Research Article

Appreciation of the use of Blackboard at the Police Academy of the Netherlands using the Technology Acceptance Model

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Abstract

This research covers appreciation of the use of Blackboard among students and teachers at the Police Academy of the Netherlands in the period from 2008 up to and including 2011, using the Technology Acceptance Model (TAM). From questioning the students, it became clear that the unclear structure of Blackboard was a problem. Therefore, a *heliview* (a homepage featuring an overview of the entire training course) was introduced, and this resulted in a clear improvement of the structure. The research was subsequently repeated in 2011. The results show a significant improvement of appreciation of the use of Blackboard by students. Teachers also complained about the use of Blackboard. Therefore, the research was carried out among teachers again in 2011. Teachers scored significantly lower at behavioural intention than students. The data show that Blackboard it better appreciated by students than by teachers.

Keywords: *Blackboard; behavioural intention; ease of use; enjoyment; Technology Acceptance Model (TAM); usefulness*

Introduction

Among Dutch students the Technology Acceptance Model (TAM) has proven its value in comparative research in the appreciation of the use of Blackboard and the use of a Personal Digital Analyser (PDA) (Vrielink, 2006a/b). Research among American students served as the basis for this (Yi and Yujong Hwang, 2003). Dutch students appreciated the use of Blackboard significantly less than the American students (Vrielink, 2006a). Was this due to

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the research method, due to the younger age category, or was Blackboard used properly? Deinum (2003) investigated the implementation of Blackboard at 33 schools in the north of the Netherlands. His conclusion was that students frequently used the *drop box* function. Deinum (2003) recommended the use of the discussion board for students for their assignments. This research covers appreciation of the use of Blackboard among students of the Police Academy of the Netherlands from 2008 till 2011. This research method is used to determine if structural improvements in Blackboard lead to increased appreciation and use among students. Because teachers also complained about the use of Blackboard, and hardly ever used the discussion board, the research was carried out among teachers as well.

The Police Academy of the Netherlands is the centre for training, knowledge and research for the Dutch National Police. The institute covers 6 schools and 8 trainings locations, has 1600 staff members and more than 35.000 students. The School of Policing is one of the six schools from the Police Academy of the Netherlands and offers middle vocational education and training and is known as MBO. At this school, on-the-job training plays a key role. The students' courses alternate between the institute and the workplace, where they work on key assignments and competence tests. The traditional focus on the exchange of practical knowledge has been replaced by an approach that concentrates on the acquisition of a variety of competences in professional practice. The use of Information and Communication Technology (ICT) plays an important role in the courses. For example students can learn individually by using *E-campus*, test their progress made in programs and plan their own courses. Police education and training is supported by *Blackboard*.

Blackboard is an American Learning Management System that was introduced in the Netherlands at the end of the nineties. The Police Academy of the Netherlands has worked with Blackboard since 2002 and will switch to Blackboard 9.1 at the end of 2013. It depends on the school and the students to what extent all the possibilities offered by Blackboard are used. These possibilities are perhaps more extensive than initially suspected. Not only can a teacher email their students via Blackboard or publish all their content, Blackboard also offers room for discussion, submission of assignments, digital testing, a grade book, etc.

