PERCEIVED MOBILE TECHNOLOGY ATTRIBUTES, TEACHER'S MORALE AND TEACHING INNOVATION: A STUDY AMONG SECONDARY SCHOOL TEACHERS IN PENANG

ALEX GOON BENG TATT

Research report submitted in partial fulfillment of the requirement for the degree of Master of Business Administration

UNIVERSITI SAINS MALAYSIA

2014

ACKNOWLEDGEMENT

This research project would not be a success without the love, support and guidance from many people. First and foremost, I would like to express my sincere and utmost gratitude to my supervisor, Dr. Tan Cheng Ling, whose expertise, understanding, guidance, and flexibility have helped me through the course of doing this project. I truly appreciate for her valuable knowledge and skills in many areas, especially in the process of writing.

Apart from that, I would like to thank to my parents and sister who had shown continuous support and encouragement that motivates me psychologically and taking care of me during throughout the project period. Besides, I would like to record my deepest appreciation to my fellow friends, who has helped me with this project. They are the people who always entertain me when I was in frustration and facing difficulty by showing me positive energy and hilarious action, which at least made me feel relieve and weight off of the shoulder. Not to forget, I feel grateful to the Ministry of Education for approving my application letter to conduct survey in the selected schools. I would like to also thanks to all principals and teachers of the schools for allowing me to be able to collect my data in specified time frame.

Last but not least, I feel thankful to all GSB lecturers and staffs for their aids which had come in any form. Without the help from all parties, the completion of this thesis would have been impossible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRAK

Tujuan kajian ini adalah untuk mengkaji pengaruh teknologi mudahalih (seperti pembelajaran, kemudahan, kecekapan, kebolehcapaian, fungsi, kebolehgunaan dan mudahalih) sebagai inovasi di dalam proses pengajaran di kalangan guru-guru sekolah menengah di Pulau Pinang, Malaysia. Tambahan, moral guru juga telah digunakan sebagai factor pengantara dalam kajian ini. Kaji selidik ini telah dijalankan ke atas 20 buah sekolah menengah kebangsaan dengan sejumlah 10 orang guru daripada setiap sekolah .Kajian ini telah membina satu rangka kerja berdasarkan Theory of Acceptance Model (TAM) dan Motivational Model. Data yang diperolehi telah dianalisis dengan menggunakan alat statistik SPSS dan SmartPLS. Dari kajian ini, dapat ditunjukkan bahawa daripada tujuh sifat teknologi mudahalih di atas, empat daripadanya (kecekapan ,kebolehcapaian, fungsi dan kebolehgunaan) adalah berkadar langsung dalam penghasilan pengajaran yang berinovasi. Semangat guru juga ad amemberi kesan tambahan yang penting sebagai pengantara di antara empat sifat dan inovasi pengajaran. Sebagai kesimpulannya, adalah penting bagi teknologi mudahalih untuk memainkan peranan kepada guru bagi membolehkan mereka menjadi lebih inovatif dalam penyampaian pengajaran mereka kerana hal ini secara langsung akan member kesan kepada pelajar-pelajar mereka.

ABSTRACT

The purpose of this research is to examine the influence of perceived mobile technology attributes (learnability, simplicity, efficiency, accessibility, functionality, usability, and portability) to teaching innovation among secondary school teachers in Penang, Malaysia. Moreover, teacher's morale has as well been used as a mediating factor in the study. The survey had been conducted among 20 national secondary schools, with 10 teachers as respondents from each school. The research had built a framework based on the Theory of Acceptance Model (TAM) and Motivational Model. Data collected was analyzed using SPSS and SmartPLS statistical tool. This study had shown the result that out of seven mobile technology attributes, four of them (efficiency, accessibility, functionality and portability) were significantly related with teaching innovation. Teacher's morale also had a significant mediating effect in mediating between these four attributes with teaching innovation. In summary, it is important for mobile technology to play a role in teacher in order for them to be more innovative in the teaching method as this will directly give effect to their students.

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter starts with the outline of the study. In the introduction, it encompasses the background of the study, research problem, research objectives and research questions. It also includes the significance of the study, definitions of variables and organization of thesis.

1.1 Background of study

Education has been playing a very important role in everybody's life. In fact, it can be considered as"equipment" for people to gain knowledge and act on it when dealing with certain situation, especially when in the society. According to Belinda (2006), it is undisputed that many learning institutions are finding ways to incorporate technology into traditional teaching methods for learning efficiency. Transition are being made today in most universities. All these changes from traditional learning to mobile learning are driven by the economic pressure and demands for students to function in a knowledge society (Franklin & Peat, 2001).

