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# Factors Influencing the Adoption of Mobile Learning

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## Factors Influencing the Adoption of Mobile Learning

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### Abstract

*Education delivery by mobile devices enables anywhere / anytime learning. Mobile learning has the potential to allow students to more closely integrate learning activities into their busy lives. At this early stage in its development, this is an opportune time to initiate a stream of research that examines the adoption of m-learning applications. This study determines the key factors influencing the behavioural intention for adoption of mobile learning. Several external variables are incorporated into the Technology Acceptance Model and tested in six New Zealand universities. Six of the seven variables – self-efficacy, perceived usefulness, subjective norm, attitude, perceived ease of use, and perceived financial resources were accepted. Prior use of e-learning was not accepted and reasons for this are explored in the study.*

### Keywords

mobile learning, mobile applications, technology adoption, Technology Acceptance Model.

### INTRODUCTION

In the beginning, there was one-place, one-time education. From the first European universities until modern times, higher education has been principally taught synchronously with both professor and student face-to-face in the same classroom.

Then came e-learning. Learning management systems such as BlackBoard, WebCT and Moodle are now widely used to support classroom learning as well as distance education. The principal limitation with e-learning is the dependence on having access to a computer, almost always with an Internet connection. Learning is still a dedicated activity that is location-based for most students; not always convenient and not integrated into the student's life.

The next evolutionary step in education delivery systems is mobile learning. Mobile devices are becoming a primary personal communication mechanism and mobile learning is predicted to be a significant next wave in the learning environment (Attwell 2005; Motiwalla 2005; Tiong & Kinshuk 2006). The massive infusion of these devices, coupled with their Internet capabilities, promises to alter the nature of higher learning (Green 2000).

Despite the potential, mobile learning is not widespread. Why not? What factors impact the adoption and use of mobile learning? Empirical research is needed to investigate the user's intention to adopt this new technology.

The purpose of this research is to investigate which factors influence the intention to adopt mobile learning. This study does so using the Technology Acceptance Model and with data gathered from students enrolled in New Zealand universities. In New Zealand, mobile phones are being used to promote in-class interaction (Scornavacca & Marshall 2007) and organise learning-related activities (Brown et al. 2006) but, as in most of the world, m-learning is at an introductory stage. Accordingly, this study is limited to investigating user's intention to adopt, not actual usage.

### BACKGROUND

Different studies have defined mobile learning differently according to the purpose. Mobile learning has been defined as e-learning that uses wireless transmission and mobile devices such as personal digital assistants (PDAs), mobile phones, laptops and tablet PCs (Attwell 2005). In this, and many other definitions, the focus is on the technology. Mobile learning has also been defined as learning across contexts, where the focus is on the mobility of the learner who is interacting with portable technology (Sharples 2007). Mobile learning has also been defined as learning in a mobile society, where the focus is on how institutions can accommodate and support education of an increasingly mobile population (Sanchez et al. 2007).

As used in this study, mobile learning is defined as learning activities that use mobile devices such as the mobile phone and personal digital assistants. Typical mobile learning applications are accessing learning resources on a learning management system such as WebCT or BlackBoard or collaboration with other students on an electronic discussion board (e.g., Lundin & Magnusson 2003; Milrad et al. 2002; Viehland & Marshall 2005). More advanced mobile learning applications include intelligent tutoring systems, simulation and modelling tools, personalised communication aids, simulated classrooms and access to dictionaries, learning organisers, planners and other resources that help learners to learn whenever and wherever they find it convenient (Sharples 2000).

This research offers pioneering research of adoption of m-learning from a human behaviour perspective. This research contributes to the literature in two ways. First, the study provides an increased understanding of user behavioural intention towards the adoption of mobile learning, which has not been studied to any great extent. Second, this research provides significant insight about mobile learning from the users' perspective. This will help guide practices on how to improve the mobile learning environment and develop better learning applications in the future. This research provides guidelines and implications to mobile learning suppliers, mobile network operators, educational institutions, lecturers and users to improve the acceptance and use of mobile learning activities.

## LITERATURE REVIEW

This section begins with an examination of the theoretical framework used in this research. Then related literature and a few studies in mobile computing are used to identify what factors might influence adoption of mobile learning. Those factors are expressed in the m-learning adoption model used in this study, at the conclusion of the literature review.

