Appreciation of the use of Blackboard by students and teachers at the Police Academy of the Netherlands with the Technology Acceptance Model (TAM)

Reinder Vrielink, MSc

School of Policing, Police Academy of the Netherlands

30 October 2013

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 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. As teachers also complained about the use of Blackboard, the research was carried out among teachers as well in 2011. This resulted in teachers scoring significantly lower at behavioural intention than students. This makes appreciation of Blackboard by students all the better.

Keywords: Blackboard, behavioural intention, ease of use, enjoyment, Technology Acceptance Model (TAM) and usefulness
1. Introduction

The research method of the Technology Acceptance Model (TAM) has proven its value in comparative researches among Dutch pupils into 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 et.al., 2003). Dutch pupils appreciated the use of Blackboard significantly less than the American students (Vrielink, 2006a). Was this due to the research method, the younger age category, or was Blackboard used properly at all? Deinum (2003) investigated the implementation of Blackboard at 33 schools in the north of the Netherlands. His conclusion was that pupils frequently used the drop box. Deinum recommended the use of the discussion board for pupils to hand in their products.

This research covers appreciation of the use of Blackboard among students at the Police Academy of the Netherlands (Middle vocational education: MBO level 3 and 4) in the period from 2008 up to and including 2011. This research method is used to determine if structural improvements in Blackboard lead to increased appreciation among students of its use. As teachers also complained about the use of Blackboard, and as teachers hardly ever use the discussion board, the research was carried out among teachers as well.

Blackboard is an American Learning Management System which was introduced in the Netherlands at the end of the nineties. The Police Academy 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 gradebook, etc.
2. Literature review

2.1. The Technology Acceptance Model (TAM)

This paragraph deals with the Technology Acceptance Model (TAM), which Davis (1993) introduced and which was modified by Yi (Yi et al., 2003). The TAM encompasses a wide range of research objects, a brief list: website usage (Heijden, 2000; Selim, 2003); online shops (Baus, 2005); E-mail (Gefen, 1997); ICT acceptance by therapists (Schaper, 2004); mobile telephone (Aversano, 2005); the use of Blackboard Yi (Yi et al., 2003). TAM has established a powerful model for explaining and predicting usage intentions and acceptance behaviour. 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). 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.

Recent findings on intrinsic motivation in social psychology indicate that enjoyment plays 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. 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 (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.

**Criticism**

According to Chutter (Chuttur 2009) TAM has been widely criticised, despite its frequent use, leading the original proposers to attempt to redefine it several times. Criticisms 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 (Benbasat et.al., 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 IT environments has lead 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', and 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, this research method has been widely used, with only enjoyment as external variable. It is easy and quickly yields results. As a comparative research instrument it is suitable. Comparing appreciation of the use of Blackboard among various circumstances (improved structure, use of discussion board), is the aim.
3. **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. The most critical indicators were instructor’s attitude towards interactive learning and teaching via e-learning technologies. 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.

Research question 1 therefore focuses on improvements in perceived usefulness and perceived ease of use, and research question 2 focuses on the instructor’s attitude toward e-Learning.

Research questions:

1. From questioning the students, it became clear that the unclear structure was a problem. That is why, in 2008, a heliview (homepage featuring an overview of the entire training course) was introduced, resulting in a clear structural improvement. The research was subsequently repeated in 2011. Does the introduction of an improved Blackboard structure by means of a heliview to increased appreciation of the use of Backboard as learning management system by students at the Police Academy?

2. How do teachers appreciate Blackboard?

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 about the fact that the use of Blackboard is clumsy. Educational innovations stand no chance without the support of teachers. They ultimately give shape to an innovation. 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 et.al., 2008).

3.1. **Procedure**

3.1.1. **Questionnaire**

The preparation of the Blackboard research resulted in constructing a questionnaire in Dutch for students according to Yi’s research’ (Yi, et al., 2003). In 2008, the research was repeated among 188 students at the School of Policing. In 2011, 213 MB0 level 3 and 4 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 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 3 months (period between 15 April up to and including 15 June 2011).

