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Relationship of Ubiquitous Technology Usage with Technology Competency

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Abstract— The objectives of the study were to (i) identify the level of U-Tech usage, (ii) determine the undergraduates' U-Tech competency level and (iii) determine whether there was a significant relationship between U-Tech usage and U-Tech competency. A total of 400 undergraduates from four faculties were randomly selected. The study employed the survey method in which the data were gathered through a 5 point-Likert scale questionnaire. The questionnaire consisted of 5 items (demographic information), 42 items (U-Tech usage) and 42 items (U-Tech competency) with the reliability of 0.958 for U-Tech usage and 0.971 for U-Tech competency. Data were analyzed descriptively (mean, percentage, frequency and standard deviation), and inferentially (Pearson correlation). The findings of this study revealed that majority of the undergraduates were at high level of U-Tech usage (mean = 4.39, SD = .895). The overall level of u-tech utilisation among the undergraduates was moderate, and the overall competency level of the undergraduate in using u-tech was observed to be moderate. Finally, results revealed that, there was a significant and positive relationship ($r = 0.335$; $p < 0.01$) between the undergraduates' use of U-Tech and their competency level.

Keywords- ubiquitous technology, Technical Undergraduates, Use , Competency

1. Introduction

In this digital era and with the technology-innovation pace, the most recent form of technology, the ubiquitous technology or *U-Tech,* has emerged and played an important role in diversifying educational settings. U-tech devices such as smartphones, laptops and tablets (Lei, 2010, Saadiah, 2010, Levin & Bruce, 2001) are gaining recognition as tools, not only to serve their original and basic purposes for communication, entertainment and organization, but also to be used as a strong mediator in education to support learning. Majority of the undergraduates incorporate U-Tech in classrooms and laboratories to assist them learn more effectively because this technology provides better understanding to them on what they are learning (Guetl, Chang, Edwards & Boruta, 2013). There are many factors that influence U-Tech usage including competency which have been identified to have affects on the use of U-Tech among undergraduates. Such factors have been explored in previous research (eg. Kadel, 2005; Mudasiru & Modupe, 2011). Successful integration of U-Tech depends largely on the competence of undergraduates in using and understanding the role of these digital and advanced technologies either for learning or leisure purposes.

Simply having the sophisticated U-Tech in hand and in the institution will not guarantee effective usage. Regardless of the quantity and quality of technology placed in classrooms, the key to how those tools are used is the undergraduate themselves. Therefore, undergraduates must have the competence and the right attitude towards technology (Kadel, 2005). Major technology competencies required were highlighted by Ahmad, Abdul Karim and Albakri (2013) to include competency in making personal use of the tools, mastery of a range of educational paradigms that make use of it, competency in making use of the tool as mind tools, competency in using technology as tools for learning which involves use of the technology and competency in understanding the standard dimensions of the use of U-Tech for learning.

Utilization of Technology in Technical University

Higher education system in Malaysia is designed to ensure that public higher education institutions will have the ability to build a reputation to be dynamic, competitive, able to anticipate and overcome the challenges ahead and be prepared to act effectively, as well as keep pace with globalization. It also focuses on the efforts to improve the ability of universities to perform the functions and responsibilities more efficient, transparent and effective in creating an excellent facilitating environment for their students. To date, MoE has listed out 11 universities as a focused university including four Malaysian Technical Universities which focusing more on the technical and engineering field and committed to be an excellent innovation-driven university. The four Malaysian

Technical University Networks or MTUN are Universiti Teknikal Malaysia Melaka (UTeM), Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Malaysia Pahang (UMP) and Universiti Malaysia Perlis (UniMAP).

These universities are committed in producing excellent and skilled manpower to contribute to the advanced industrial countries especially in Malaysia, and at the same time aim to produce a ready technology-competence graduates for a direct fit with the requirements of the IT industry (TaskForce on Meeting and Human Resource Challenge for IT and IT enabled Services, 2003). On the other hand, the Engineering Accreditation Commission (EAC) of Accreditation Board for Engineering and Technology (ABET), has identified technology use skills, technology competency, multi-tasking and the ability to identify, formulate and solve engineering problem as part of the key themes in their assessment of skill trend.

Benefits of Ubiquitous Technology Utilisation

i) Promoting Flexibility in Learning

In higher learning, the use of u-tech as a learning tool could provide authentic learning opportunities for students, especially for engineering and technical students who need clear and explicit examples or stages in connecting electronic circuits, without the chance of doing it hands-on (Beetham & Sharpe, 2013). A study conducted among engineering educators and students showed that with technology, engineering educators were able to draw on the applications to simulate real-world environments and create actual arenas for experiments for their students. With technology too, their students could carry out 'bona fide' tasks as real workers, explore new environments, meet people of different cultures and employ a variety of tools to gather information and solve problems (Rodríguez, Granados & Muñoz, 2013).