### Technology Acceptance Model

The theoretical framework for this research is the Technology Acceptance Model (TAM), an adaptation of the theory of reasoned action specifically tailored for modelling user acceptance of information systems (Davis et al. 1989).

Perceived usefulness and perceived ease of use are two of the main constructs of TAM (see Figure 1). Perceived usefulness is the degree to which a person believes that using a particular technology would enhance his or her performance (Davis 1989). Perceived ease of use is the degree to which a person believes that using a technology would be free from effort (Davis 1989). TAM posits that actual system use is determined by behavioural intention to use. In turn intention to use is determined by both attitude and perceived usefulness. Behavioural intention will be affected by perceived usefulness and perceived ease of use. In addition, perceived ease of use also affects perceived usefulness. External variables will influence behavioural intention indirectly through perceived usefulness and perceived ease of use (Davis 1989).

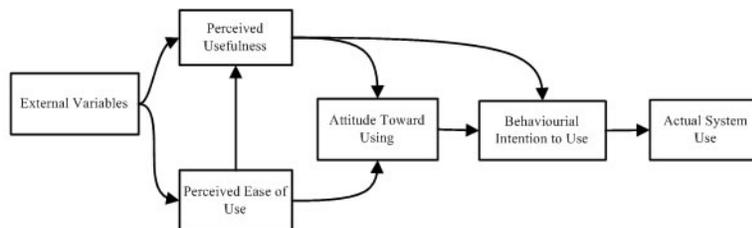


Figure 1: Original variables in TAM and their relationship (Davis 1989)

TAM has been applied to many different end-user technologies, such as e-mail (Adams et al. 1992), word processing (Davis et al. 1989), spreadsheets (Agarwal et al. 2000), the World Wide Web (Lederer et al. 2000) and mobile payments (Viehland & Leong 2008), to name just a few.

Although many studies have explored various aspects of technology adoption, there is no research that specifically explores the factors influencing user intention to adopt mobile learning. However, extrapolations from previous research with a different focus provide precedents that are useful in this study. Especially, an empirical analysis of 80 TAM-based studies (Legris et al. 2002) showed TAM's predictive capacity generally increases if organisational and social factors are included as external variables in the model. As described in the following section, the literature suggests several external variables that can be added to TAM to increase the explanatory power of this research.

### Mobile Learning Adoption Model

*Perceived usefulness of mobile learning:* Mobile learning systems have demonstrated the usefulness of context-awareness support, providing appropriate information to support a student's university life at the right time and in the right place (Brown et al. 2006). In addition, use of mobile devices as an interactive tool in education has proven useful for increasing the communication between learner-learner and learner-instructor (Markett et al. 2006). This study examines the extent to which users perceive usefulness of mobile learning will influence their intention to adopt mobile learning, as expressed in the following proposition:

Proposition 1: Perceived usefulness of mobile learning will have a positive effect on the users' behavioural intention to adopt mobile learning.

*Perceived ease of use of the mobile learning:* Clarke (2000) found ease of use to be one of the five significant factors that determined general use of wireless handheld devices. An individual might have a higher intention to adopt mobile learning if they think mobile learning is easy to operate, leading to this proposition:

Proposition 2: Perceived ease of use of mobile learning will have a positive effect on the users' behavioural intention to adopt mobile learning.

*Attitude toward using mobile learning:* Attitude is an individual's positive or negative feelings about performing the target behaviour (Davis 1989). Chau and Hu (2001), and others, have demonstrated attitude toward using a technology is a significant determinant of behavioural intention. Chau and Hu also found that users are more likely to use new innovations if they have fun interacting with those innovations. Another study found that young students enjoy using a mobile learning application (Attwell 2005). The current study extends this research in the following proposition:

Proposition 3: Attitude toward using mobile learning will be positively related to the behavioural intention to adopt mobile learning.

