

# **An empirical investigation of students' acceptance of Web-based technology**

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## **Abstract**

The purpose of this study is to investigate the acceptance of Web-based technology as learning and teaching tool in higher education institutions as perceived by university students and to specify the critical factors contributing to the usage. The results of this research indicate that active participation in the discussion board of Blackboard leads to more satisfaction of Blackboard by Dutch students in higher education. Furthermore, the experimental results show that students (N=84) to a greater extent accept the Weblog as a study learning and teaching tool than is the case with students (N=113) accept Blackboard as a learning and teaching tool. The results of this study clearly point out the important role of enjoyment and usefulness in positively influencing the decision to use new technology and its subsequent actual use.

**Keywords:** enjoyment, feedback, learning, reflection, Blackboard, Weblog

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## 1. Introduction

The past decade has seen unprecedented investment in the use of new technology. Still a number of studies have pointed to the disappointing returns and uncertain benefits of the massive investments in ICT (Haydn, 2006). Although there are researchers who are studying how to deliver courses in a Virtual Learning Environment (VLE) like Blackboard, there is still much to learn about how to effectively implement these courses and what practices are best. It is not clear yet what specific design features (chat-features, discussion boards) in the course development system appear to be most effective for students (Mills, 2006). But institutions do not invest enough time in it and discussions at many institutions are about abandoning Blackboard because of a lack of flexibility (Rubens, 2007). We should think of e-learning and learning technology as enablers, not as a strategy. It is not the technology which makes learning challenging, but the way it is used and implemented. It's the highway, not the destination; the means rather than the end (Rosenberg, 2006).

With the increasing rapidity of the introduction of new technology, user acceptance continues to be an important issue. Understanding the factors that promote effective utilization of new technology is a vital issue for researchers and practitioners of the Net Generation. The purpose of this study is to investigate the acceptance of Blackboard and the acceptance of the Weblog as learning and teaching tool in higher education institutions as perceived by university students.

This research uses the Technology Acceptance Model (TAM) constructs of usefulness and ease of use to assess students' acceptance of Blackboard as an effective learning and teaching tool, with a construct of enjoyment as external factor, because prior research shows that enjoyment is a stronger predictor of usefulness than ease of use is (Yi et al., 2003).

## 1.2. Blackboard

Many institutions collectively introduced a Virtual Learning Environment (VLE) in the past ten years as learning and teaching tool over the Internet. Examples of a VLE are Blackboard, WebCT, N@tschool, Fronter, and Moodle. The VLE is the binding agent in competence based learning and using digital didactics (Awouters et al., 2005). It can more or less be regarded as a learning environment managed by teachers. Although a by a VLE supported lesson will enhance the quality of education, teachers do not tend to see the benefits of a VLE supported lesson (Vrieling, 2006a). There is substantial evidence to suggest that the computer offers the advantage of making work more stimulating, thereby motivating the individual. The search for information is made considerably easier, thus making one's workload less tedious, and perhaps more interesting (Hargis, 2000). This electronic form of communication combined with a proper use (good assignments and tasks) makes it possible to engage oneself in intensive exchange, more time-on-task, and effective discussions than is the case with many face-to-face groups in education (Deinum, 2003). DeWert (DeWert et al., 2003) have reported that discussion boards can provide an interactive venue where students can reflect, evaluate, solve problems and exchange ideas. Mills (2006) implemented the discussion board in courses in order to increase overall interaction as well as to better assess student learning. The preliminary results of this (*her*) study indicate that students who were more actively involved with course materials, discussions, and others in the class demonstrated an improvement in overall course satisfaction and academic performance. Requirement of participation appeared to influence attitudes as well as academic performance. Other researchers shows also that participation in the discussion board increased students'

reproductive knowledge effectively (Chao-hua Lou et al., 2006) and students enjoyed working in online groups and found the discussion board useful (Finegold et al., 2006).

Critics like Kirschner (2004) state that a teacher-controlled closed tool like Blackboard is a very restricted manifestation of an VLE with a very limited shelf life - well in fact it is already well past its shelf life.

### *1.2. Reflection*

As part of the assessment for the competence 'self development', students have to write a reflection report. Learning to reflect is a competence of growing importance in higher education (Andernach, 2006). López (2006) let students work with virtual diaries and let students hand in homework or projects via Moodle, this virtual diary has proved to be an important tool. To do action research is to plan, act and observe and reflect more carefully, more systematically and more rigorously than one usually chooses in everyday life. The importance of systematically writing down the things you do as a help by reflection is also stated by Sankaran (1997). Therefore students' were stimulated to write week journals.

Writing week journals gives input to the students' reflection report. A great power of writing week journals is the process of continuous reflection which gives time and space to create new ideas (Hartnell-Young, 2003). Students can put their week journals in their own thread in the discussion board of Blackboard or in their own Weblog. Furthermore, the Weblog or the week journals are handy as argumentation during the assessment of other competencies.

Asynchronous discussion allows time for reflection, clarification, or help. Following the threads of such discussions and seminars often shows how the conceptual interactions between participants shape their ideas (Lander, 1999). The advantage of this use of the

discussion board is the clear organization when the week journals are in students' own thread in the discussion board. A drawback of the use of the discussion board is that students' has to ask the teacher to arrange the discussion fora.

