

RELATIONSHIP OF THE UTILIZATION OF UBIQUITOUS TECHNOLOGY AND TECHNOLOGY COMPETENCY AMONG UNDERGRADUATES IN MALAYSIAN TECHNICAL UNIVERSITIES

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ABSTRACT

The aim of this paper is to present part of a study done related to the utilization of Ubiquitous Technology among undergraduates in Malaysian Technical Universities. The objectives of the study were to identify (i) the ubiquitous technology utilization level (ii) the undergraduates' technology competency level and (iii) whether there was a significant relationship between the utilization of ubiquitous technology and technology competency. A total of 101 undergraduates were randomly selected. The study employed the survey method in which the data were gathered through a 5 point-Likert scale questionnaire. Data were analyzed descriptively (mean, frequency and standard deviation), and inferentially (Pearson correlation). The findings of this study revealed that majority of the undergraduates were at high level of ubiquitous technology utilization Also found, the undergraduates had high level of technology competency. In addition, results demonstrated that there was a significant relationship between utilization and technology competency.

KEYWORDS: Ubiquitous technology, Utilization level, Technology competency, Engineering undergraduates

1.0 INTRODUCTION

Technology is referred as a diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information. These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephone (Abas, 2009; Wan Ali, 2009). Technology also covers product that will

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store, retrieve, manipulate, transmit or receive information electronically in a digital form (Steven, 2012).

In this digital era and with the technology-innovation pace, most recent form of technology that has emerged and played as a role in diversifying educational settings, that technology is an advanced-mobile technology or ubiquitous technology. Ubiquitous technology devices such as mobile phones, smartphones, laptops, computer tablets, Personal Digital Assistants (PDAs), iPods (Jobs, 2011, 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, also to be used as a strong mediator in education to support learning.

According to Garfield (2008), ubiquitous technology is a term used to describe types of advanced-mobile communication and latest digital technologies. Ubiquitous technologies feature with built-in applications and Internet access/WiFi, as well as text messaging, e-mail, Web browsing, video cameras, MP3 player, GPS navigation device, video viewing and able to make either voice or video calling. Finding by Lance (2012) stated that users are using ubiquitous technology more often to new purposes rather than to what they are intended for in the first place.

Meanwhile, according to a definition given by (Singh, 2010) ubiquitous technology is a convergence of mobile and wireless technologies that commonly used for communication and searching information. These technologies also act as a mediator in helping learners to accomplish more complex tasks such as completing analysis (Stephen, 2012), research as well as collaborating with others software (Jurvansu, 2011). Other characteristic of ubiquitous technology is its pervasiveness in nature and unobtrusively embedded in the environment, completely connected, intuitive, pervasive and persistent, effortlessly portable, constantly available (Job, 2011) which allows users to access information flexibly, calmly and seamlessly (Jones, 2011).

The utilization of ubiquitous technology namely; a laptop, smart phone and tablet, in learning is widespread. Most universities in Malaysia are also moving towards enhancing learning by using the hybrid approach of providing traditional lectures as well as tutorials and supplementing this with ubiquitous learning (u-learning) options (Alias & Zaitun, 2006).

There are many factors that influence the utilization of ubiquitous

technology including technology competency. Such factors have been explored in previous research (Kirschner & Woperies, 2003; Kadel, 2005; Mudasiru & Modupe, 2011). Successful integration of ubiquitous technology depends largely on the technology competence of undergraduates in using and understanding the role of these digital and advanced technologies for learning purposes.

1.1 Utilization of Ubiquitous Technology in Higher Learning

Higher education is a linchpin of any countries economy and society. Meanwhile teaching and research at universities and colleges contribute significantly to the nation's economic activity, both directly and through their impact on future growth in teaching and learning as well as the nation gain from the learning and innovation that occurs in higher education.

To date, Ministry of Higher Education has listed out 12 universities as a focused university including four Malaysian Technical Universities which concentrating more on the technical and engineering field and committed to be an excellent innovation-driven university. The four Malaysian Technical University Networks (MTUN) are Universiti Teknikal Malaysia Melaka (UTeM), Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Malaysia Pahang (UMP) and Universiti Malaysia Perlis (UniMAP).

In line with the focus of MTUN as a focused-university, 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 (Task Force 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.