*Subjective norm:* Subjective norm is the perceived social pressure to perform or not perform a given behaviour (Ajzen 1991). The more favourable the subjective norm with respect to a behaviour, the higher an individual's intention to perform the behaviour will be (Ajzen 1991). Various studies (e.g., Hausenblas et al. 1997; Johnson et al. 1999) have shown that subjective norm is an important determinant of user behaviour intention in information systems. Choi et al. (2003) used TAM to investigate adoption of interactive television and concluded that subjective norm had the greatest impact on behaviour intention.

In this study, subjective norm is the perceived social pressure to use mobile learning systems. Since potential users have never experienced mobile learning, social influence – by positive word-of-mouth from family, friends, and other adopters – will positively affect adoption, as specified in the following proposition.

Proposition 4: Subjective norm will have a positive effect on the users' behavioural intention to adopt mobile learning.

*Self-efficacy:* Self-efficacy is a person's judgement of their capability to organise and execute a course of action required to attain designated types of performance. Self-efficacy is based on research that shows that human behaviour is strongly influenced by people's motivation, perseverance and effort to surmount difficulties and perform successfully (Gist 1987; Wood & Bandura 1989).

In this study, self-efficacy is closely associated with what is known as system-specific computer self-efficacy (Bandura 1997) or specifically, a user's self-judgement of their ability to use a mobile learning system. Perceived knowledge has a significant positive influence on behavioural intention to adopt an information system in an extended TAM model (Mathieson 1991). This indicates that an individual with considerable experience in using a mobile device can be expected to have a higher intention to use mobile learning than an individual with little or no expertise, as expressed in this proposition:

Proposition 5: Self-efficacy will have a positive effect on the users' behavioural intention to adopt mobile learning.

*Perceived financial resources:* Perceived financial resources is the extent to which a person believes that he or she has the financial resources to use the information system, and it has been shown to be an important factor in IS adoption studies (Mathieson et al. 2001). In the mobile computing literature, perceived financial costs has a negative effect on behavioural intention to use a mobile application (Luarn & Lin 2005). In this context, an individual with a high level of financial resources might have a higher intention to use mobile learning compared with a person who has less financial resources. Accordingly:

Proposition 6: Higher perceived financial resources will lead to a higher intention to adopt mobile learning.

*Prior use of electronic learning:* A person is most likely to adopt information technology that is functionally compatible to technologies they have used before. For example, previous use of computers positively influenced adoption of phone-based services (Neuendorf et al. 1998) and previous telephone use has been found to be positively related to the adoption of online shopping, banking and investing (Eastin 2002).

In the case of mobile learning, it is appropriate to consider electronic learning or e-learning as an application of prior technology for the same activity. Electronic learning facilitates and enhances learning through the use of computer-based technology (Nagy 2005), so one expects that experienced e-learners will be comfortable with mobile learning and they are more likely to adopt it, as suggested in this proposition:

Proposition 7. Prior use of electronic learning will have a positive effect on the users' behavioural intention to adopt mobile learning.

When the external variables identified in this literature review – subjective norm, self-efficacy, perceived financial resources and prior use of electronic learning – are applied to the general TAM, the model to be tested in this research is shown in Figure 2.

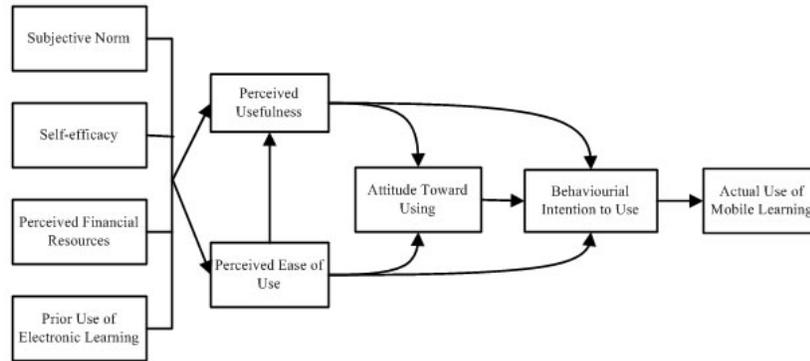


Figure 2: Mobile learning adoption model

## RESEARCH DESIGN

A quantitative research approach is usually used in studies intended to measure attitude (Creswell 2003). Additionally, if the research problem is identifying factors that influence an outcome, the utility of an intervention, or understanding the best predictors of outcomes, then a quantitative approach is preferable (Creswell 2003). This research examines seven factors that influence the adoption of mobile learning, thus a quantitative research approach is appropriate.