ii) Promoting Engagement in Learning

Student engagement is used to 'depict students' willingness to engage in routine learning activities, such as attending class, submitting required assignments and following teachers' directive' (Manuguerra & Petocz, 2011). Several alternatives have been demonstrated to promote students engagement. Educators can intensify students' engagement by persuading their students to become more active participants in learning by providing collaborative opportunities for educational research, planning, teaching and evaluation (Martin et al., 2013).

iii) Promoting Collaborative Learning

Collaborative learning refers to the environment in which engage learners in a task where each individual depends on and is accountable to each other. These include both face-to-face conversations and computer discussions such as online forums and chat rooms via videoconferencing (Moores, 2013). Generally, collaborative learning is about working together where knowledge can be generatedby sharing experiences and taking on symmetry roles (Wali et al., 2014). Collaboration represents a virtue in the online world. Rather than working on a one-to-one basis, technology enables students to collaborate with one another and work with a range of interactive and instructional resources.

iv) Promoting Personalised Learning

In the 21st century, students learn best when lessons are tailored to their individual interests, strengths and challenges (Arshad & Scott-Ladd, 2010). A study conducted in Malaysia by Mokhtar and Huoy (2013) found that with wireless classrooms and electronic instruction let students study at their own pace. Personalisation makes learning more adaptive and timely and this frees educators from the usual tasks such as marking papers manually and gives them more time to serve as instructional coaches for students. Personalised learning with u-tech puts learners at the centre of the education process. Here, students' activities are customised based on what they need to learn where learning can be received either one-on-one or in small groups. At the same time, with the use of technology, educators are able to track their students'progress and give feedback at real-time.

v) Promoting Speed in Information Accessibility

A continuous flow of information among users is often hailed as the important feature of u-tech (Gupta, 2013). For example, when using u-tech, the students are provided with numerous channels of input and output, thereby augmenting their efficiency in learning. According to Hwang et al. (2008), with technology, there are five combinations of interaction occurring namely learner-content, learner-teacher, learner-learner, learner-interface and learner-community. Students can access databases, contact other students, send messages to lecturers, work within the interface of the technology and systems provided, connect to community-wide discussion areas or connect to social network system like Facebook® and Twitter to keep them up-to-date with the latest news or to amass information.

vi) Promoting 21st Century Skills

In Malaysia, in regard to a review of the relationship between technology and 21st century skills, Fadzil and Abdol Latif (2011) reported that with the utilisation of new technology, students were able to produce high-calibre work with a range of technology providing opportunities for creativity. The researchers found that students utilised u-tech to exhibit creative thinking, increase knowledge and develop innovative products.

Technology Competency

BrckaLorenz, Haeger, Nailos and Rabourn (2013) refer to technology competency as the ability to handle a wide range of computer applications for various purposes which can be achieved through the process of learning, acquisition of knowledge and development of skills in using technology. In the context of engineering and technical education, technology competency is interpreted as the perceived skills, abilities, knowledge and other characteristics displayed by students (Passow, 2012). Technology competency is also considered as the most important skill that should be acquired by the engineering graduates before they enter the workforce. This is important, because the students are expected to deal with and be involved in technical skills while in the workforce, which require them to handle and utilise a wide array of technologies and machines (Male, Bush & Chapman, 2010). According to ISTE understanding of the technology competency pattern can also be based on the standards developed, which is NETS.S. The NETS.S serves as a set of standard in nurturing the practice of enhancing certain skills with the utilisation of technology in school up to university level as well as assisting students to promote 21st century skills.

A study conducted among engineering students in India by Goel (2006) concluded that technology competency had influenced the use of technology. He discovered that most undergraduates had excellent competency in using technology and this had influenced them to use the technology for learning. However, from the study, Goel found that most students used technology only for lower cognitive thinking level such as for specific subjects and as a general tool; the technology was not being used to its fullest capability. The use of technology for higher cognitive thinking at the level of analysis, synthesis, and evaluation was still lacking due the limited opportunities and exposure given to the students.

2. Problem Statements

Although many attempts have been made to identify undergraduates' U-Tech usage in higher education around the world, there is mostly superficial literature in this area (Abdullah, Wan Mohd Amin, Masor, Mohammad & Amirdin, 2011). In most studies that have been conducted, many have merely focused on the lecturers' and students' ICT literacy, rather than the use of U-Tech (Ahmad & Bakhtiari, 2007). In fact, there is little information available on how U-Tech is being used among technical undergraduates. Moreover, the field also lacks data to actually determine the level of U-Tech usage among the undergraduates and their competency level. Hence, this study fills the gap in the existing literature by determining the level of U-Tech usage and U-Tech competency level among undergraduates in one Malaysian Technical University Networks (MTUN). It also determined the undergraduates' U-Tech usage according to the National Educational Technology Standard for Students (NET.S).

3. Objectives

The study attempts to achieve the following objectives:

1. To identify the level of U-Tech usage among technical undergraduates.

2. To examine the competency level of technical undergraduates in the use of U-Tech.

3. To determine whether there is any significant relationship between technical undergraduates' use of U-Tech and competency level.