New technology has brought significant changes in technical and engineering education (Dutta, 2010). These education fields have also undergone profound changes due to recent technological advancements (Harden, 2002; Davis & Harden, 2001). Most engineering and technical programs in higher institutions particularly in the developed countries, have invested heavily in technology, not only to deliver education, but also to improve the quality of services that health professionals provide.

In fact, international organizations such as the United Nations (UN) have acknowledged technology as a useful tool to address education in engineering and technical programs especially in developing countries (Drury, 2005).

Nowadays, technology such as high-end laptops, smartphones and tablets are widely used among the undergraduates either for learning or leisure purposes. Such technology is being used in order to enhance better quality of learning such as for downloading notes, taking attendance and communicating with others (El-Gayar, 2010; Fadzil, 2010). Now, Malaysian Technical Universities have done much better from their previous years since their inceptions in term of governance, leadership, academia, teaching and learning and also in research and development. They have not only produced high-skilled graduates, but also skilled in theory which gears towards applied with particular emphasis on the more practical components of the conventional universities. These at the same time, uphold one of the long-term objectives on human capital development as stated in the National Higher Education Action Plan which to empower Malaysian higher education, in order to meet the nation's developmental needs and to build its stature both at home and internationally.

1.2 Technology as Operations and Concepts Tool

Based on the standard, technical undergraduates should be able to use U-Tech effectively by selecting the most relevant information using appropriate search engines either for academic or leisure purposes. Basically, for this standard they should be able to independently use an appropriate search engine while looking for information, compare and later select the most relevant information that suit with their needs. On top of that, students should be able to use ubiquitous technology effectively for basic use like capturing picture, installing software and accessing to the latest application available in the web. All these skills should be done independently without getting help from anyone. This is to ensure that, students are absolutely capable in operating and utilizing the ubiquitous technology for basic use.

2.0 PROBLEM STATEMENTS

Although many attempts have been made to identify undergraduates' utilization level in using technology in higher education around the world, there is mostly superficial literature in this area of ubiquitous technology (Ahadiat, 2005; Sedek, 2012). In most studies that have been

conducted, many have merely focused on the lecturers' and students' ICT literacy, rather than the utilization of ubiquitous technology (Sedek, 2012). In fact, there is little information available on how ubiquitous technology is being used among engineering undergraduates. Moreover, the field also lacks data to actually determine the utilization level of ubiquitous technology among the undergraduates and their technology competency level. Hence, this study fills the gap in the existing literature by determining the utilization level and technology competency among undergraduates in one Malaysian Technical University Networks (MTUN).

3.0 OBJECTIVES

The study attempts to achieve the following objectives:

1. To identify the utilization level of ubiquitous technology among undergraduates.
2. To examine the technology competency level of undergraduates.
3. To determine whether there is any significant relationship between the utilization of ubiquitous technology and technology competency.

4.0 METHODOLOGY AND FINDING

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 utilization level and 42 items on technology competency) with the reliability of 0.958 for utilization and 0.971 for technology competency. Data were analyzed descriptively (mean, frequency and standard deviation), and inferentially (Pearson correlation) using SPSS version 18. All items in the section B were measured on a five-point Likert scale. A total of 101 undergraduates were randomly chosen from five faculties.

4.1 Demographic Information

The demographic information of the participants is given in Table 1 below. The table indicates that 39.6% (n=40) were male while 60.4% (n= 61) were female. Undergraduates who participated in this research were from five different faculties. Majority of the undergraduates was from the Information & Communication Technology faculty

(29.7 %), followed by Electrical Engineering (26.7%), Manufacturing Engineering (15.8%), Electronics & Computer Engineering (14.9%) and the least was from Mechanical Engineering (12.9%). With regard to undergraduates' ubiquitous technology ownership, almost all of them had a laptop (96%) and a smartphone (82.2%), meanwhile only 17.8% of the undergraduates owned a tablet. However, technology wise, this did not imply that the undergraduates were not exposed to use ubiquitous technology but it was perhaps due to their 'technology-choice'.