Several quantitative research methodologies exist (e.g., experiment, survey). Surveys are frequently used to test a theory or explanation (Creswell 2003), and especially when respondents are asked to provide information about themselves – for example, their attitudes and beliefs, demographics and prior or intended behaviours (Cozby 2004). The survey research methodology is appropriate for this research because it uses direct questioning to gather descriptive data to answer the questions posed in the seven propositions.

A survey instrument with 26 questions that addressed various aspects of the seven propositions was developed (see Appendix 1). A five-point Likert scale (i.e., “strongly agree” to “strongly disagree”) was used. A pilot study was conducted to insure the survey questions were easily and correctly understood.

The population of interest in this study is all students enrolled in New Zealand (NZ) universities. The sampling frame is all NZ university students who own mobile phones and PDAs, but because of limited resources, the primary focus is on six university campuses on New Zealand’s North Island. Convenience sampling, a form of non-probability sampling, is employed as the sampling strategy in this research.

In data collection, the survey was posted on the Web and the URL was promoted on advertisement boards on six North Island university campuses – Auckland University of Technology, Massey University (three campuses), University of Auckland and Victoria University of Wellington. The survey was also promoted to university students throughout NZ by viral messaging (e.g., Microsoft Messenger, ICQ). The online survey was posted on the Internet on 9 April 2008, widely advertised and available for seven weeks, until 29 May 2008.

The factor analysis technique was used for data analysis. Factor analysis is designed to group variables into a smaller number of factors by looking at the correlations between the variables (Rodeghier 1996). It is often used to determine whether a set of variables are related to an underlying dimension, in this case, users’ behavioural intention to adopt mobile learning. The statistical package SPSS was used to assist with this data analysis.

## RESULTS

During the seven weeks the survey was available, 184 people completed the survey. Four entries were not usable, so the final sample count was 180 responses.

### Demographical Profile

The demographic profile of the respondents is as follows:

- Sixty-one percent (61%) of the participants in this study were male and 39% were female.
- One third (33%) of the respondents were 18-20 years of age and slightly more (38%) were 21-23. The remaining 29% were older than 23 and so could be considered non-traditional students.
- As expected for a university student sample, two-thirds (66%) of the sample earned less than NZ\$5,000 per year and another 12% earned less than \$10,000. Only 22% earned more than \$10,000.
- Despite a low earning threshold, 85% of these participants own mobile devices with Internet functionality – smartphones, PDAs, Blackberries or iPhones. Thirteen percent (13%) do not have access to the mobile Internet and 2% didn't know.
- Many own an Internet-capable phone, but relatively few have a great deal of experience with it. Almost one-quarter (24%) access the Internet from their phones frequently (19%) or very frequently (5%). The largest proportion (39%) exercise moderate use of the mobile Internet; 21% do so infrequently and 16% not at all (this last percentage includes the 13% who do not own an Internet-capable device).
- Finally, the distribution of participants by university campus is shown in Table 1. Concerted efforts to promote the survey on Massey, AUT, Victoria University and University of Auckland campuses were rewarded with 97% of the respondents from these six campuses. Promotion efforts on other campuses was by messaging services and word of mouth, resulting in only 3% of the sample from these four campuses.

Table 1. Survey Respondents by University

	Students	Percent
Massey University (3 campuses)	83	46.1%
Auckland University of Technology (AUT)	39	21.7
Victoria University of Wellington	29	16.1
University of Auckland	23	12.7
Lincoln University	3	1.6
Otago University	2	1.1
Waikato University	1	0.6
University of Canterbury	0	-0-

### Data Analysis

Unconstrained factor analysis was used for analysis of the research results because this research is not based on an established instrument or hypothesis. Unconstrained factor analysis enables the data itself to determine some real-world construct and common themes among highly diverse questions (Field 2005).

Table 2 shows the mean of the summarised scores for each of the seven constructs examined in this research (i.e., responses to each of the questions associated with a construct were summed together and then a mean was calculated). The responses were ordered from 5 (strongly agree) to 1 (strongly disagree) with 3 as the middle response.