### *1.3. Weblog*

Weblogs, often simply called blogs, are online diaries where people can post their thoughts, information, links, or interests. It consists of several posts or distinct chunks of information per page, which are usually arranged in reverse chronological order; from the most recent post at the top to the oldest post at the bottom (Blood, 2002; Poortman et al., 2005). Postings to blogs are frequent, they are usually produced by one author or by a small group of authors and are open to the public for reading. For instance, researchers today often post their thoughts and test new ideas on a Weblog (Mortensen et al., 2002).

Reflection is among the main reasons why people blog and is described by numerous authors (Bartlett-Bragg, 2003; Downes, 2004; Thomas, 2005). Reflection has traditionally been undertaken in isolation, in private spaces such as journals. This no longer needs to be the case. Blogging affords us the opportunity to share our reflections with others globally. The ensuing conversations can lead to deeper learning and are found to be more interactive than other forms of online discussion. The learner's reflective thinking therefore becomes more constructive and meaningful. With the proper supervision of Weblogs, the ability for students to receive feedback and critiques to guide and monitor their academic achievement can surely be an effective assessment tool (Lee et al., 2006).

Weblogs do have some drawbacks (Poortman et al., 2005). Firstly, communication is asynchronous, which implies that reactions on messages are not direct, but appear later. This

could severely slow down interaction. Secondly, communication is text-based. This implies that non-verbal aspects of communication are not included. This also implies that information is less rich and thus, it could be harder to transfer ideas or thoughts. Thirdly, discussion on a Weblog can become messy, because reactions and reactions on reactions can get disharmonious. Despite these drawbacks, Weblogs do offer some important advantages (Linde van der, 2004; Poortman et al., 2005). Weblogs are relatively easy to maintain and they are freeware. They are very suitable for student centred learning, because it is the student who is responsible for it. When people react on a Weblog, they are more careful in their wording and reflect more on what they are writing. Therefore, posts and reactions often have the form of a short argument. Another advantage is that blogging creates a readable and searchable report of a discussion. A discussion can be recalled whenever is needed. Thus, it can function as a shared repository, which is available to anyone at any time.

With the growing importance of the Internet in our society and thus in education, social software shall play an important role. Experimenting with Weblogs is a way to get insight into that role (Poortman et al., 2005). Kloos (2006) studied the effects of Weblogs, wikis, and social bookmarking on communities of practice. He argues that social software can offer facilities that support communities of practice and that it can support communities better than 'traditional' software. There is a need to investigate how social software can be integrated and utilized in order to improve and enhance the learning process. An important part of this investigation addresses students' perspectives on the use of Weblogs in higher education and university environments.

## **2. Research model and hypothesis**

### *2.1. Research model*

This paragraph deals with the Technology Acceptance Model (TAM), which Davis (1993) introduced and which was modified by Yi (Yi et al., 2003). TAM has established a powerful model for explaining and predicting usage intentions and acceptance behaviour. TAM theorizes that an individual's actual system usage is determined by behavioural intention, which is in turn jointly determined by perceived usefulness and perceived ease of use. Legrisa (Legrisa et al., 2003) concluded, after a literature study, that TAM can be regarded a useful model, but it 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. TAM does not explicitly include any social variables. TAM provides a quick and inexpensive way to gather general information about individuals' perceptions of a system. TAM provides an information representation of mechanisms by which design choices influence user acceptance, and should therefore be helpful in applied contexts for forecasting and evaluating user acceptance of information technology (Davis, 1993). TAM introduced two new constructs: perceived usefulness (the belief that using an application will increase one's performance) and perceived ease of use (the belief that one's use of an application will be free of effort). Since the introduction by Davis, the Technology Acceptance Model (TAM) has been widely used for predicting the acceptance, adoption, and use of Information Systems (IS). TAM theorizes that an individual's actual system usage is determined by behavioural intention, which is determined by perceived usefulness and perceived ease of use.

