



Enablers and Barriers to Academic's Acceptance of Technology: Can "Individual Differences" Make a Difference?

Maimuna Musarrat

Engineering and Science Education Research Group
Swinburne University of Technology

A/Prof. Birgit Loch

Engineering and Science Education Research Group
Swinburne University of Technology

Dr. Benedict Williams

Brain and Psychological Sciences Research Centre
Swinburne University of Technology

With the advances in technology the higher education sector is rapidly evolving. While some researchers are predicting the University of the Future to be more virtual, many academics at the coal face are still struggling to embrace emerging technologies. This paper reports the first stage of a project aimed at identifying the enablers and barriers for adopting new technology among Australian Higher Education academics. In this pilot study, academics who have integrated Tablet PCs in their teaching were surveyed. For a richer understanding of the enablers and barriers of technology uptake, focus groups will follow. The next stages of this research will be a wider survey open to all academics across universities. The ultimate goal of this project is to generate recommendations for universities in better managing the technological change.

Keywords: technology acceptance, academics, individual differences

Introduction

The fast-paced evolution of technology is requiring higher education institutions to go through many changes if they are not to be left behind by competitors who are embracing technology at a quicker rate. Some experts controversially (as reported by Williams (2011)) predict that physical universities will soon become extinct and that with the vast amount of information available on the web, students will be able to find the world's best lectures on the web without going to university.

Such predictions have not passed without criticism. Although Australian universities are "scrambling" to get involved with massive open online courses (MOOCs), it is still too early to predict how sustainable MOOCs will be over the long term (Norton, 2012). However, there is little doubt that universities are changing and that this change is happening quicker than expected leaving higher education institutions with many challenges.

One of the biggest challenges facing the higher education industry in the next few years, according to the NMC Horizon Report for Higher Education (Johnson et al., 2013), is that "most academics are not using new technologies for learning and teaching, nor for organizing their own research" (p. 10). There is no doubt universities urgently need to develop strategies to engage their staff in the uptake of new technologies for teaching and learning, or they risk being left behind.

The uptake of technology has been researched for more than a few decades and various models on *technology acceptance* have been developed and have evolved over time. Technology acceptance in academic contexts has also been highly researched – but with most researchers focusing on the end-users: the students. In contrast, acceptance of technology by mid-level users, i.e. academics at university level is not a highly researched area. The limited literature in this area and lack of a widely accepted and used model to engage tertiary teachers in the use of technology in their teaching suggest that there is scope for research on faculty acceptance and use of technology in the higher education sector.

Background

Technology Acceptance Model and its use in the Academic Setting

Most of the research involving technology acceptance is based on the Technology Acceptance Model (TAM), making it the most widely discussed model on technology acceptance so far. TAM was first proposed by Davis (1986) and, since then, has been tested and extended by many researchers. Overall, TAM has proven empirically successful in forecasting about 40% of a system's use (Legris, Ingham, & Colletette, 2003). The core concepts which drive most of this prediction are "perceived usefulness" and "perceived ease of use". Perceived usefulness is referred to as "the degree to which a person believes that using a particular system would enhance his or her job performance", while perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). TAM argues that actual technology usage is determined by intention to use, which in turn, depends on attitude towards technology. Attitude, on the other hand, is jointly determined by perceived ease of use and perceived usefulness (Tang & Chen, 2011).

The original TAM had been extended to TAM2 by Venkatesh & Davis (2000) where additional constructs spanning social influence process (subjective norm, voluntariness, image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, perceived ease of use) were incorporated, which were considered to influence perceived usefulness. Further extension of the model (TAM3) was proposed by Venkatesh & Bala (2008) where constructs based on "anchor" and "adjustment" were added to elaborate perceived ease of use.

TAM and its extensions have been tested and applied in various contexts, the academic setting being only one of them. In an attempt to apply TAM to an academic setting, researchers have added to the original constructs contained in TAM. Some additional factors that seem to have an impact on technology acceptance by academics are: individual differences, such as innovativeness (Kurulgan & Özata, 2010); concern for privacy and security (Flosi, 2008) and peer pressure (Salajan, Welch, Peterson, & Ray, 2011).

The existing literature on TAM and its application on academics is not very rich and there is more scope for research in this area. This project builds on TAM3 and specifically on "individual differences" that may have an impact on the technology acceptance of academics, in particular.