The means for five of the seven constructs were greater than 3.5. This indicates that most of the respondents agreed with the propositions on self-efficacy, perceived usefulness, subjective norm, attitude, and perceived ease of use. Two constructs – perceived financial resources and prior use of electronic learning – fell below the mid-point of 3. Of course, the mean of summarised scores are only indicative notions, it cannot determine of acceptance of the constructs. To do this, the data are further analysed in the following sections.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) was used to measure sampling adequacy and appropriateness of the factor analysis. The result was an MSA score of 0.834, which approaches the top of the scale at 1.0, indicating a high degree of sampling adequacy.

The Bartlett's Test of Sphericity was used to determine whether the original correlation matrix is an identity matrix. If the correlation coefficient value is less than 0.001, then the R-matrix is an identity matrix and the factor analysis is appropriate. The result of the Bartlett Test showed a Chi-square value of 1903.861 with a df value of 276 resulting in a significant value of 0.000, which is less than 0.001 and thus supporting the factor analysis. In other words, the model is a good fit for the purpose of this study.

Table 2. Question Map and Summarised Mean for Constructs

	Questions	Mean
Self-efficacy (SE)	23, 24, 25	3.86
Perceived usefulness of mobile learning (PU)	1, 11, 12, 17, 20	3.75
Subjective norm (SN)	6, 9, 14, 19	3.60
Attitude toward use of mobile learning (AT)	5, 13, 15, 21	3.60
Perceived ease of use of mobile learning (PE)	4, 7, 18	3.52
Perceived financial resources (PFR)	2, 22, 26	2.69
Prior use of electronic learning (PUE)	8, 10	2.41

Cronbach's Alpha was used to determine the internal consistency of each scale in this research. A Cronbach's Alpha coefficient close to 1.0 means that the questions are measuring similar dimensions of a factor. Although the general limit is > 0.7, a score > 0.6 would be acceptable because of the exploratory nature of this research. By this standard, any factor with a Cronbach's Alpha coefficient less than 0.6 should be eliminated. The reliability coefficients for the seven constructs examined in this study are reported in Table 3.

Table 3. Cronbach's Alpha Questionnaire Reliability Analysis

	# of items	Cronbach's Alpha	Accept
Attitude toward use of mobile learning (AT)	4	0.878	Yes
Perceived financial resources (PFR)	3	0.877	Yes
Self-efficacy (SE)	3	0.820	Yes
Perceived ease of use of mobile learning (PE)	3	0.809	Yes
Perceived usefulness of mobile learning (PU)	5	0.783	Yes
Subjective norm (SN)	4	0.732	Yes
Prior use of electronic learning (PUE)	2	0.455	No

As a result of the reliability analysis, four of the seven factors received Cronbach's Alpha coefficient greater than 0.8 and two were greater than 0.7, which indicates those six factors should be accepted.

Only one factor, prior use of electronic learning (PUE), is less than 0.6. PUE is composed of two items so a test of future item reliability was conducted to determine if the deletion of either item would increase PUE's Cronbach's Alpha coefficient to 0.6. It didn't and so the construct of prior use of electronic learning was rejected.

Because this is exploratory research, there is a need to verify the accuracy of the items in the constructs. Principal component analysis with a varimax rotation was selected for this test. Due to space limitations, the full results of this test are not reported here, but according to the rotated component matrix, seven components were identified and those were exactly same as the propositions stated earlier. The result is that there is no need to explore the formation of a further proposition. One result from this test revealed that question 11 in the perceived usefulness (PU) construct was viewed as an independent variable. Accordingly, the Cronbach's Alpha coefficient of PU was re-tested without question 11. The revised Cronbach's Alpha coefficient decreased to 0.775, but this was still above 0.6 and so PU was still accepted.

## DISCUSSION

The purpose of this study is to determine the key factors influencing the behavioural intention for adoption of mobile learning. Each of those factors is briefly discussed in this section, with some additional analysis from some of the survey questionnaire results and insight from the literature.

The one question that was outside the seven propositions discovered that intent to adopt mobile learning was quite high – over 76% of the respondents agreed or strongly agreed that they intend to use mobile learning in the future (questions 3 and 16). University students in New Zealand expect that mobile learning will enhance their learning activities if universities will provide facilities for mobile learning.