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) (see Figure 1) was introduced by Davis (1993) and was modified by Yi and Yuong Hwang (2003). The TAM encompasses a wide range of research objects, including: website usage (Heijden, 2000; Selim, 2003); online shopping (Banus and Baptist, 2005); E-mail (Gefen and Straub, 1997); ICT acceptance by therapist (Schaper and Pervan, 2004); mobile telephone (Aversano, 2005); and the use of Blackboard (Yi ad Yujong Hwang, 2003). TAM has proven to be a powerful model for explaining and predicting usage intentions and acceptance behaviour. Legris (Legris et al, 2003) concluded 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). 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.
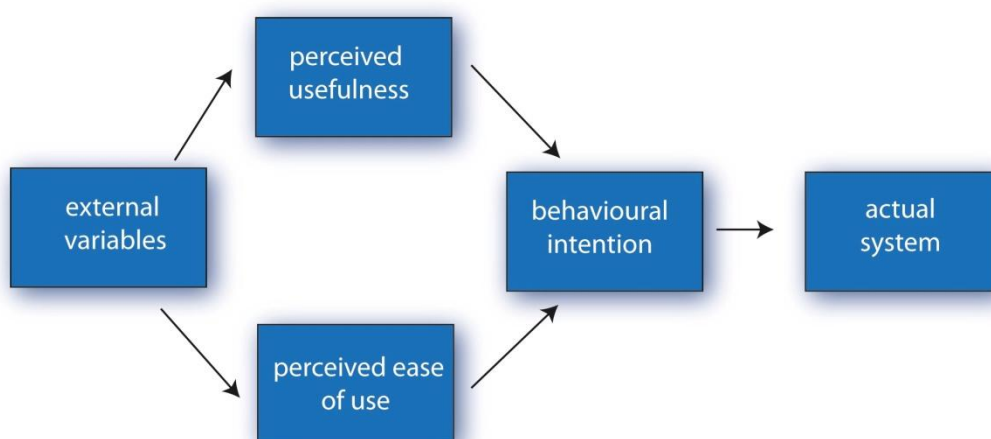

Figure 1: Davis' Technology Acceptance Model (TAM)

Recent findings on intrinsic motivation in social psychology indicate that enjoyment plays an important role in determining a person's behaviour. Yi and Yujong Hwang (2003) investigated this feature (enjoyment) as external variables and their 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. These variables include will now be described in turn:

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 Venkatesh and David (2000) social influence, e.g. through subjective norm, is defined as a "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 and Yujong Hwang (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 and Yujong Hwang (2003) the ease of use perceptions are influenced by the degree to which people perceive using the system to be personally enjoyable. Agarwal and Karahanna (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 that shows the three sides are part of an interdependent system.
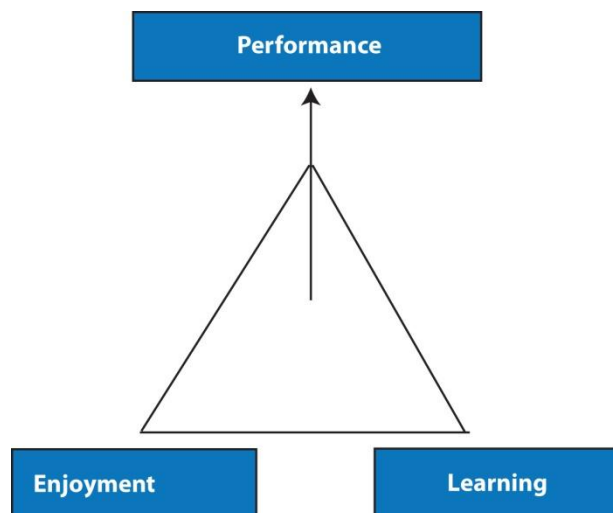
Figure 2: The working triangle

If the enjoyment or learning side is ignored, the performance will finally be damaged (Gallwey, 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.

According to Chuttur (2009) TAM has been widely criticised, despite its frequent use, leading the original proposers to redefine it several times. Criticism of TAM as a "theory" include its lack of falsifiability, questionable heuristic value, limited explanatory and predictive power, triviality, and lack of any practical value. Benbasat and Barki (2007) suggest that TAM 'has diverted researchers' attention away from other important research issues and has created an illusion of progress in knowledge accumulation. Furthermore, the independent attempts by several researchers to expand TAM in order to adapt it to the constantly changing Information Systems (IS) environments has led to a state of theoretical chaos and confusion. In general TAM focuses on the individual 'user' of a computer, with the concept of 'perceived usefulness', with extension to bring in more and more factors to explain how a user 'perceives' 'usefulness'. TAM ignores the essentially social processes of IS development and implementation, without question where more technology is actually better, and the social consequences of IS use.

