predictions. As can be seen from results generated in Table 2 for our student groups, computer anxiety seems not be a problem with all our subjects, perhaps because of the adequate exposure to computers and ICT-related facilities by the various schemes and projects in the country. In brief, this information may be useful for policy making in the country.

Next, in our analysis with PLS Graph 3.0 where we used the endogenous constructs of technology and user characteristics comprising variables like ease of finding, ease of

understanding, computer anxiety and self-efficacy, we found evidence in support of strong effects of these two constructs and perceived usefulness and perceived ease of use. Further, in examining the effects between acceptance constructs and the dependent variable – continuance intention – we found that usage and perceived ease of use have significant effects on continuance intention, whilst perceived usefulness did not indicate any meaningful relationship. Sørrebø's (2004) study found no support for perceived usefulness as being a determinant for continuance intention, whilst Limayem et al.'s (2003) study found that the usage of such technologies has a positive effect on continuance intention. In some respects, our data corroborates the findings made by Morss and Fleming (1998) that "84% of the students surveyed recommend continued use of WebCT" (p. 1). The relevance of the information relating to the strengths of the relationships between usage and perceived usefulness and continuance intention in the context of WLT for policymakers working in the e-learning and Web-based learning initiatives in Estonia cannot be over-emphasized. This will be discussed in the next section.

4.1 Limitations of the Study

Before highlighting the implications of this study for practice and research, we would like to discuss the limitations of the study. As was noted above, the study is exploratory; as such, a convenient sample size of 72 used may be limiting. Our selection and composition of subjects may not be representative of all University students in the country. Also, the measurement of WebCT usage was self-reported. Some studies have suggested that self-reported usage may not be accurate in assessing IS usage (please, see Szajna, 1996; Legris et al., 2003). Furthermore, variables such as gender, peer-pressure, social status and, of course, the technical and educational backgrounds of respondents could be influential factors affecting the IS acceptance and use (Venkatesh et al., 2003), which incidentally this study did not incorporate. Another limitation to this study relates to the timeframe of data collection. This study is a cross-sectional study. A longitudinal study may offer better insights regarding the initial acceptance and the post acceptance phases. The TAM is useful for the former whereas the PAM for the latter. In this study, the participating students offered their views at one single point in time. Certain biases may stem from this shortcoming. Relatedly, Limayem et al. (2003) and Bhattacharjee (2001) suggest that the antecedents of the TAM and PAM may be different. Apart from perceived usefulness, which is common to both, we did not investigate other variables in the PAM. Therefore, the generalisability of our findings to other IS acceptance contexts may have to take into account the limitations of this study. Notwithstanding, there are implications of the study despite its limitations, which we will discuss below.

4.2 Implications for Research and Practice

To the best of our knowledge, this study is among the few to study the TAM in Eastern Europe (EE). In using the TAM in a Web-based learning context, we extended that theory and investigated the effects of external characteristics on continuance intention through the three TAM constructs. This study provides support for relationships between usage and continuance intention in support of Limayem et al.'s (2003) findings. Thus, our study adds to the emerging body of knowledge regarding the incorporation of post-adoption measures to the initial usage phase. Additionally, the findings of the study may suggest that studies involving the TAM need not stop at the initial usage stage. We found that usage could be an important predictor for the continuing use of WebCT. The same may be true for other IS. Thus, our study may entice other researchers to investigate the TAM model beyond the initial usage stage.

The results from IS studies examining the relationships in the TAM have been mixed (Gefen and Straub, 2000). Some IS researchers have confirmed the original model of the TAM where perceived usefulness and perceived ease of use are observed to be the predictors of usage (e.g. Adams et al. 1992, Igbaria et al., 1997; Straub et al. 1995). On the other hand, others have expressed doubts as to the veracity of the model, at least in the higher educational settings where WLT are being adopted (Pan et al., 2003). Essentially, Gefen and Straub (2000) suggested that some specific aspects of the TAM may be more important for IS acceptance in the developed West. Notably, Gefen and Straub (2000) listed 42 studies involving constructs in the TAM, 25 of those studies did not find perceived ease of use to be a significant predictor, whilst 9 studies did. On the other hand, studies in developing countries using the TAM produce contrary views. Anandarajan et al. (2002) and Brown (2002) – in the context of WebCT use among students – showed that perceived usefulness is not a significant predictor of use, unlike the majority of studies in developed countries. The results in this present study in an emerging economy of CEE seem to support the findings in the developing countries. With this contribution, the body of knowledge in the IS field is enriched, which could also stimulate further inquiry.