*P1: Perceived usefulness of mobile learning will have a positive effect on the users' behavioural intention to adopt mobile learning.* Collaboration learning experiences is considered to be a major benefit from mobile learning (e.g., Lundin & Magnusson 2003; Milrad et al. 2002; Viehland & Marshall 2005). The results of this

study support this. Eighty-four percent of the participants agreed/strongly agreed that mobile learning is useful because it could improve their collaboration with classmates on group assignments (Q20). Over 70% of the respondents believe that mobile learning would enhance their learning process (Q1) by allowing anytime-and-anywhere access to learning materials. A smaller percentage (56%) agreed the mobile learning would improve their grades (Q11). As noted in the previous section, the rotated component matrix showed this item did not contribute to their intention to adopt mobile learning.

*P2: Perceived ease of use of mobile learning will have a positive effect on the users' behavioural intention to adopt mobile learning.* There are a range of restrictions on mobile devices that could inhibit student access to learning applications, such as limited input capability, small screens and limited network bandwidth. So while a large number of students felt they could become skilful in using an m-learning application (64%; Q7) and learning to use the application itself would be easy (66%; Q18) a much smaller percentage (58%) believed they could fully utilize a mobile learning application (Q4).

*P3: Attitude toward using mobile learning will be positively related to the behavioural intention to adopt mobile learning.* Survey respondents agreed/strongly agreed that they would enjoy mobile learning (63%; Q5) and find it interesting (66%; Q15). They would also enjoy using a mobile learning application (68%; Q13) and learning to use it would be easy (66%; Q18). A key construct of the TAM posits that individuals have an intention to perform a certain behaviour based in part on their affective feeling about the system. Participants in this study have a very positive attitude about using mobile learning and this supports acceptance of this proposition.

*P4: Subjective norm will have a positive effect on the users' behavioural intention to adopt mobile learning.* Like all people, students consider opinions of family, classmates and others as important to their decision to adopt a new technology. Following the research of Hsu and Lu (2004), the questions in this study were designed to investigate this for three types of subjective norm. First, an individual will look for guidance from those they trust, such as family. In this study, 69% of the respondents agreed/strongly agreed their family would encourage them to use m-learning (Q6). Second, an individual attempts to adopt the behavioural norms of groups to strengthen their relationship with the group. In this study, 63% of the respondents think they would use mobile learning because of their friends' encouragement (Q9). Third, individuals usually expect reciprocal benefit, such as personal affection, trust, gratitude, and economic return, when they act according to social norms. Nearly 76% of the respondents think they would use mobile learning so that they do not feel left behind (Q14).

*P5: Self-efficacy will have a positive effect on the users' behavioural intention to adopt mobile learning.* The construct of self-efficacy scored highest in the mean of summarised scores (see Table 2), and the questionnaire results reflect that. More than three quarters (78%) of the respondents agreed/strongly that they would be more inclined to use mobile learning application if they had seen someone else using it before (78%; Q24), if a help facility was available (76%; Q23) and if they participated in a demonstration (78%; Q25). The demographic profile indicated that only 24% are frequent users of the mobile Internet. Despite limited experience, self-efficacy is high.

*P6: Higher perceived financial resources will lead to a higher intention to adopt mobile learning.* Generally, higher perceived income will lead to a higher intention to adopt a new technology (Mathieson et al. 2001), especially if there are user costs associated with it. Respondents expressed considerable concern about their ability to use mobile learning – only 11% agreed/strongly agreed that m-learning would be something they could afford (Q23). To explore this further, a separate analysis compared the high income group (>\$31,000) with low income group (<\$31,000). The response on all three questions related to this construct followed the same pattern – there was a large gap in affordability. For example, only 6% of the low income group agreed/strongly agreed they could afford mobile learning while the equivalent percentage for the high income group was nearly 79%.