Despite the criticism above, TAM was chosen in this research because it is used worldwide. TAM gives easy and quick results, partly because there is only one external variable chosen (enjoyment) in this research. Moreover, it is about a comparative research on the appreciation of the use of Blackboard under different conditions (e.g. improved structure). A previously carried out comparative research showed that this method is suitable for this (Vrielink, 2006b).

Research questions and research method

According to Selim (2007) the specified e-learning critical success factors (CSF) are: instructor characteristics (attitude towards and control of the technology, and teaching style); student characteristics (computer competency, interactive collaboration, and e-learning course content and design); technology (ease of access and infrastructure); and support. The ease of use of the course web was the most critical factor followed by browser efficiency and screen design. According to Sun (Sun et al, 2008) instructor attitude toward e-Learning, perceived usefulness, perceived ease of use, are some of the critical factors affecting learners' perceived satisfaction.

The first research question, therefore, focuses on improvements in perceived usefulness and perceived ease of use. From questioning the students, it became clear that the unclear structure was a problem. That is why, in 2008, a *heliview* (in the form of a homepage featuring an overview of the entire training course) was introduced, resulting in a clear structural improvement. The research was subsequently repeated in 2011.

The second research question focuses on the instructor's attitude toward e-Learning. The use of Blackboard is predominantly teacher-guided. Teachers use Blackboard to post Word documents. The entire curriculum and all assignments are online. In addition, the timetables, tests and announcements can be found online. There are also links to external sources such as the *Politie Kennisnet* (PKN = Police Knowledge Net), *Juras* (a multimedia library), etc. Teachers complain that the use of Blackboard is clumsy. Educational innovations stand no chance without the support of teachers. They ultimately give shape to an innovation. According to Selim (2007) the most critical indicators were instructor's attitude towards interactive learning and teaching via e-learning technologies. Whether an innovation succeeds, strongly depends on the question if teachers are willing and able to further develop

their competencies, and if teachers are able to promote the competency development of their teachers (Miedema and Stam, 2008).

In summary the research questions are as follows:

1. Does the introduction of an improved Blackboard structure, by means of a *heliview,* increase appreciation of the use of Backboard as a learning management system by students at the Police Academy?
2. How do teachers appreciate the use of Blackboard?

Questionnaire

The preparation of the Blackboard research resulted in constructing a questionnaire in Dutch for students based on Yi And Yujong Hwang's research' (Yi and Yujong Hwang, 2003) In 2008, the research was repeated among 188 students at the School of Policing. In 2011, 213 MBO students and 71 teachers received a questionnaire consisting of 14 questions and the opportunity to make comments. At the top of the questionnaire, the student could fill in his/her name, age, and gender. 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 questionnaire consisted of three questions to measure the *enjoyment* construct;

> *I have fun using the Blackboard system,*
> *Using the Blackboard system is pleasant,*
> *I find using the Blackboard system to be enjoyable.*

Four questions were used to measure the *ease of use* construct:

> *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*
> *I find the Blackboard system easy to use.*

Four questions were used to measure the *usefulness* construct:

> *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*
> *I find the Blackboard system would be useful in this course.*

Three questions were used to measure the *behavioural intention* construct:

> *I intend to check announcements in the Blackboard system frequently*
>
> *I intend to (upload, 2008) download files from the Blackboard system frequently*
>
> *I intend to visit other Web sites using the Blackboard system frequently.*

The actual *use* of Blackboard 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 3 months (period between 15 April up to and including 15 June 2011).

Data analysis

The reliability of the questionnaire was measured by examining the internal consistency. ICR = Internal Consistency Reliability (similar to Cronbach's alpha). The correlation coefficient (Pearson's product-moment correlation coefficient) is measured to show the connection between the questions.