There are also implications for administrators, instructors and other entities involved with e-learning projects development in Estonia and in similar countries. In the context of Web-based learning technology, in Estonia, this study suggests that the characteristics of the technology may affect how users perceive the usefulness and ease of use of such technologies. Based on this fact, entities involved in e-learning projects in the country should focus on procuring tools that are not perceived to be complex in order to ensure success for courses offered through such technologies. For the same reason, success of a WLT can be enhanced when individual or user characteristics are taken into account as such tools are introduced. It may be necessary to provide extra training and tutorials for students that are not technically inclined before WLT are introduced. Further, the knowledge that all the students in this study seem not to indicate any computer anxiety could be useful for future planning of IT-related projects in pedagogy in the country.

In order to maximise the return on investment in Web-based learning environments in the country, administrators must ensure that such systems are widely used. The relative ease of use of such technologies may affect its usage. On the other hand, perceived usefulness of WebCT, was not found to be significant in encouraging usage; therefore, instructors and other policy makers in the country could devise useful incentives that could result in more usage of the adopted WLT. For example, extra credits or points could be offered to students who participate in a Web-based course in lieu of the traditional method. Our findings suggest that WebCT usage will lead to increased continuance intention; as such, measures and schemes that could encourage regular use could be explored. Incentives that could enhance the development of positive habits regarding WLT use among students could be helpful. Limayem et al. (2003) has suggested that developing the right sorts of habits may be critical in WebCT continuance intention.

4.3 Future Study

In order to improve upon the generalisability of this study's finding, future studies could increase the sample size as well as take into account the composition of the research subjects. Other significant variables such as age, peer-pressure and facilitating conditions could be incorporated into the research model. A longitudinal study that uses the TAM (with the additional variables) could be used at the initial adoption stage, whilst the PAM with all its antecedents variables may be used at the post-adoption stage; i.e. some months after the initial adoption stage. This approach may yield better insights for entities interested in

obtaining a full picture of acceptance and continuance intention of Web-based learning tools among University students. Finally, this research could be replicated in other settings especially in comparable nations in the EE region in order to further validate the findings discussed here.

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APPENDIX: The Research Questionnaire (in English)

Perceived ease of use (PEOU)	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
1. WebCT is easy to use 2. WebCT is easy to learn 3. WebCT is user friendly 4. WebCT is easy to master							
Perceived usefulness (PUS)	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
1. WebCT is useful for my studies 2. WebCT usages improves my academic performance 3. WebCT makes my studying easier.							
Ease of understanding (EOU)	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
1. WebCT uses consistent terms 2. WebCT uses understandable terms. 3. WebCT display pages provide links to more detailed information. 4. WebCT displays a visually pleasing design 5. WebCT displays pages that are easy to read.							
Ease of finding (EAF)	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
1. WebCT allows easy return to previous display pages. 2. I can determine my position within the WebCT program. 3. WebCT is easy to navigate.							
Self-efficacy (SEF)	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
1. I would feel comfortable using WebCT on my own. 2. If I wanted I could easily use any of the functions in WebCT. 3. I would be able to use WebCT even if there is no one around to show me how to use it.							
Computer Anxiety (CAX)	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
1. Working with a computer makes me nervous. 2. Computers make me feel uncomfortable. 3. Computers make me feel uneasy. 4. Computers scare me.							

Internet Usage

Please answer the following with regard to your internet usage.

1. For how many years have you been using the internet?	Less than 1 year	1 year	1-2 y	2-3 y	3-4 y	4-5 y	> 5 years
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Please answer the following with regard to your WebCT experience.

WebCT Usage (USG1)	1 almost never	2 < ½hr	3 ½ - 1 hr	4 1-2 hrs	5 2-3 hrs	6 > 3 hrs
On an average working day that you use WebCT, how much time do you spend on the system?						
On average (for the period that you were using WebCT), how frequently do you use it? (USG2)	1 once a month	2 a few times a month	3 a few times a week	4 about once a day	5 several times a day	

Please indicate the extent to which you use the Web for the following:

Diversity of Web usage	Never 1	2	3	moderate use 4	5	6	A great deal 7
1. Web browsing to view information 2. Downloading information and/or free resources 3. Email 4. Chat rooms 5. Discussion lists							
Continuance (CONX)	Strongly Disagree 1	Disagree 2	Somewhat disagree 3	Neutral 4	Somewhat Agree 5	Agree 6	Strongly Agree 7
I intend to continue to using WebCT rather than discontinue its use							
My intentions are to continue my use of WebCT rather than use alternative means							

Demographic information

Faculty/ Department of study: _____

Occupation: _____

Year of study: _____

Please tick your appropriate *age* group box:

= 25 years 26 – 39 years 40 - 55 years 56 – 67 years

What is your gender?: male female

Choose your study programme : Bachelor' s Master' s Others: vocational etc.