*P7: Prior use of electronic learning will have a positive effect on the users' behavioural intention to adopt mobile learning.* Many studies have shown individuals are more likely to adopt innovations that are compatible with other technologies they have already used (e.g., Eastin 2002; Neuendorf et al. 1998; Rogers 2003). This study found that 73% respondents have used a desktop learning management system (Q8) and 57% of the respondents have used more than one (Q10). Despite strong support in the literature, this proposition was not accepted in this study and the rotated components matrix indicated that no solid theme could be identified separate from the construct of prior use of e-learning. This indicates this is not a contributor to the adoption of mobile learning.

Why? Even users who have minimal experience in e-learning still may have a high intention to adopt mobile learning. Similarly, a student may not adopt mobile learning even if he or she has a lot of experience in e-learning. To investigate this further we approached several of the students who participated in the pilot study. One pilot test participant with minimal experience in e-learning said "I do not access the WebCT often, but I still have a high expectation of mobile learning, because it gives me the chance to access learning material at anytime and anywhere, it also looks very cool." On the other hand, an experienced user of e-learning tools said "I access WebCT daily. But I think access learning material on a mobile is just too expensive and not efficient.

The screen of my mobile phone is just too small.” The feedback from these two individuals is the strongest indication we have for these results.

## CONCLUSION

The most important outcome of this study was to identify six key factors that influence the behavioural intention of users to adopt mobile learning; they are perceived usefulness of mobile learning, perceived ease of use of mobile learning, attitude toward using mobile learning, subjective norm, self-efficacy and perceived financial resources. Prior use of electronic learning is not considered a reliable factor that influences the behavioural intention to adopt mobile learning.

This research had several limitations, most of which lead to suggestions for future research. Due to a strict deadline for completion of the study, the survey questionnaire was only available online for seven weeks. Without this constrain, the survey could have been available longer and gathered a larger response. Similarly, increased resources would have allowed the promotion of the survey to reach more respondents in more universities. Despite these limitations, 180 participants is a respectable response and there is no indication that a larger sample would have produced different results. A final limitation is the reminder that this research only investigates the behavioural intention to adopt mobile learning. The research does not measure actual acceptance and use of mobile learning.

A suggestion for future research is an in-depth qualitative research approach to further investigate the quantitative research results of this paper. Qualitative research would answer some of the why and how questions raised in this study and to determine if there are additional factors beyond the seven identified here. Comparative research is also possible, between New Zealand and another country or between different universities or student groups.

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## APPENDIX 1: SURVEY QUESTIONS

The following 26 questions were included in the online questionnaire. Because of space limitations, demographic questions, explanations and instructions are deleted.

1. Mobile learning would enhance my learning process.
2. I have enough financial resources to pay for communication time, data access and text messages to use mobile learning.
3. To the greatest extent possible, I would use mobile learning to do different things, including download learning materials, complete online projects, collaborate with students and learn on the mobile.
4. I would find it easy to fully utilize a mobile learning application.
5. I would enjoy using mobile learning.
6. My family would encourage me to use mobile learning.
7. It would be easy to become skilful at using a mobile learning application.
8. I have lots of experience in using e-learning management systems on a PC (e.g. WebCT, BlackBoard, Cecil, AUT online, i.wakato, etc).
9. Most of my friends would encourage me to use mobile learning.
10. I have used more than one e-learning system on a PC (e.g. WebCT, BlackBoard, Cecil, AUT online, i.wakato, etc).
11. Mobile learning could improve my grades.
12. Mobile learning would give me greater control over learning.
13. I would enjoy using a mobile learning application.
14. I would use mobile learning so I did not feel left behind.
15. Using mobile learning would be interesting to me.
16. If I had access to a mobile learning application, I would use it.
17. Mobile learning would improve my self-discipline.
18. Learning to use a mobile learning application would be easy.
19. People whose opinion I value would encourage me to use mobile learning.
20. Mobile learning could improve my collaboration with classmates on group assignments.
21. I would have fun interacting with a mobile learning application using my mobile phone or PDA.
22. I have enough financial resources to pay for a phone suitable for mobile learning.
23. I would be more inclined to use a mobile learning application if it had a built-in help facility for assistance.
24. I would be more inclined to use a mobile learning application if I had seen someone else using it before trying it myself.
25. I would be more inclined to use a mobile learning application if someone showed me how to do it first.
26. Using a mobile phone or PDA for mobile learning would be something I could afford

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