Facing the quick change in the society, challenges of globalization, rapid change in technology, economic transformation international competition and local development in new era, teacher education institutions in the Asia-Pacific have undergone a number of educational reformations (Cheng, 2009). Among all these reformation, teachers, as well as the schools itself, are forced to face different kind of unpredictability and challenges that come from their internal and external environment impacts. As a result for that, teacher is now bearing a greater and more

complex role. New responsibilities will be built on teachers' shoulder not only delivering classes, but also in charge of school management, curriculum planning and development, mentoring new teachers, staff development, school-based action learning projects, working and communicating with parents as well as outside leaders and professionals (Cheng, Chow & Tsui, 2001; Boles & Troven, 1996)

The future scenario in education is highly depending on the effectiveness of the teaching process. Educational excellence is the hope and target in the society, and to achieve this excellence, it is inevitable for teacher to play a role along it. Teacher stands out as the main agent to accomplish excellence in education. In today's education context, some creative and innovative changes in the teaching process among teachers need to be instilled. Teachers with creativity and innovation are role-playing to make the vision a success. Conservative way of thinking that has been haunted them for long time must be freed and reserved in the teaching methods. Just like the chalk and talk method, now is longer relevant in today's teaching process (Mahasan, 2003).

Because of the fast changing of the society and transformation, innovation has become a mandatory capability in life. Innovation is a process that involves the changing of context which in turn produces imagination, creativity and new energy. As mentioned by the former US President Bill Clinton once said "*the knowledge-based economy is science and technology as fuel, innovation as power*." Hence, innovation, critical thinking, problem solving and the ability of applying technology in the new education in the era of knowledge-based economy is crucial for future citizen (Su, 2002). When applied to problem solving, it is often called as reframing, restructuring or reforming. Creative education has become the main function of the future education as creativity is the creative flame of innovation. To develop a

potential for the sake of educational reform and economic development, creativity and innovativeness is vital.

According to Lailinanita (2008), teaching innovation is a redevelopment of creativity where new methods are meant for certain teachers to ensure their teaching objective is accomplished. She also mentions that being innovative in teaching is to increase the problem solving skills in the education system. Innovation in teaching is deemed as an effort to change the learning process that could raise the quality of curriculum, places for teaching and learning, professionalism of teachers and as well the outcome of the educational management.

In Malaysia, change and innovation in education have been taking place since the Independence in 1957. The development of education system in Malaysia is reflecting the multi-faceted role it assumes in creating a united Malaysian society. In the forces of moving vigorously ahead, the development of human resources, talents, skills and creativity is the ultimate goals. In the mission statement of the Ministry of Education, it states that "to develop a world class quality education system which will realize the full potential of the individual and fulfill the aspirations of the Malaysian nation" (Haji Azmi, 2000).

In schools, innovation can happen provided the school principals are able to endure with uncertainties and deviation from traditional ways of teaching that could create innovative teachers. Having teachers to be innovative, they can make the teaching process better and may find ways to make teaching become more interesting to students. However, not every school in Malaysia or even foreign school could stand up to this application in their education system. To incur innovation impact into teaching process in school, it requires the openness of school

principals and teaching to look at problems in multiple aspects. For instance, if the main task of teacher's mindset rest purely on making sure student passing examinations, they will be automatically trapped into a narrow perspective where they are limiting themselves to be innovative when delivering lesson to the student, or their innovative initiative to reconstruct the alternative method of teaching.

As in Malaysia, institutes of higher education are moving towards to a more multimedia-oriented classroom style, where technologies are now being part of the teaching methods. According to Neo and Neo (2004), they mention that there is already a move to create multimedia courseware in education institutions. As in the elementary and secondary schools in the United States of America, the chalk board is no longer available in the classroom. It is evident that nowadays a lot more student-centered learning is taking place where the students are driving some of the instructions that could be instead of chalk board, or the interactive white board that can engage student. There is a lot of mobile technology that is being infused into classrooms nowadays. With the involvement of mobile technology playing its part in teaching method, there is certainly be a lot more research or project based learning instead of the tradition teaching that had been done for the past decades.

Technologies in school are actually evolving long time ago. For instance, in science subjects, the focus is to having student to actively engage in the learning through the process with mobile technology as an integral part of that learning process. And process is developed, and technologies have to support that, and as technologies are developed, the process is adjusted.