Table 1. Demographic information of participants

Measure	Description	Frequency	%
Gender	Male	40	39.6
	Female	61	60.4
Total		101	100
Faculty	Information & Communication	30	
	Electrical Engineering		29.7
	Manufacturing Engineering	27	
	Electronics & Computer Engineering	16	26.7
		15	15.8
	Mechanical Engineering	13	14.9
			12.9
Total		101	100
Technology Ownership	Laptop	97	96
	Smartphone	83	82.2
	Tablet	18	17.8
Total		101	

4.2 Undergraduates' Utilization of Ubiquitous Technology

This section of the questionnaire aimed to investigate the utilization level among undergraduates for learning purposes. For each item undergraduates were asked to tick appropriate option(s) and also indicate their frequency of use (i.e. 1- never; 2- rarely 3- sometimes; 4- often; 5- very often). The utilization level among the respondents were based on the mean scores of the six subscales of the variable which were technology as operations and concepts tool, technology as research and information fluency tool, technology as communication and collaboration tool, digital citizenship, technology as critical thinking, problem solving and decision making tool and technology as creativity and innovation tool.

However, for the purpose of this article, only the level of U-Tech use for the first subscale; technology as operations and concepts tool will be reported. All these subscales were adapted from the National Educational Technology Standard for Students (NET.S). The utilization level of ubiquitous technology were categorized as: Low ($0 \leq M \leq 1.33$),

Moderate ($1.34 < M \leq 3.26$), and High ($3.27 < M \leq 5$).

The findings as in Table 2 shows that majority of undergraduates was at high of utilization level ($M=3.86, SD=.895$). The overall results indicates the highest mean is the item related with "I use ubiquitous technology to select the most relevant information using appropriate search engine or directory for my studies (Mean = 4.38, $SD=.823$). Majority of the undergraduates used U-Tech very often to access Web 2.0 application such as Facebook, Twitter and YouTube for learning ($M=4.36, SD=.994$), while 54.5% used U-Tech to save files and documents and 45.5% used them to install freeware and application.

Furthermore, results indicated that the usage of U-Tech for downloads music video and capture pictures were at high level too. This shows that majority of the undergraduates use U-Tech very often as operations and concepts tool.

Table 2. Utilization Level of Ubiquitous Technology

Item	NVR	RA	ST	OFT	VOFT	Mean	SD	Level
I use ubiquitous technology to:	F	F	F	F	F			
save files and document	2	3	7	34	55	4.36	.890	High
set an event reminder (e.g. time and place)	4	13	23	29	32	3.71	1.160	High
capture pictures	4	19	30	18	30	3.50	1.213	High
capture videos	8	30	29	15	19	3.07	1.235	High
download music video	5	9	25	25	37	3.79	1.177	High
organize files into folders	4	11	19	26	41	4.14	.990	High
access Web 2.0 applications (YouTube, Facebook etc.) for learning purposes	3	2	9	29	58	4.36	.994	High
select the most relevant information using appropriate search engine or directory for my studies	2	2	4	41	52	4.38	.823	High
select the most relevant information using appropriate search engine or directory information for other purposes	5	8	18	37	33	3.84	1.120	High
install freeware / application	5	8	13	29	46	4.02	1.166	High

NVR= Never RA= Rarely ST= Sometimes OFT= Often VOFT= Very Often

4.3 Undergraduates' Technology Competency Level

This section of the questionnaire aimed to investigate undergraduates' technology competency level. For each item they were asked to tick

appropriate option(s) and also indicate their competency level (i.e. 1- no skills in this area; 2- limited skills in this area; 3- fairly skillful; 4- skillful; 5- very skillful). Undergraduates' technology competency level were identified based on the mean scores of the six subscales of the variable which were technology as operations and concepts tool, technology as research and information fluency tool, technology as communication and collaboration tool, digital citizenship, technology as critical thinking, problem solving and decision making tool and finally, technology as creativity and innovation tool.

For the purpose of this article, only the utilization level of ubiquitous technology as operations and concepts tool will be reported. This subscale was adapted from the National Educational Technology Standard for Students (NET.S). Three levels of ubiquitous technology utilization and technology competency were categorized as: Low ($1 \leq M < 2.0$), Moderate ($2.1 \leq M < 3.0$), and High ($3.1 \leq M \leq 5$). The overall findings demonstrate that the technology among technical undergraduates was at high level ($M = 4.12, SD = .764$).

The results in Table 3 are on undergraduates' technology competency based on the technology as operations and concepts tool subscale only.