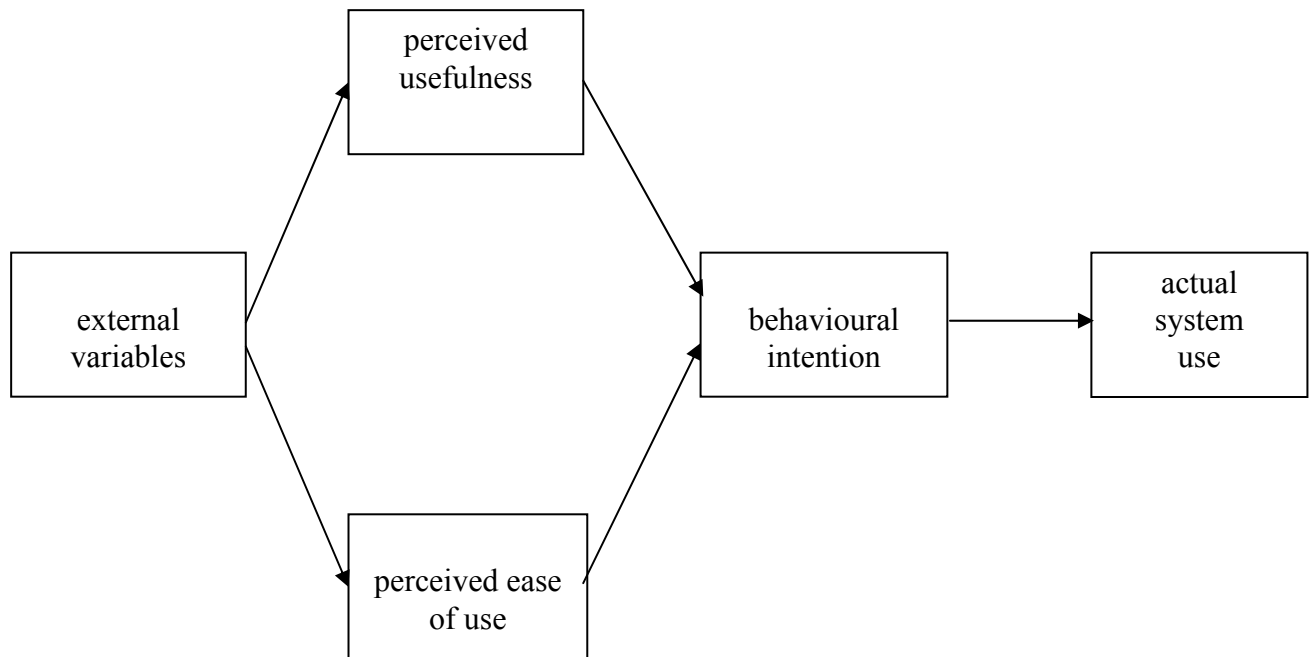


Figure 1. Davis' Technology Acceptance Model (TAM).

Recent findings on intrinsic motivation in social psychology indicate that enjoyment, play an important role in determining a person's behaviour. Yi (Yi et. al., 2003) investigated this feature (enjoyment) as external variables and his research shows that the motivational variable enjoyment plays an important role in influencing the individual's decision whether or not to use a Web based technology.

**Perceived usefulness** is the extent to which a person believes that using the technology will enhance his or her job performance. (Davis, 1989). According to Venkantesh (Venkantesh et al., 2000) social influence, e.g. through subjective norm, defined as "person's perception that most people who are important to him think he should or should not perform the behaviour in question", significantly influences perceived usefulness.

**Perceived ease of use** is the extent to which a person believes that using the technology will be free of effort (Davis, 1989). TAM posits that behavioural intention is a

determinant of actual system use, and that behavioural intention is determined by two salient beliefs, perceived usefulness and perceived ease of use. Further, perceived ease of use is a determinant of perceived usefulness because, assuming other things be equal, user consider a system more useful when it is more effort-free (Yi et. al., 2003)

**Enjoyment** refers to the extent to which the activity of using a computer system is perceived to be personally enjoyable in its own right, aside from the instrumental value of the technology (Davis et al., 1992). According to Yi (Yi et al., 2003) the ease of use perceptions are influenced by the degree to which people perceive using the system to be personally enjoyable. Agarwal (Agarwal et al., 2000) propose that the individual traits of playfulness and personal innovativeness are important determinants of cognitive absorption. Performance is reached when it joins up with enjoyment and learning in the same triangle. When there is enjoyment, this will positively influence learning, which in its turn will lead to performance and so on. See figure 2, the working triangle.

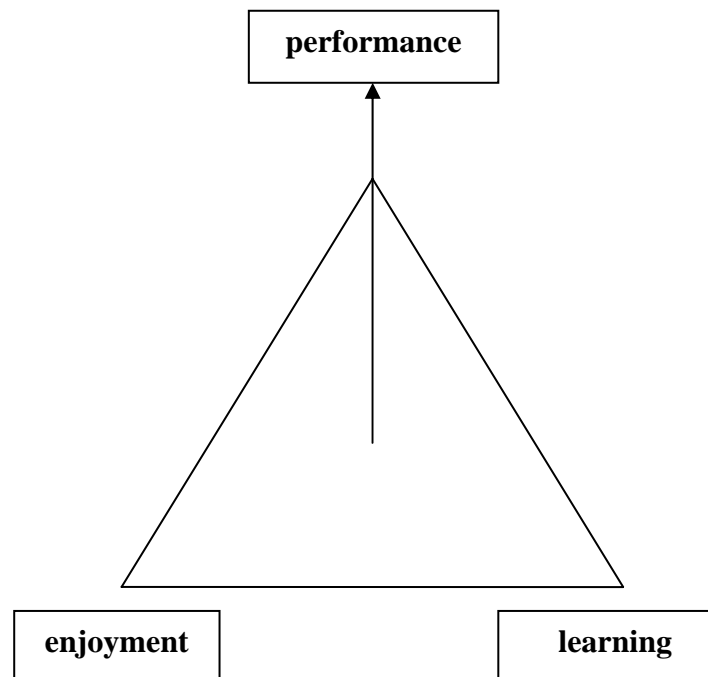


Figure 2 shows that the three sides are part of an interdependent system.

If the enjoyment or learning side is ignored, the performance will finally be damaged (Galley, 1999). Learning and enjoyment always remain inseparable dimensions of working. Either you increase and develop your skills or you come to a standstill. The learning component forms part of working. The same applies to enjoyment. While you are working, there is a sensation somewhere between pain and ecstasy. Most of us know by experience that performance enhances when you are enjoying yourself. In this manner, you are able to develop competencies.