A T-test was carried out to find if there was a significant difference between the samples. 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 were assessed by examining the significance of the ß-coefficients and the variance accounted for by the antecedent constructs. The standardized ß coefficients (the coefficient of the independent variables when all variables are expressed in standardized form) were presented. Multiple regression analyses were employed to adjust for the influence of behavioural intention on use the ß-coefficient is measured with use as dependent variable. All statistical analyses were performed with the SPSS version 18.0. (SPSS Inc.).

Results

In 2008, 188 students participated in this research with an average age of 23.9 (sd. = 4.8). In 2011, 213 students participated in this research with an average age of 24.5 (sd. = 6.1). The percentage of females in both student populations is 32%. In 2011, 71 teachers were interviewed. The average age was 45.6 (sd=8.8).

The reliability of the questionnaire is expressed in ICR (ICR=Cronbach's alpha). All ICRs are more than 0.7. ICR of 0.7 or higher are considered adequate (Barclay et al., 1995). This does not apply to the ICR of Behavioural intention of the 2008 population (ICR = 0.58). According to George and Mallery (2003) this is questionable. The questionnaire for 2011 has been adjusted accordingly. Question 7 has been changed: "I intend to regularly publish contributions on Blackboard" (2008) has been changed to: "I intend to regularly download files from Blackboard" (2011). This provides a more acceptable ICR. ICR of Behavioural intention of the 2011 student population = 0.70, for the teacher population = 0.82. Apparently, in 2008, uploading to Blackboard was confusing or not applicable (the discussion board was not used!).

The correlation between the questions can be considered to be the strength and direction of the relationship between two (or more) interval/ratio variables expressed. Pearson's Product-moment correlations are expressed in correlation coefficient r. The value of r is always between -1 and + 1. The higher the absolute value, the stronger the relationship. Pearson's product-moment correlation coefficient across the board, r, varies from 0.57 to 0.80. This can be qualified as a large interconnectedness (Lund and Lund, 2010). While an ICR of 0.58 is poor, in relation with Pearson r, it can be concluded that the questionnaire is a good tool for this comparative research.

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Table 1 shows that, in 2011, students scored significantly higher at behavioural intention than students in 2008. They scored significantly lower at enjoyment. The mean visits per student is 111 times (Standard Deviation 81) with a minimum of 6 times and a maximum of 398 times.

Table 1: Comparison scores from students (School of Policing: MBO) in 2008 and 2011

	2008 N=188		2011 N=213			
Construct	Mean	S.D.	Mean	S.D.	T	Sig.
Enjoyment	**5.2**	2.1	**4.8**	1.8	-2.1	P <0.01
Ease of use	**5.8**	1.9	**5.7**	1.7	-0,3	ns
Usefulness	**6.0**	1.8	**5.8**	1.6	-0.8	ns
Behavioural intention	**5.5**	1.7	**6.1**	1.7	3.4	P <0.01

Table 2 shows that, in 2011, students score significantly higher than teachers for the items enjoyment and behavioural intention.

Table 2: Comparison of the scores between students and teachers at School of Policing (MBO) in 2011

	Students N=213		Teachers N=71			
Construct	Mean	S.D.	Mean	S.D.	T	Sig.
Enjoyment	**4.8**	1.9	**4.0**	2.0	-2.8	P <0.01
Ease of use	**5.7**	1.8	**5.2**	2.0	-2.0	ns
Usefulness	**5.8**	1.6	**5.5**	2.2	-0.9	ns
Behavioural intention	**6.1**	1.7	**4.9**	2.4	-4,5	p <0.001