Table 3. Undergraduates' Competency based on the Technology as Operations and Concepts Tool

Item	NS	LS	FS	SF	VSF	Mean	SD	Level
I use ubiquitous technology to:	F	F	F	F	F			
save files and document	2	2	12	33	52	4.30	.900	High
set an event reminder (e.g. time and place)	2	2	20	32	45	4.15	.942	High
capture pictures	2	5	18	29	47	4.13	1.007	High
capture videos	4	7	28	33	29	3.75	1.007	High
download music video	5	2	19	27	48	4.10	1.091	High
organize files into folders	2	4	11	28	56	4.31	.956	High
Access Web 2.0 applications (YouTube, Facebook etc.) for learning purposes	2	2	16	23	58	4.32	.948	High
Select the most relevant information using appropriate search engine or directory for my studies	2	4	13	35	47	4.20	.949	High
Select the most relevant information using appropriate search engine or directory information for other purposes	4	4	20	40	33	3.93	1.022	High
Install freeware / application	4	4	14	33	46	4.12	1.052	High
NS= No skills	LS= Limited skills	FS= Fairly skillful	SF= Skillful	VSF= Very skillful				

The result in Table 3 above indicates that the technology competency level of undergraduates in the utilization of ubiquitous technology as a mediator for operations and concepts tool was high. Most of the respondents reported that they are competent on most of the items where they were able to perform a task using ubiquitous technology as well as assist others. It shows that 51.5% of undergraduates were very competent in saving files and documents with the help of ubiquitous technology (M=4.30, SD=.900) while 57.4% of them were capable to organize files into folders (M=4.31, SD=.956).

Meanwhile, least number of undergraduates (n= 28) were not competent in capturing videos using ubiquitous technology; however it was not meant that they were low competent users in this area. Finding showed that, although least number of them was very often to utilize ubiquitous technology for capturing videos, they were still high competent in this area.

4.4 Relationship between the utilization of ubiquitous technology and technology competency

The Pearson’s correlation coefficient was used to examine the relationship between technical undergraduates’ utilization of ubiquitous technology and their technology competency level. Table 4 presented 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’ utilization of ubiquitous technology and their technology competency level.

The results indicated that undergraduates utilize ubiquitous technology very often as they have higher technology competency. In other words, undergraduates with high technology competency level tend to utilize ubiquitous technology more frequently than the others.

Table 4. 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	.456**
	N	101	101
U-Tech competency	Pearson Correlation	.456**	1
	N	101	101

5.0 DISCUSSION

The finding shows that, ubiquitous technology was used as operations and concepts tool and most widely used for accessing Web 2.0 applications (e.g. Facebook, YouTube etc) for learning purposes. The least used of ubiquitous technology was for capturing videos.

Majority of the undergraduates organize files into folders, save files and also their documents with the help of ubiquitous technology. This could be due to the fact that the most technology that they have is laptop. Laptop is commonly used by most of the undergraduates in learning and at the same time used it for saving and organizing their learning documents into folders.

The study also shows that there is a significant and positive correlation ($r = 0.456$, $p < .001$) between undergraduates' utilization of ubiquitous technology with their technology competency level. Hence, it is assumed that undergraduates who make daily use of ubiquitous technology as operations and concepts tool are more competent compared to those with a lower rate of adoption. Eventually, when undergraduates have high technology competency, there is a relative advantage in using ubiquitous technology as others tool, perhaps for the higher level of thinking, such as in expressing complex concepts.

6.0 CONCLUSION AND IMPLICATION

This study has discovered that most of undergraduates in Malaysian Technical Universities are at the high level as well as very competent in the utilization of ubiquitous technology as operations and concepts tool. The relationship between students' ubiquitous technology utilization and technology competency level highlights their ability to use ubiquitous technology namely; laptops, smart phones and tablets and how they would use these digital and advanced technology for learning purposes.

The findings and information gathered from this study would hopefully be able to increase the knowledge and deepen the understanding of how these factors may lead to a better use of ubiquitous technology, which would help the planning and implementation of ubiquitous learning environment for Malaysian higher learning institutions especially in Malaysian Technical Universities.

This study may help to determine factors affecting undergraduates in Malaysian Technical Universities in using ubiquitous technology

either in supporting learning. In unison, this research has a potential in providing functional information for all Malaysian Technical Universities administration in devising on strategies to be implemented before embark in transforming respective universities towards ubiquitous learning environment as well as make an appropriate technological response to these changing world conditions, both for the betterment of the students and academician as well.

Lastly, it is hoped that the findings of this study will benefit the education system especially at higher learning institution which may lead and motivate the practical technology implementation not only in higher learning but also in education system as a whole to enable the goals of Vision 2020 be attained.

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