## *2.2. Hypotheses*

### *2.2.1. Active participation in the discussion board of Blackboard*

Recent study shows that Dutch pupils did not like to work with Blackboard (Vrieling, 2006b). They scored significant lower on the items ease of use, usefulness and behavioural intention than the American students in Yi's research (Yi et al., 2003). Deinum (2003) investigated the implementation of Blackboard at 33 secondary schools in the north of the Netherlands. His research among Dutch pupils also shows that they did not respond well to Blackboard. Is it because teachers did not use it properly? The discussion board function was hardly used and this particular use might well be a success factor in digital didactics. He recommended the use of the discussion board for pupils to hand in their products.

To investigate the role of active participation in the discussion board, at the beginning of the second period, teachers stimulate students to hand in their agendas, minutes, mood boards, week journals etc. in the discussion board. By doing so the number of hits in 'groups

area' (discussion board and file exchange) of the course of the second project erases up to 75%, absolute 30.000 hits more than in the course of the first project.

Assuming that the use of computers in the USA and in the Netherlands do not differ very much, the expectation can be held that the same results will be generated as from Yi's research (Yi, et. al., 2003) among American students aged 18-20 and Dutch students aged 17-29 who active participate in the discussion board. Therefore the following hypotheses are tested.

**H1:** Active participation in the discussion board leads to more satisfaction of Blackboard among Dutch students age 17 – 29 in higher education.

### 2.2.2. *Blackboard (traditional software) versus Weblog (social software)*

Students grow up differently with ICT than previous generations. They are called the Net Generation because they grew up online (Oblinger et al., 2005). Young people teach themselves and with the devices they use, they actively maintain control of their chosen information streams. They are becoming informed at an ever earlier age and developing opinions based on interaction (Veen et al., 2005). According to Veen (Veen et al., 2005), a pupil's use of digital tools drops dramatically during school hours. Do institutes take into account the Net Generation traits when they implement new technology in their study concept? According to Veen (Veen et al., 2004) the Net Generation characteristics are: Group activity; Goal and achievement orientation; Multitasking; Experimental; trial and error; Heavy reliance on network access; Pragmatic and interactive; Ethnically diverse; Visual; Interactive.

Blogging might come closer to the Net Generation traits because its interactivity is high, it supports group activity and because students themselves are in control of their learning process. Consequently, the hypothesis is:

**H2:** The use of a Weblog is more attractive for students in higher education than the use of Blackboard.

### *2.2.3. Enjoyment*

Prior research proposed enjoyment as a determinant of ease of use (Venkatesh, 2000). The results of Yi's research (Yi et al., 2003) also clearly indicate the important role of enjoyment, as being a positive influence on the decision of students to use Blackboard and the subsequent actual use. Enjoyment is a significant determinant of usefulness while ease of use is a non-specific determinant. Enjoyment is a stronger predictor of usefulness than ease of use is. These findings suggest that practitioners should provide a working and learning environment where personal enjoyment supports and fosters the facilitation of a successful acceptance of new technology. The results of Yi's research (Yi et al., 2003) suggest that enjoyment might play a more influential role than ease of use in determining the usefulness perception within the Web-base IS context. The sense of enjoyment in using a given system should reduce anxiety and help people feel confident about their ability to successfully execute the requisite actions. Assuming other things being equal, the system should be perceived to be more useful as the system is considered to be more enjoyable. Thus, the hypotheses are:

**H3a:** Enjoyment will have a positive effect on ease of use in the Blackboard sample

**H3b:** Enjoyment will have a positive effect on ease of use in the Weblog sample

**H4a:** Enjoyment will have a positive effect on usefulness in the Blackboard sample

**H4b:** Enjoyment will have a positive effect on usefulness in the Weblog sample

#### *2.2.4. Ease of use, usefulness, and behavioural intention*

TAM posits that behavioural intention is a determinant of actual system use, and that behavioural intention is determined by perceived usefulness and perceived ease of use.

Further, perceived ease of use is a determinant of perceived usefulness because, assuming other things being equal, users consider a system more useful when it is more effort-free.

These relationships have been examined and supported by many prior studies (Davis, 1989; Yi et al., 2003; Selim, 2003). Yi's (Yi et al., 2003) research shows that in the presence of enjoyment, ease of use had no longer a significant effect on usefulness indicating that enjoyment is a stronger predictor of usefulness than ease of use is. Selim (2003) however shows that ease of use had a direct effect on usefulness. The present study revalidates those relationships in a Web-based context with the following hypotheses:

**H5a:** Ease of use will have a positive effect on usefulness in the Blackboard sample

**H5b:** Ease of use will have a positive effect on usefulness in the Weblog sample

**H6a:** Ease of use will have a positive effect on behavioural intention in the Blackboard sample

**H6b:** Ease of use will have a positive effect on behavioural intention in the Weblog sample

**H7a:** Usefulness will have a positive effect on behavioural intention in the Blackboard sample

**H7b:** Usefulness will have a positive effect on behavioural intention in the Weblog sample

**H8a:** Behavioural intention will have a positive effect on actual use in the Blackboard sample

**H8b:** Behavioural intention will have a positive effect on actual use in the Weblog sample

### **3. Research Methodology**

#### *3.1. Sample*

The subjects participated in this study included a total of 113 undergraduate students in higher education. All participants volunteered to participate in the study and the sample was random in time. 113 questionnaires were handed out at the start meeting of period 3 (5 February 2007). Most of the students are 19 years old (24%). Mean age = 20.5 (s.d. = 2.5), 13% of the respondents are female. For the Weblog sample 84 students enrolled in the second, the third or the fourth study year of 6 minors filled in a questionnaire during a community meeting in the period January 2007 till May 2007. The respondents' age range is from 18 to 30. Most of the students are 22 years old (24%). Mean age = 22.4 (s.d. = 2.2), 10% is female. These questionnaires, after analysis, provided answers to the research questions.