4. Methodology

This research deployed a survey method using a questionnaire to investigate the level of U-Tech usage among engineering students and their competency level. The questionnaire consisted of Section A (eight items on socio-demographic information), Section B (42 items on U-Tech usage and 42 items on ICT competency). The instrument was validated by a panel of experts and pilot tested. Based on the pilot study the obtained reliability was 0.96 for U-Tech usage and 0.97 for U-Tech competency. Data were analyzed descriptively (mean, percentage, frequency and standard deviation), and inferentially (Pearson correlation) using SPSS version 17. All items in the section B were measured on a five-point Likert scale.

5. Findings

Demographic Information

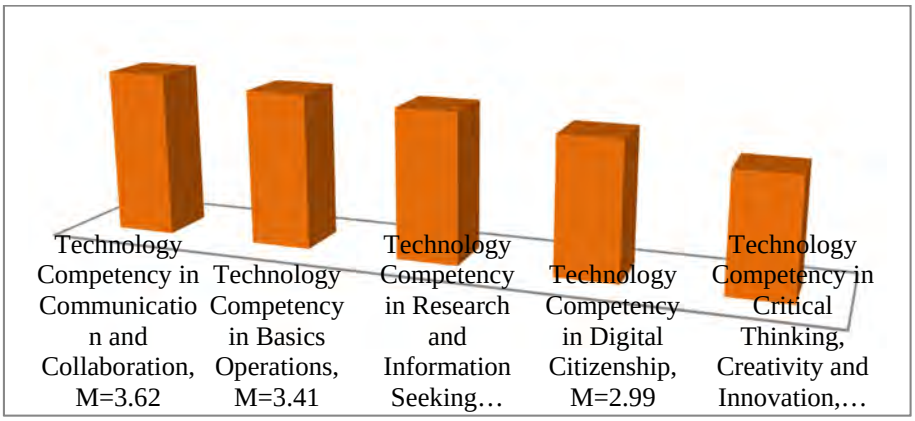
A total of 400 undergraduates from four universities participated in this study. Most undergraduates were from UTeM (n=175, 44%), followed by UTHM (n=154, 38%) and UniMAP (n=42, 11%). The least number of undergraduates was from UMP (n=29, 7%). The gender distribution was almost equal among undergraduates;

male (n=208, 52%) and female (n=192, 48%). The age of undergraduates varied from 22 to 25 years old. Many of the undergraduates were around 23 years (n=165, 41%). Those, of 22 years (n=113, 28%). Undergraduates of age 24 (n=79, 20%) and the fewest undergraduates were at the age of 25 (n=43, 11%).

Undergraduates' Level of U-Tech Usage

Results revealed that the overall level of u-tech utilisation was moderate. A majority of undergraduates (n=229, 58%) perceived their utilisation level as moderate, 168 (41%) undergraduates high with a maximum score of 223, and 3 (1%) undergraduates perceived their utilisation level as low with a minimum score of 98. From 229 (58%) undergraduates who perceived their utilisation level as moderate, 110 (28%) were males and 119 (30%) were females. From 168 (41%) undergraduates who perceived their utilisation as high, 95 (24%) were males and 73 (17%) were females. Finally, 3 (1%) undergraduates who perceived their utilisation as low, were all males.

Patterns in Competency in Using Ubiquitous Technology According to Categories



The highest competency in using u-tech was as a communication and collaboration tool (M=3.62, SD=.95), followed by basic operation tool (M=3.41, SD=.920), research and information seeking tool (M=3.28, SD=.95) and digital citizenship tool (M=2.99, SD=.93). Competency in using u-tech as a critical thinking, creativity and innovation tool was perceived as the lowest competency (M=2.57, SD=.99).

Relationship between technical undergraduates' U-Tech usage and competency level

The Pearson's correlation coefficient was used to examine the relationship between the undergraduates' use of U-Tech and their competency level. The correlation results between the research variables. Results revealed that, there was a significant and positive relationship (r =0. 335; p<0.01) between the undergraduates' use of U-Tech and their competency level. The results indicated that undergraduates who used U-Tech very often have higher competency than those that never or occasionally used them. In other words, undergraduates who have high competency level tend to use U-Tech more frequently than the others.

Correlation Analysis between Relationships of technical undergraduates of U-Tech usage and U-Tech Competency Level

		U-Tech usage	U-Tech competency
U-Tech_usage	Pearson Correlation	1	.335**
	N	400	400
U-Tech competency	Pearson Correlation	.335**	1
	N	148	148

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

6. Discussion and Conclusion

The study also shows that there is a significant and positive correlation (r = 0.335, $p < .01$) between undergraduates' U-Tech usage with their competency level. Hence, it is assumed that when undergraduates have high competency, there is a relative advantage in using U-Tech fully, perhaps for the higher level of thinking, such as in expressing complex concepts. This finding is consistent with those of Abdullah Abdullah, Wan Mohd Amin, Mansor, Mohammad Noor and Amirudin (2011) and Ahmad, Abdul Karim, Din and Albakri (2013) in which competency was the most influential factor related to technology use. Both studies reported that many users were in agreement that having sufficient technology competency and skills were primary importance in the successful and effective utilisation of technology.

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