3.2. 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 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 are assessed by examining the significance of the β-coefficients and the variance accounted for by the antecedent constructs. The standardized β 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 β-coefficient is measured with use as dependent variable. All statistical analyses were performed with the SPSS version 18.0. (SPSS Inc).
4. Results

4.1. Respondents

Table 1: Number respondents and mean age

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>mean age in years</th>
<th>s.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students MBO (2008)</td>
<td>188</td>
<td>23.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Students MBO (2011)</td>
<td>213</td>
<td>24.5</td>
<td>6.1</td>
</tr>
<tr>
<td>Teachers MBO (2011)</td>
<td>71</td>
<td>45.6</td>
<td>8.8</td>
</tr>
</tbody>
</table>

Table 1 shows that in 2008, 188 students participated with a mean age of 23.9 (sd. = 4.8). In 2011, 2013 students with a mean age of 24.5 participated in the questionnaire (sd. = 6.1). The percentage of females in both student populations is 32%. In 2011, 71 teachers were interviewed. The mean age was 45.6 (sd=8.8).
4.2. Reliability of the questionnaire

Table 2: Internal Consistency Reliabilities (ICR)

<table>
<thead>
<tr>
<th>Construct</th>
<th>Student 2008</th>
<th>Student 2011</th>
<th>Teacher 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>188</td>
<td>213</td>
<td>71</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>0.93</td>
<td>0.90</td>
<td>0.86</td>
</tr>
<tr>
<td>Ease of use</td>
<td>0.88</td>
<td>0.89</td>
<td>0.92</td>
</tr>
<tr>
<td>Usefulness</td>
<td>0.93</td>
<td>0.92</td>
<td>0.90</td>
</tr>
<tr>
<td>Behavioural intention</td>
<td>0.58</td>
<td>0.70</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Table 2 shows that all ICRs (ICR=Cronbach’s alpha) are more than 0.7. Internal consistencies (comparable to Cronbach’s alpha) 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. According to George (George et. al., 2003) this is questionable. The questionnaire for 2011 has been adjusted accordingly. Question 7 has been changed: Question 7: 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. Apparently, in 2008, uploading to Blackboard was confusing or not applicable (the discussion board was not used!).
4.3. *The correlation between the questions*

Table 3: Pearson’s product-moment correlation coefficient across the board

*The correlation between the questions*

<table>
<thead>
<tr>
<th></th>
<th>Enjoyment</th>
<th>Ease</th>
<th>Usefulness</th>
<th>Behavioural</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enjoyment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 2008</td>
<td>1.00</td>
<td></td>
<td>0.80</td>
<td>0.64</td>
</tr>
<tr>
<td>Student 2011</td>
<td></td>
<td>0.81</td>
<td>0.81</td>
<td>0.60</td>
</tr>
<tr>
<td>Teacher 2011</td>
<td></td>
<td>0.74</td>
<td>0.68</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>Ease of use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 2008</td>
<td>0.84</td>
<td>1.00</td>
<td>0.78</td>
<td>0.60</td>
</tr>
<tr>
<td>Student 2011</td>
<td></td>
<td>0.81</td>
<td>0.76</td>
<td>0.57</td>
</tr>
<tr>
<td>Teacher 2011</td>
<td></td>
<td>0.74</td>
<td>0.74</td>
<td>0.68</td>
</tr>
<tr>
<td><strong>Usefulness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 2008</td>
<td>0.80</td>
<td>0.78</td>
<td>1.00</td>
<td>0.74</td>
</tr>
<tr>
<td>Student 2011</td>
<td></td>
<td>0.81</td>
<td>0.76</td>
<td>0.69</td>
</tr>
<tr>
<td>Teacher 2011</td>
<td></td>
<td>0.68</td>
<td>0.74</td>
<td>0.80</td>
</tr>
<tr>
<td><strong>Behavioural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 2008</td>
<td>0.64</td>
<td>0.60</td>
<td>0.74</td>
<td>1.00</td>
</tr>
<tr>
<td>Student 2011</td>
<td></td>
<td>0.60</td>
<td>0.57</td>
<td>0.69</td>
</tr>
<tr>
<td>Teacher 2011</td>
<td></td>
<td>0.57</td>
<td>0.68</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Correlation significant at the 0.01 level (2-tailed)

Table 3 shows Pearson’s product-moment correlation coefficients. R varies from 0.57 to 0.80. This can be qualified as a large interconnectedness (Lund et al., 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.
Table 4: Comparison scores from students at the Middle vocational education and training institute in 2008 and 2011

<table>
<thead>
<tr>
<th>Construct</th>
<th>2008 mean ± s.d.</th>
<th>2011 mean ± s.d.</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment</td>
<td>5.2 ± 2.1</td>
<td>4.8 ± 1.8</td>
<td>-2.1</td>
<td>P &lt; 0.01</td>
</tr>
<tr>
<td>Ease of use</td>
<td>5.8 ± 1.9</td>
<td>5.7 ± 1.7</td>
<td>-0.3</td>
<td>ns</td>
</tr>
<tr>
<td>Usefulness</td>
<td>6.0 ± 1.8</td>
<td>5.8 ± 1.6</td>
<td>-0.8</td>
<td>ns</td>
</tr>
<tr>
<td>Behavioural intention</td>
<td>5.5 ± 1.7</td>
<td>6.1 ± 1.7</td>
<td>3.4</td>
<td>P &lt; 0.01</td>
</tr>
</tbody>
</table>

Table 4 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 (s.d. 81) with a minimum of 6 times and a maximum of 398 times.