### *3.2. Measures*

Most of the constructs in the research model were measured with the items from prior research. At the top of the questionnaire, the student could fill in his/her name, age, and gender. At the end of the questionnaire the students were invited to give comment. All the questionnaire items used an 11-point Likert-type scale where 0=completely disagree, 5=neither agree nor disagree, and 10=completely agree.

The enjoyment items were 'I have fun using the Blackboard system/Weblog'; 'Using the Blackboard system/Weblog is pleasant', and 'I find using Blackboard system/Weblog to be enjoyable'.

The usefulness items in the Blackboard sample were 'Using the Blackboard system would improve my performance in this course'. 'Using the Blackboard system would increase my productivity in this course', 'Using the Blackboard system would enhance my effectiveness in this course', and 'I think the Blackboard system would be useful in this course'. The usefulness items in the Weblog sample were 'Using my Weblog would improve my performance in this course'. 'Using my Weblog would increase my productivity in this course', 'Using my Weblog would enhance my effectiveness in this course', and 'I think the Weblog would be useful in this course'.

The ease of use items in the Blackboard sample were 'Learning to use the Blackboard system is easy for me', 'I find it easy to get the Blackboard system to do what I want it to do', 'My interaction with the Blackboard system is clear and understandable', and 'I find the Blackboard system easy to use'. The ease of use items in the Weblog sample were 'Learning to use the Weblog is easy for me', 'I find it easy to get the Weblog to do what I want it to do',

'My interaction with the Weblog is clear and understandable', and 'I find the Weblog easy to use'.

Measurement of behavioural intention took place with the following statements in the Blackboard questionnaire: 'I intend to check announcements in the Blackboard system frequently', 'I intend to download files from the Blackboard system frequently', and 'I intend to visit other websites using the Blackboard system frequently'. Measurement of behavioural intention with the following statements in the Weblog questionnaire: 'I intend to read the Weblog frequently', 'I intend to give comments on the Weblog frequently', and 'I intend to visit other Weblogs frequently'.

The actual use in the Blackboard sample was measured through the course statistics of the control panel by counting the number of times (frequency) a student logged into Blackboard courses in the period of September 4<sup>th</sup> 2006 until February 3<sup>rd</sup> 2007. The courses concerned, General info CMD, Leeuwarder bioscopen (project one) and Dierenpark Emmen (project two). The mean visits per student is 483 times (s.d. 375) in the three involved courses. Further investigation on the group's area in the second course 'Dierenpark Emmen' shows that students actively participated in the group's area discussion board, with an average contribution of 50 and a maximum of 225. The average hits (visits) in the groups area is 136, with a maximum of 811 times, this indicates that students also look at each others contribution because the number of hits in the groups area is about 2.7 times higher than the average number of contributions.

The actual use in the Weblog sample was measured by asking the student how often he/she visits (uses) the Weblog. 1 = once a day; 2 = once a week; 3 = once a month; 4 = once a trimester; 5 = rarely. The measurement was taken in the period January 2007 till June 2007.

31% of the students visit the Weblog daily and 48% of the students visit the Weblog once a week.

### *3.3. Data analysis*

The reliability of the questionnaire is measured by examining the internal consistency. ICR = Internal consistency reliability (similar to Cronbach's alpha). ICR of 0.7 or higher are considered adequate (Barclay et. al., 1995). The correlation coefficient (Pearson's product-moment correlation coefficient) is measured to show the connection between the questions.

A comparison of the mean of the constructs was made based on the results of the students with a contribution in the discussion board less or greater than the average of 50. Therefore, a T-test was carried out to find if there was a significant difference. The T-test is based on an a-select random sample survey and on the assumption that the random sample survey distribution is normal divided.

The structural model and hypotheses are assessed by examining the significance of the  $\beta$ -coefficients and the variance accounted for by the antecedent constructs. The standardized  $\beta$  coefficients (the coefficient of the independent variables when all variables are expressed in standardized form) are presented. Multiple regression analyses were employed to adjust for the influence of behavioural intention on use the  $\beta$ -coefficient is measured with use as dependent variable. To determine the influence of ease of use and usefulness on behavioural intention the  $\beta$ -coefficient is measured with behavioural intention as dependent variable. To determine the influence of enjoyment and ease of use on usefulness, the  $\beta$ -coefficient is measured with usefulness as dependent variable. To determine the influence of enjoyment and

ease of use, the  $\beta$ -coefficient is measured with ease of use as dependent variable (Vocht, 2004).