Figure 3 provides the results of the regression analysis (N= 186 for actual use). Behavioural intention has a significant effect on Use (ß=0.29, p<0.001). Usefulness has a significant effect on Behavioural intention (ß=0.66, p<0.001) and Ease of use has a no significant effect on Behavioural intention (ns). Enjoyment has a significant effect on Usefulness (ß=0.54, p<0.001) and Ease of use has a significant effect on Usefulness (ß=0.33, p<0.001). Enjoyment has a significant effect on Ease of use (ß=0.58, p<0.001).
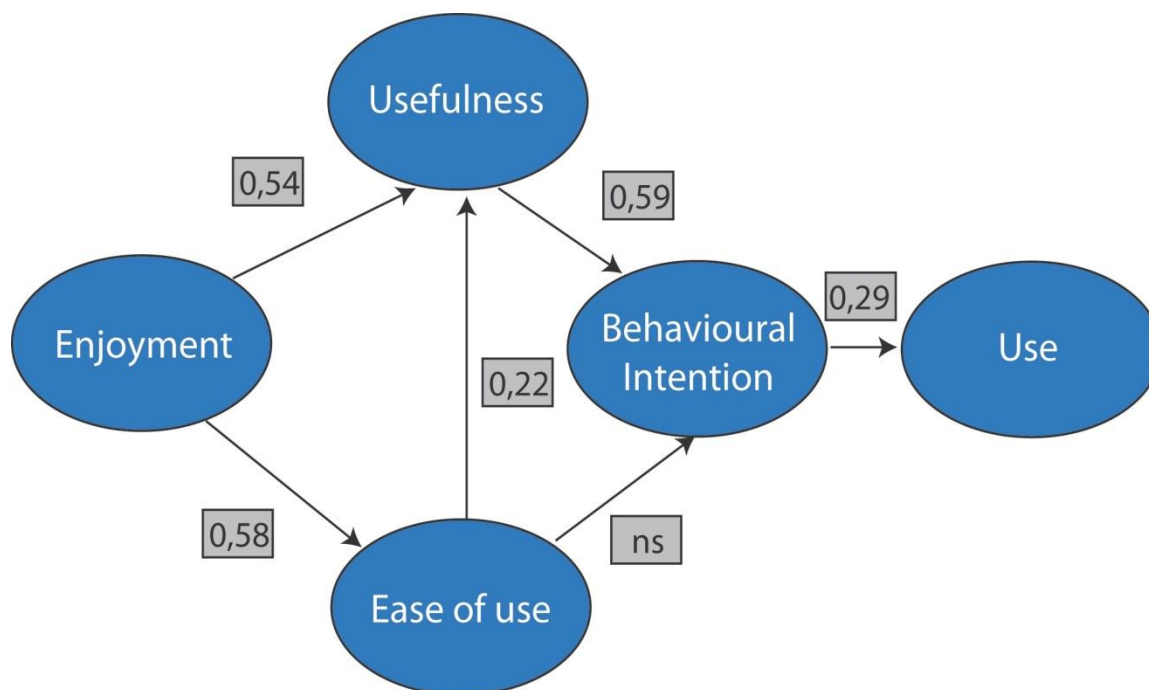
Figure 3: Regression analyses to test the proposed model

* Note: Student 2011 n = 186 (some questionnaires were completed anonymously, therefore the actual use could not be determined)

Discussion and conclusions

The aim of this research was to investigate whether an improved structure increases appreciation of the use of Blackboard by students of the Dutch Police. Additionally the attitude of teachers with respect to appreciation of the use of Blackboard was investigated. From Table 1 it becomes clear that students from the 2011 population score significantly higher at behavioural intention than students from the 2008 population. Striking is that they also score significantly lower at enjoyment. An improved structure does lead to more behavioural intention but not to more enjoyment. Is this in conflict with the vision of Gallwey (1999) that when learning and enjoyment go hand-in-hand performance is increased? The latter has not been measured though. This needs to be further researched.