Giving the importance of mobile technology adoption has associated with the potential influence on teaching innovation. The study aims to examine the direct

relationship between mobile technology attributes on teaching innovation, as well as to examine the role of morale as the mediator on the direct relationship

1.2 Research Problem

Mobile technologies has been a belief that it stands in a position to be a complete necessity to almost everybody's life, from adolescent to adult, even the senile are playing along with all these advancements. Mobile devices do not only exist for personal entertainment purpose, they have also been used as a technological tool in many sectors, For instance, in health sector, "digital health" has become the main key focus for the technology industry. Apps that measure heart rate, blood pressure, glucose and other bodily function are multiplying, and Google, Apple and Samsung have launched platforms that make it easier to integrate medical and health service. All these have proven that mobile technology has actually evolved in every sector, from conventional way of handling to an innovative way.

To researcher knowledge, the innovation practice in Malaysia's education is still considerably low. Ever since from 1980s, there have been a lot curriculum innovation carried out and some believe that, this action had been executed even earlier in the year 1960 and 1970, that was considered as year to give attention to curriculum realization process. At that moment, lots of (Fullan, 1991). Apart from that, back into the past where Berman (1978) noticed that almost all the researches that had been done proved that the acceptance of innovative curriculum programs was not the main issue but the execution was. As a matter of fact, not much of innovative idea that had been successfully carried out in the classroom while the curriculum enactment was still an agenda and its importance in raising the education system. Due to lack of innovative evidence in the primary and secondary education,

the Malaysia's Education Minister, Tan Sri Muhyiddin Yassin urges teachers to continually improve themselves as they are the agents of change needed to educate Malaysian student during the national Teachers Day celebration themed "Teachers: Creating Creativity, Generating Innovation" in May, 2014. He also expressed that ordinary teachers direct students along the right path but innovative teacher inspire student to seek their own path. Such innovative teacher will encourage students to discover their talents. Teachers should be ready to accept change and be equipped with innovative skills.

According to Lailinanita (2008), there are two main factors while carrying innovation, which are the constraints in executing and the opportunities of encouraging. The constraints mentioned here are the obstacles to achieving the objective that has been determined at the end of the lesson. It has been thought that curriculum innovation gives implication to curriculum and the education institution itself. And recently, problem arises while executing innovation in education during the time when Datuk Seri Najib Tun Abdul Razak had made different kind of curriculum changes while he was still an Education Minister. However, these changes in curriculum planning have not taken into account the opinion from the public and education professions, and it had come to an aggressive debate over it. Consequently, this has created a lot of woes.

First of all, teachers are not well prepared to accept and carry out the new curriculum as planned by the Ministry. As stated by Laffey (2004), teachers are not sufficiently prepared for teaching technology implying an inadequacy in the technology training of teachers. And this will cause the teaching and learning realization fall far from what has initially been targeted by the government. As mobile technology involve in part of innovation process, Shuldman (2004) says that

on the current state of technology integration revealed that creating a better understanding of how technology can be applied in normal classroom could be the solution to the problem of technology integration in teaching innovation.

Secondly, teachers have not been given a space to voice out their opinion about the new innovative curriculum planning and this renders less interest and excitement for teachers to embrace and execute it. Having no involvement in the planning, it is high probable that the teachers will reject the recommended innovation method as they will, deep in heart, think that these innovation has nothing to do with them as they have not been involved or be part of it. Reversely, this effort could be their disturbance in carrying out their duty as a teacher. Therefore, when comes to something to do with educational innovation, teacher should be the first and main to be involved as they have wider role as an educator.

Besides, the knowledge available regarding the new innovative curriculum obtained from the cascading model indirectly will lower the teacher's understanding in order to carry the innovative effort in a more effective way. Lailinanita (2008) also mentions that the new innovative teaching for the new curriculum planning has shown the bad sign and impact. There is still no solid evidence to prove that technology could be teacher's replacement in classroom. From the aspect of social and political, this effects of new innovative teaching for the new curriculum planning, without prior and proper plan, will cause the destabilization to the society and politic in the country, as this will render the inequality of the academic achievement that would wider up the gap between race and social class.

In conclusion, teacher's understanding about innovation is important for the plan to be a success implementation. Even though we have a stable education

guideline, it does not mean the guideline itself will not be having any problem. Failure in effectively carrying out teaching innovation will cause severe impact to the receiver, which are students

1.3 Research Objective

This study attempts to fulfill several objectives as below:

1. To examine the influence of perceived mobile technology attributes (learnability, simplicity, efficiency, accessibility, functionality, usability, portability) on the teaching innovation.

2. To examine the influence of perceived mobile technology attributes (learnability, simplicity, efficiency, accessibility, functionality, usability, portability) on the teacher's morale.