All statistical analyses were performed with the SPSS version 12.0.1. (SPSS Inc).

## 4. Results

### 4.1. Reliability of the questionnaire

Construct	Blackboard	Weblog
1. Enjoyment	0.9	0.9
2. Ease of use	0.8	0.8
3. Usefulness	0.9	0.9
4. Behavioural intention	0.6	0.9

Table 1 shows that, except for behavioural intention (Blackboard sample), all internal consistency reliabilities (ICR=Cronbach's alpha) are  $> 0.7$ . Internal consistencies (similar to Cronbach's alpha) of 0.7 or higher are considered adequate (Barclay et al., 1995). For research purposes, an ICR of 0.6 is acceptable. The questionnaire proves to be a reliable questionnaire.

4.2. The correlation between the questions

Table 2: Pearson's product-moment correlation coefficient

		Enjoyment	Ease	Usefulness	Behavioural
Enjoyment	Blackboard	1.00	0.73**	0.69**	0.60**
	Weblog		0.61*	0.83*	0.64*
Ease of use	Blackboard	0.73**	1.00	0.61**	0.52**
	Weblog	0.61*		0.51*	0.35*
Usefulness	Blackboard	0.69**	0.61**	1.00	0.61**
	Weblog	0.83*	0.51*		0.73*
Behavioural	Blackboard	0.60**	0.52**	0.61**	1.00
	Weblog	0.64*	0.35*	0.73*	

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows Pearson's product-moment correlation coefficients. All variables are strongly interconnected. The ICR's and the Pearson's product-moment correlation coefficient prove that the questionnaire is a good instrument for testing the hypotheses.

*4.3. Comparising of the satisfaction of Blackboard by students who have a contribution in the discussion board less or greater than the average of 50*

Table 3. Independent T test comparison of the satisfaction of Blackboard by students who have a contribution in the discussion board less or greater than the average of 50

	Contributions >50 N = 45		Contributions < 50 N = 68		T	Sig. (2-tailed)
	Mean	s.d.	Mean	s.d.		
Enjoyment	4.59	1.83	3.38	2.06	0.002	p<0.01
Ease of use	5.98	1.76	5.24	1.90	0.035	p<0.05
Usefulness	5.61	1.88	4.69	1.97	0.015	p<0.05
Behavioural intention	5.14	1.81	4.04	1.81	0.002	p<0.01

Table 3 shows that 45 students who have a contribution in the discussion board greater than the average contribution of 50 have a mean score of 4.59 for enjoyment. For enjoyment and behavioural intention there is a significant better score on the level  $p < 0.01$ , for ease of use and for usefulness there is a significant better score on the level  $p < 0.05$  by the 45 students who have a contribution in the discussion board greater than the average contribution of 50. This supports H1.

4.4. Comparison of the results from respondents Blackboard sample, with the results from respondents Weblog sample

Table 4: Independent T test comparison respondents Blackboard sample, with the results from respondents Weblog sample

	<b>Blackboard</b>		<b>Weblog</b>			
	N = 113		N = 84			
Construct	Mean	s.d.	Mean	s.d.	T	Sig. (2-tailed)
Enjoyment	3.70	2.10	6.00	2.43	7.21	p<0.001
Ease of use	5.49	1.88	7.76	1.53	9.14	p<0.001
Usefulness	4.90	2.06	5.19	2.35	0.95	0.34ns
Behavioural intention	4.37	1.90	5.21	2.44	2.76	p<0.01

ns = not significant

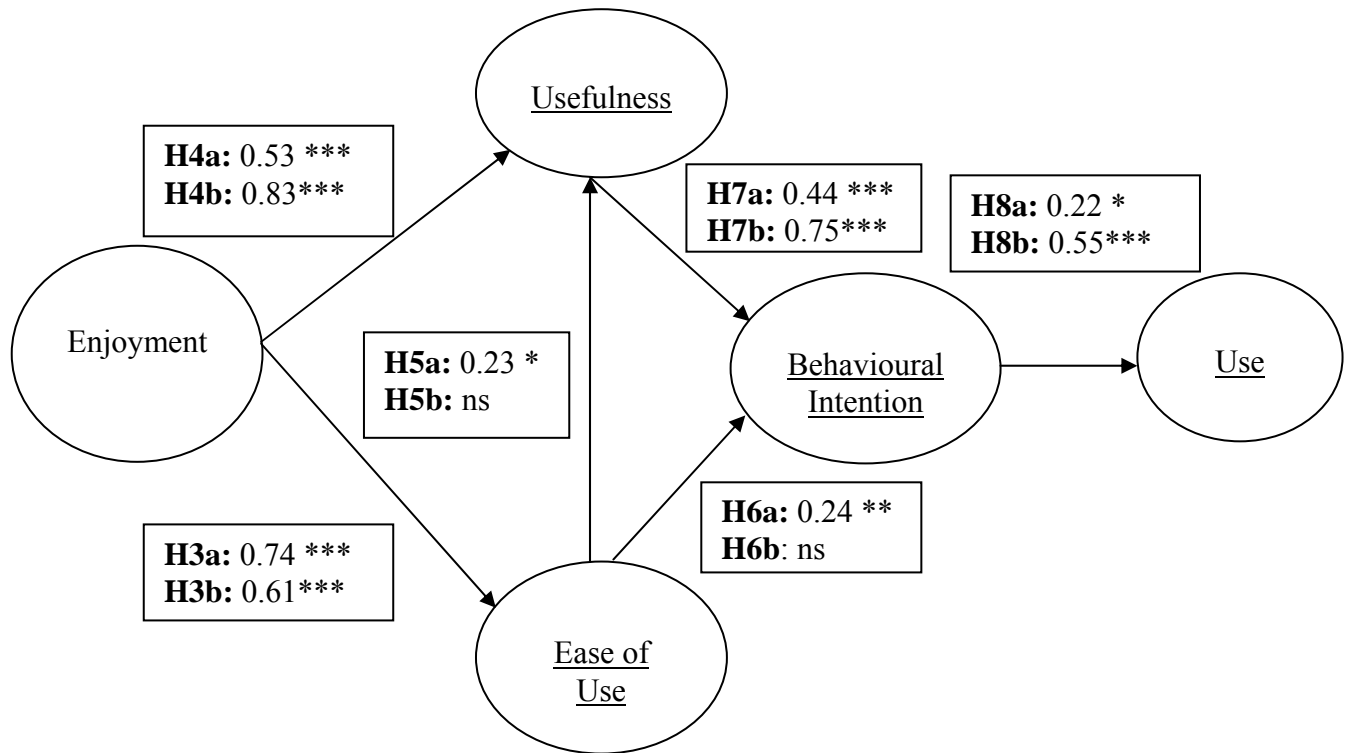
Table 4 shows that for enjoyment ( $p<0.001$ ), ease of use ( $p<0.001$ ), and behavioural intention ( $p<0.05$ ) the respondents in the Weblog sample scored significantly higher than the respondents in the Blackboard sample. This supports H2.