Table 5: Comparison of the scores between students and teachers at the MBO School of Policing in 2011

<table>
<thead>
<tr>
<th>Construct</th>
<th>Students mean ± s.d.</th>
<th>Teachers mean ± s.d.</th>
<th>T</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment</td>
<td>4.8 ± 1.9</td>
<td>4.0 ± 2.0</td>
<td>-2.8</td>
<td>P &lt; 0.01</td>
</tr>
<tr>
<td>Ease of use</td>
<td>5.7 ± 1.8</td>
<td>5.2 ± 2.0</td>
<td>-2.0</td>
<td>ns</td>
</tr>
<tr>
<td>Usefulness</td>
<td>5.8 ± 1.6</td>
<td>5.5 ± 2.2</td>
<td>-0.9</td>
<td>ns</td>
</tr>
<tr>
<td>Behavioural intention</td>
<td>6.1 ± 1.7</td>
<td>4.9 ± 2.4</td>
<td>-4.5</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

Table 5 shows that, in 2011, students score significantly higher than teachers for the items enjoyment and behavioural intention.
Figure 5: Regression analyses to test the proposed model

student 2011  N = 186 (some questionnaires were completed anonymously as a result of which the actual use could not be determined)

Figure 5 provides the results of the regression analysis (N= 186 for actual use).

β= 0.19/0.29 Comparison of results of American research (Yi et. al., 2003) and this research among students SvP (2011)

Behavioural intention has a significant effect on Use (β=0.29, p<0.001). Usefulness has a significant effect on Behavioural intention (β=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 (β=0.54, p<0.001) and Ease of use has a significant effect on Usefulness (β=0.33, p<0.001). Enjoyment has a significant effect on Ease of use (β=0.58, p<0.001)
5. Discussion

The aim of this research was to investigate whether an improved structure increases appreciation of the use of Blackboard by students of the Netherlands Police. Additionally the attitude of teachers with respect to appreciation of the use of Blackboard was investigated.

From table 4 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 5 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 you expect students to be motivated for it? Thus, the score of 6.1 at behavioural intention may be viewed with more weight. Despite 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? Does the attitude of the teacher play a role here?

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. Are teachers questioned about the use of Blackboard? Is it compulsory, are students encouraged to co-operate on the discussion board? Teachers are unable to use the enormous potential offered by new technology in a learning environment (Allen et.al., 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).

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. A triangle between teacher, student, and content. 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 Information and Communication Technology (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 on the application and impact of ICT in education. Viewed in light of the intensive use of ICT in society, education lags behind. 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 management should develop a shared vision on the use of ICT in education and 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. In 2013 Blackboard 9.1. is introduced because the user interface is more user-friendly and single sign-on is possible, and to simplify the design and create a better search function. 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). The introduction of the new Blackboard does not delivers what's expected by the absence of a good implementation. Therefore it might be better to have the two greats, innovation and implementation, as an inseparable whole.
From figure 5, 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). The TAM model is undermined by this. 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 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.

The results of this research show that the student population (2011) and the intention to start using Blackboard shifted in the direction of the original research (behavioural intention 6.5 American students (Yi et al., 2003), versus 6.1 Dutch students). Striking is that the population from the original research scores significantly better for the items Ease of use and Usefulness (Vrielink 2006a). Is there a cultural difference here? Does this have to do with a more course-oriented offer? Reasons enough to further research this. The research into appreciation of the use of a PDA (Vrielink, 2006b) has been carried out with an educational tool that has been developed by the school itself. Does this partly explain the better score because these teachers believe in their own products? (Albirini, 2005) Again, appreciation of the use of Blackboard by students in 2011 is to be appreciated all the more, for their teachers appreciate the use of Blackboard significantly less.

Although there are many more questions than answers at the point about teaching with Blackboard as learning management system, 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 technological environment.
References