Enablers and Barriers to Technology Adoption by Academics

In addition to the constructs of TAM and its elaborated versions, researchers have also examined other factors regarding technology acceptance by academics. Ranging from individual to social, various factors can impact technology acceptance by academics (Mirriahi, Dawson, & Hoven, 2012). In a case study that investigated teacher beliefs and integration of a learning management system, Steel & Levy (2009) recommended that in the case of technology integration "one size does not fit all" (p. 1021) and that the diversity in teacher's beliefs must be acknowledged. Similar recommendations are provided by Ertmer (2005) when he suggested that teachers' practices are rooted in teachers' pedagogical beliefs and that it is impossible to change teachers' practices if teacher's pedagogical beliefs are overlooked.

These literature conform that the difference in individual beliefs and attitude towards teaching of each academic should be addressed while managing the change associated with integration of technology at a university.

Managing Technology Integration in Higher Education Institutions

Recent researchers have looked into the implementation of innovation strategies in universities. In his PhD dissertation, Schneckenberg (2007) suggests that active faculty involvement in the change process is required for successful integration of technology in higher education. In a later paper, Schneckenberg (2009)

recommended university leaders to implement innovation strategies that are tailored to academic's real learning needs and motivation.

In addition, in their study of South African universities, Czerniewicz & Brown (2009) suggest that universities with "supportive, flexible, non-restrictive institutional policies" would provide the most conducive environment for innovation by staff in the classroom (pg. 130). Phillips (2005) looked into the management of change associated with integrating technology in the Australian context and concluded that although institutional factors do have an impact on technology adoption, the main factors are human – and these are the ones that need to be addressed for an effective technological change.

About the Project

This project was initiated from the growing need for an effective technological management program in higher education institutions. Its aim is to identify how human factors such as individual differences of academics have an impact on academics' integration of technology. The outcome of the project will be recommendations to help universities better manage the technological change.

This paper discusses results from a small-scale survey, which is the first stage of this project. This project is an exploratory study consisting of multiple stages.

In this pilot stage, a group of academics who have integrated a Tablet PC in their teaching for more than a year were surveyed to identify certain factors that influenced their use of technology. This survey will be followed up by a focus group which will better clarify the findings from the pilot stage. In the second stage, a larger scale university-wide survey will be conducted to validate the findings from the first stage small-scale survey. This survey will be designed based on the findings from the first stage. Analysis of the findings from the second stage survey will then be the basis for the formulation of recommendations for technology integration in higher education institutions. We hope to eventually extend this investigation to other universities.

Stage 1 Preliminary Findings

The link to an online survey was sent through email invitation to 43 faculty members of the Faculty of Engineering and Industrial Sciences at Swinburne University of Technology who have been implementing tablet technology in their face to face teaching or in the preparation of teaching material. The first invitation was sent out in late May, 2013 and two reminder emails were sent in early and late June. A total of 14 academics responded to the survey.

This number of responses is too small to generalise, but some of the responses are intriguing and call for further investigation. Generalisation may follow from the larger scale survey informed by these initial responses.

The most interesting findings and how they relate to TAM are summarised below:

- "Because it is fun", "because I like it", "because I like using technology" "to better interact with students" are some of the main reasons that academics reported they use the technology for. These can be related to the constructs "computer playfulness", "computer anxiety", "perceived enjoyment" of TAM3 (Venkatesh & Bala, 2008).
- "Peer pressure" and "pressure from authority" were among the least important reasons for teaching with a Tablet PC.
- The biggest barriers to technology uptake were statements, such as "time commitment to learn", and "time commitment to use". Any version of TAM does not directly address time commitment, but it may be a determinant of perceived ease of use.
- Academics were asked how much they believe themselves to be a "motivator". Most of the academics who reported they were high on the scale of motivator also implemented the tablet in their face to face teaching; and the main reason for their tablet use was "to improve their teaching in innovative ways".
- Academics were asked how much they believe themselves to be an "entertainer". The majority of the teachers who scored themselves highly on the entertainer scale also implemented the Tablet PC in their teaching.
- Academics who strongly identified themselves as a "motivator" thought that the most

significant outcome of teachers using technology was “motivated/engaged student” and “high student achievement”. It could be that teachers who are motivators are encouraged to see motivated students and that could be a reason why they like using technology.

Discussion and Future Directions

We acknowledge that by the nature of surveying such a selected group of academics (all have already taken up a tablet PC for face to face teaching and/or related tasks), we can only report on one technology, and on the individual differences of this homogeneous group. It is too early to generalise any of the findings from this small-scale study. More representative conclusion will be drawn once further stages of this project are complete. The preliminary findings from stage one conform to some extent with the literature in the finding that human factors, such as “liking technology” “motivation” etc. may have a positive impact on technology acceptance. However, the findings cannot be generalised and they call for more research into technology acceptance of academics. Factors that could be considered are personal beliefs, values, individual differences such as personality factors, teaching styles, to name just a few. Larger scale surveys of users and non-users of technology need to be done to make a comparison between these groups. A range of educational technologies, including newly emerging trends such as MOOCs, also need to be addressed in future studies. Readers are encouraged to provide feedback regarding how to enrich this project and identify future directions.