*Note: Because there are no data known about more or less than average use within the Weblog sample, there is only a comparison made between the average use within the Blackboard sample and the average use within the Weblog sample.*

4.5. Regression analyses. Measurement of  $\beta$ -coefficients to test the Technology Acceptance

Model (The dependent factors are underlined)

Figure 3: Regression analyses to test the proposed model:  $\beta$  coefficients



a = Blackboard sample; b = Weblog sample;

|ns = not significant| |\* p<0.05 | |\*\* p<0.01| |\*\*\* p<0.001|

Figure 3 shows the results of the measurement of the  $\beta$  coefficients. Supporting H3a, enjoyment has a significant effect on ease of use ( $\beta=0.74$ ,  $p<0.001$ ) in the Blackboard sample and supporting H3b enjoyment has a significant effect on ease of use ( $\beta=0.61$ ,  $p<0.001$ ) in the Weblog sample. Supporting H4a, enjoyment has a significant effect on usefulness ( $\beta=0.53$ ,  $p<0.001$ ) in the Blackboard sample and supporting H4b enjoyment has a significant

effect on usefulness (6:  $\beta=0.83$ ,  $p<0.001$ ) in the Weblog sample. Supporting H5a, ease of use has a significant effect on usefulness ( $\beta=0.23$ ,  $p<0.05$ ) in the Blackboard sample, but inconsistent with H5b, ease of use has a no significant effect on usefulness in the Weblog sample. Supporting H6a, ease of use has a significant effect on behavioural intention ( $\beta=0.24$ ,  $p<0.05$ ) in the Blackboard sample, but inconsistent with H6b, ease of use has no significant effect on behavioural intention in the Weblog sample. Supporting H7a, usefulness has a significant effect on behavioural intention ( $\beta=0.44$ ,  $p<0.001$ ) in the Blackboard sample and supporting H7b usefulness has a significant effect on behavioural intention ( $\beta=0.75$ ,  $p<0.001$ ) in the Weblog sample. Supporting H8a, behavioural intention has a significant effect on use ( $\beta=0.22$ ,  $p<0.05$ ) in the Blackboard sample and supporting H8b behavioural intention has a significant effect on use (1:  $\beta=0.55$ ,  $p<0.001$ ) in the Weblog sample.

#### *4.6. Summary of comments of the students*

Examples of positive comments are:

Blackboard has good potential, getting feedback for example and it is handy to exchange files.

Because of the use of the Weblog you think about the process and you get more conscious.

The Weblog is also handy to look back once a week at the process, this helps in writing the reflection report. Furthermore, the Weblog is handy as argumentation during the assessment.

Sometimes you have a look at some Weblogs of your peers.

Examples of negative comments are:

Blackboard is very user unfriendly and poorly organized. The structure is not clear, because the materials for colleges are at different places and you have to click several times to find it.

Several websites exist, like [mijnnhl.nl](http://mijnnhl.nl) (general information), [cmd.tech.nhl](http://cmd.tech.nhl) (to enrol for colleges) and [ge.nhl.nl](http://ge.nhl.nl) (for the EC registration), besides the Blackboard system. This causes a lot of a jumble of information. Beside that, teachers uses Blackboard not enough. Feedback of the teachers is missing. If participation is not required, students would stop using the weblog.