Table 2 shows that students from the 2011 population have significantly more behavioural intention and significantly more enjoyment than their teachers. If teachers are negative about the use of Blackboard, can one expect students to be motivated? Thus, the score of 6.1 at behavioural intention may be viewed with more weight. In spite of the fact that their teachers are not enthusiastic about Blackboard students intend to use Blackboard after all! Does this have to do with a more course-oriented offer? It is acknowledged that the attitude of the

teacher plays an important role (Albirini, 2006). Teachers themselves have no frame of reference when it comes to working with a learning management system. They are insufficiently professionalised in the use of Blackboard. Teachers are unable to use the enormous potential offered by new technology in a learning environment (Allen and van der Velden, 2012) to cater to: individual differences, requirements for lifelong learning and the enhancement of digital competencies of pupils and students (Van der Velden, 2012). Enhancement of competencies of co-workers is a first and necessary phase of innovation by digitalising (Zand, 2011). However, many academics seem reluctant to embrace technology. Disciplines and institutional cultures, time investment and beliefs towards employability influenced training retention (Rienties et al, 2013). According to Tondeur (Tondeur et al, 2012) a number of factors have been identified to explain why teachers do not feel prepared to use technology in their classrooms, including insufficient access to technology, lack of time and lack of technology skills. Teachers are not questioned about the use of Blackboard. According to Rubens (2013) the non-binding nature should be avoided and the management should invest in learning and teaching training through the Internet. Therefore the use of the ICT should be put on the agenda of the job evaluation program and teachers should be asked about their conduct in relation to its use.

The management of institutions should formulate goals for technology enhanced learning and they should develop a shared vision together with the students about how to use new technology. Regarding the triangular relationship between teacher, student, and content, one might ask 'what content, which pedagogical approach and with what technology? Why and how?' (Hudson, 2008). Students abandon Blackboard and they are using other tools like *Facebook*, *Whatsapp* and *Twitter*. Teachers wonder how difficult it is to get students out of *Facebook* and back into Blackboard. According to Jacobs (2013), in the Netherlands, the use of ICT in learning environments often depends on improvisation, coincidences, individual commitment and isolated projects. Teachers and education managers often do not have an interconnected vision on the application and impact of ICT in education. Viewed in light of the intensive use of ICT in society, education lags behind. In 2013 Blackboard 9.1 was introduced. The user interface is now more user-friendly and single sign-on is possible, and the design and create a better search function was simplified. The introduction comes with an implementation plan (teaching and learning with Blackboard), in which there is specific attention for the aforementioned subjects (professionalization of management and teachers, improvement of usefulness and the encouraging of the use of the discussion board).

Otherwise, the introduction of the new Blackboard does not deliver what's expected by the absence of a good implementation.

From Figure 3, it appears that Ease of Use does not affect the intention to start using Blackboard. Only perceived ease of use is not recognised as one of the critical factors affecting learners' perceived satisfaction. This contradicts Sun's research (Sun et al, 2008). This undermines the TAM model. Usefulness is the strongest predictor of the intention to start using Blackboard, and enjoyment has a great impact on this as well. The results of the study clearly point out the important roles of enjoyment and usefulness in positively influencing the discussion to use Blackboard and subsequent actual use. These findings significantly extend prior research on user acceptance of web-based technology (Yi and Yujong Hwang, 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 and Yujong Hwang (2003). Enjoyment might play a more influential role than ease of use in determining the usefulness perception within the Web-based IS context.

What has the Police Academy of the Netherlands learned from this research?

Having one and the same Blackboard structure for all education and training contributes to the satisfaction among students for the use of Blackboard. The design of the environment is important; an overview of the entire training/course (*heliview*); a simple navigation structure (only in a few clicks at the desired target), and regular actualization (cleaning up old junk files), etc. The latter is evidenced by comments that students and teachers made at the end of the questionnaire. The attitude of teachers in the use of Blackboard is important and deserves improvement. Training is an important tool. Showing good examples can contribute to the will to invest in improvements ("what's in it for me"). Support of management in the use of Blackboard is crucial. Put the use of Blackboard as standing item on the year calls and prevent non-binding nature.

Although there are many more questions than answers regarding teaching with Blackboard as learning management system, it is hoped that these results and experiences may encourage further pedagogical dialogue, and empirical results about how to deliver and organize courses in this technological environment effectively and successfully.

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