References

- Czerniewicz, L. & Brown, C. (2009). A study of the relationship between institutional policy, organisational culture and e-learning use in four South African universities. *Computers & Education*, 53(1), 121–131.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319–340.
- Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4), 25–39.
- Flosi, A. B. (2008). *Course management software: Applying the technology acceptance model to study use by post-secondary faculty*. Unpublished doctoral dissertation, Nova Southeastern University, FL, United States.
- Johnson, L., Becker, S. A., Cummins, M., Estrada, V., Freedman, A. & Ludgate, H. (2013). *NMC Horizon Report: 2013 Higher Education Edition*. Austin, Texas: The New Media Consortium.
- Kurulgan, M. & Özata, F. Z. (2010). Elektronik Kütüphane Hizmetlerinin Öğretim Elemanları Tarafından Benimsenmesinde Etkili Olan Faktörler: Anadolu Üniversitesi Öğretim Elemanları Üzerinde Bir Araştırma. *Information World / Bilgi Dnyasi*, 11(2), 243–262.
- Legris, P., Ingham, J. & Collette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & management*, 40(3), 191–204.
- Mirriahi, N., Dawson, S. & Hoven, D. (2012). Identifying key actors for technology adoption in higher education: A social network approach. In *Future Challenges / Sustainable Futures. Proceedings ascilite Wellington 2012*. Retrieved from http://www.ascilite.org.au/conferences/wellington12/2012/images/custom/mirriahi%2c_negin_-_identifying_key.pdf
- Norton, A. (2012). *Mapping Australian higher education*. Carlton, Victoria, Australia: Grattan Institute. Retrieved June, 12, 2012.
- Phillips, R. (2005). Pedagogical, institutional and human factors influencing the widespread adoption of educational technology in higher education. In *Proceedings ascilite 2005*, 541–549. Retrieved from http://www.ascilite.org.au/conferences/brisbane05/blogs/proceedings/62_Phillips.pdf
- Salajan, F., Welch, A., Peterson, C. & Ray, C. (2011). Faculty Perceptions of Teaching Quality and Peer Influence in the Utilization of Learning Technologies: An Extension of the Technology Acceptance Model. In *Proceedings of the International Conference on e-Learning*, 335 – 343. Retrieved from <http://ezproxy.lib.swin.edu.au/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eht&AN=62796307&site=ehost-live&scope=site>
- Schneckenberg, D. (2007). *eCompetence Development Measures for Faculty in Higher Education-A Comparative International Investigation*. Doctoral dissertation, Universität Duisburg-Essen, Germany.
- Schneckenberg, D. (2009). Understanding the real barriers to technology-enhanced innovation in higher education. *Educational Research*, 51(4), 411–424.
- Steel, C. & Levy, M. (2009). Creativity and constraint: Understanding teacher beliefs and the use of LMS technologies. *Proceedings ascilite Auckland 2009*, 1013–1022. Retrieved from <http://www.ascilite.org.au/conferences/auckland09/procs/steel.pdf>
- Tang, D. & Chen, L. (2011). A review of the evolution of research on information Technology Acceptance Model. *Business Management and Electronic Information (BMEI) Vol.2*, 588–591.

- Venkatesh, V. & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273–315.
- Venkatesh, V. & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, 46(2), 186–204.
- Williams, L. (2011). University of the Future. *Uniken, Autumn*(60), 12 – 15.
<http://newsroom.unsw.edu.au/news/social-affairs/university-future>

Author contact details:

Maimuna Musarrat, mmusarrat@swin.edu.au

Please cite as: Musarrat, M., Loch, B. and Williams, B. (2013). Enablers and Barriers to Academic's Acceptance of Technology: Can "Individual Differences" Make a Difference? In H. Carter, M. Gosper and J. Hedberg (Eds.), *Electric Dreams. Proceedings ascilite 2013 Sydney*. (pp.607-611)

Copyright © 2013 Maimuna Musarrat, Birgit Loch, Benedict Williams.

The author(s) assign to ascilite and educational non-profit institutions, a non-exclusive licence to use this document for personal use and in courses of instruction, provided that the article is used in full and this copyright statement is reproduced. The author(s) also grant a non-exclusive licence to ascilite to publish this document on the ascilite web site and in other formats for the Proceedings ascilite Sydney 2013. Any other use is prohibited without the express permission of the author(s).