## **5. Discussion**

The purpose of this study was to investigate the acceptance of Web-based technology as learning and teaching tool in higher education institutions as perceived by university students and to specify the critical factors contributing to the usage. Twelve out of fourteen hypotheses were supported. The results of this research indicate that active participation in the discussion board of Blackboard leads to more satisfaction of Blackboard by Dutch students in higher education. Furthermore the experimental results of this study show that students to a greater extent accept the Weblog as a study learning and teaching tool than is the case with Blackboard. An explanation could be that many students have used Blackboard despite their limitations, and for many, the novelty of use has worn. Despite that, the results show that a Weblog appears to be valuable for the students. Whether Weblogs enable deep learning is also hard to say based on the empirical data from the research of Kloos (2006). The opinions of the participants differ also whether the Weblog contributed to their learning experience or not. However, according to Kloos (2006), it can be argued that the fact that Weblogs support reflective monologues and dialogues also enables a form of deep learning.

The summary of the comments of the students shows that some teachers gave no feedback on the topics in the discussion board of Blackboard or on the Weblog. Faculty should provide appropriate and immediate feedback on performance. Students need assistance in assessing their actual competence and performance, and they also need frequent opportunities to give and receive suggestions for improvement. Such feedback should be an ongoing process in collegiate settings; it is essential to the student's learning process (Chickering et al., 1986). As any instructor who has read and graded reports knows, written feedback is hard if not impossible due to limitations in time but feedback via conversation is feasible (Chen et al., 2005). Interesting at this point is the idea of *Reciprocal Interactive Effectiveness* of Willi (1999). Willi (1999) brings the human needs to shape and leave tangible signs in any environment to the foreground. The significance of these needs and even more, the need to fulfil these needs with success usually brings about a drive in humans to form intensive and effective relationships with their environment. In that way, one will also attempt to reach out for the other person, trying to get into contact with interpersonal relationship. Social Presence, Teaching Presence, and Cognitive Presence are the three essential elements of an educational experience, interacting with each other (Archer et al., 2001). Because of a lack of the teacher's presence (no feedback) a student might decide to abandon the VLE or the Weblog as learning and teaching tool.

In the study of Mills (2006) students received a grade for their contributions in the discussion board of Blackboard. This is remarkable and it also corresponds with the observation in this study that if active participation is not a necessary part of the assessment, in other words if it is voluntary, participation in the discussion board stops. Could this partly explain a lack of experience regarding usefulness and the opinion among students that if participation in the discussion board of Blackboard is not required, participation altogether

stops? Requirement of participation appeared to influence attitudes as well as academic performance. Free collaboration does not systematically produce learning. One way to enhance the effectiveness of collaborative learning is to structure interactions by engaging students in well-defined scripts (Dillenbourg et al., 1996).

How people work and function is altered when new tools are utilized. The field of education has been slow to recognize both the impact of new learning tools and the environmental changes in what it means to learn (Siemens, 2004). Further research is needed to investigate how the VLE can be integrated and utilized in order to improve and enhance the learning process for the Net Generation. Moreover, further investigation on cultural aspects as openness, willingness, values, and principles of participants is recommended.

The results of the study clearly point out the important roles of enjoyment and usefulness in positively influencing the discussion to use a Web-based technology and subsequent actual use. These findings significantly extend prior research on user acceptance of web-based technology (Yi et al., 2003; Selim, 2003) and empirically validating the relationship with enjoyment as the external variable. Enjoyment is the powerful external factor which positively effects behavioural intention through usefulness. This corresponds with the findings of Yi (Yi et al., 2003). Enjoyment might play a more influential role than ease of use in determining the usefulness perception within the Web-based IS context. Agarwal (Agarwal et al., 2000) propose that the individual traits of playfulness and personal innovativeness are important determinants of cognitive absorption.

It is remarkable that the mean score on the questions in the Blackboard sample are lower than 6.0. This indicates that Dutch students do not like to work with Blackboard. Besides the need to develop a univocal structure, having one portal would be an improvement for this faculty. Another explanation for the fact that Dutch students does not like to work

with Blackboard might be a lack of interest among teachers to use Blackboard and the importance of the teacher's own point of view and his/her experience with Blackboard (Albirini, 2005). It's important to empirically demonstrate the comparative effectiveness of a new system to potential users, such demonstrations should be done by or with the explicit endorsement of people important to the potential users (Venkantesh, 2000).

By the arrangement of courses and by the assignment teachers should taken into account the point of enjoyment. Furthermore, it is now generally accepted that the interactivity of online tasks is an important determinant of learning (Lander, 1999) and this interactivity can contribute to students' experience regarding enjoyment.

Going on with something you do not believe in, will not work, but whatever new tool you will choose, there should be a good implementation of Web-based technology (Vrieling, 2006a). Beside that, there is a need to develop teaching and learning through ICT (Simons, 2005). Maybe an entirely new approach is needed. It involves a break with the past, it is based on new relationships and dynamics within education that may undermine core competencies, and questions the very purpose of the enterprise. This kind of change involves doing things differently rather than doing things better. It might even mean doing different things (Hayes, 2002).

This study shows that students' acceptance of new technology depends on the way they enjoy working with it, on their experience regarding usefulness and on its interactivity. Although there are many more questions than answers at the point about teaching with Web-based technology, it is hoped that these results and experiences might encourage further pedagogical dialogue and empirical results about how to effectively and successfully organize and deliver courses in this new technological environment.

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