3. To examine the influence of teacher's morale on the teaching innovation.

4. To examine whether the teacher's mediates towards the relationship between perceived mobile technology attributes (learnability, simplicity, efficiency, accessibility, functionality, usability, portability) and teaching innovation

1.4 Research Question

1. Do the perceived mobile technology attributes (learnability, simplicity, efficiency, accessibility, functionality, usability, portability) influence the

teaching innovation?

2. Do the perceived mobile technology attributes (learnability, simplicity, efficiency, accessibility, functionality, usability, portability) influence the teacher's morale?

3. Does the teacher's morale influence the teaching innovation?

4. Does the teacher's morale mediates the relationship between perceived mobile technology attributes (learnability, simplicity, efficiency, accessibility, functionality, usability, portability) and teaching innovation

1.5 Definition of Variables

Discussed below are the variables used in this study and its definition for the purpose of this study:

1.5.1 Teaching Innovation

Teaching innovation is referring to how innovativeness involved during the teaching process and is when teachers use multi-faceted and lively teaching methods, and diversified and rich content to stimulate students' inner interest in learning. By doing this, student's positive attitude can be developed towards proactive learning and enhancing students' learning ability (Wu, 2002).

1.5.2 Learnability

This attribute relates to the speed of how a user can finish a task when first using an application. It also measures the how quick can a user improve their performance level (Ziefle, 2002).

1.5.3 Simplicity

Simplicity refers to the comfort level of user use the application to complete a specific task given (Ziefle, 2002). This attribute usually looks at the preface and navigation design of the mobile application. For instance, mobile technology, such as smartphone that has small screen with sensitive touch-screen detector and neatly built list structure of menu will affect users; performance and feelings.

1.5.4 Efficiency

Efficiency is defined as the pace user need when accomplishing a task through the usage of application. It also measure the speed of user perform the task after they have known the way to use the application. Main variable that has been identified in this attribute is time (Nielsen, 1997)

1.5.5 Accessibility

Accessibility refers to the conveniences of using mobile technology, where wireless network or internet could be accessed at anywhere in anytime. Tele-

conference, e-commerce, mobile email and so on could be executed at anywhere as long as there are network accessibility.

1.5.6 Functionality

In this attribute, it means the functions of the application, in terms of quantity and quality of the features, functions and tools that have been designed and would be at user's interest while using it. For instance, software installed such as Watsapp application, talk-box, email, recorder, calendar and so on.

1.5.7 Usability

Usability refers to the measurement of quality of application based on several features. Prior to conducting the usability study, the designer of the application have to decide on what attributes they want to measure as each difference may be reviewed with different method and variables. It also refers to the simplicity of understanding, learning, remembering and using the device and its tools.

1.5.8 Portability

Klopfer et al (2002) defines portability as the small size and weight of mobile device means they can be taken to different sites or moved around within a site.

1.5.9 Teacher's Morale

Teacher's morale was operationalized from the teacher 's perspective to include the enjoyment of using technology, perception of colleagues' morale

regarding technology use, opportunities for collegial sharing of technology ideas and uses, satisfaction with work environment and extent to which the position provides professional growth and is satisfying (Baylor & Ritchie, 2002).

1.6 Significance of Study

This study is expected to provide noteworthy theoretical and practical foundation and evidence to researchers in the research area of teaching innovation, mobile technology attributes, and teachers' morale.

This study further strengthen the theory of Technology Acceptance Model (TAM) where the mobile technology attribute as the influence factor that will lead to the increase of teacher's morale, and in turn improve his/her teaching innovation. From the theoretical perspective, it is observed that for teacher to have the intention to use a mobile technology, their perception towards the advantage and functions of the mobile technology is crucial in determining that. Teacher's morale as a mediating factor between these mobile technology and teaching innovation will also be observed through the development of Motivational Model. If a teacher is motivated through the usage of mobile technology, the enjoyment of using it will be assembled and bring it towards their teaching method in order to be more innovative.

Practically, this study contributes to the explanation of innovation teachers have in their teaching in school. Innovation is the product of cognition and directly determined by three interrelated factors: the mindsets, the intelligences and the generic competencies. The potential of innovation emerged in schools are determined based on how these three crucial factors are administered and nurtured by the cognitive process of teaching in the school system. The development of

creativity and innovation presents a challenge to educators and it is increasingly apparent that innovation depends on particular attention on the individual students. Teachers have to know well each of their student so that the best possible efforts can be provided for them.

With technology playing along in the education, Cheng (2009) mentions that in facing up the challenges and impacts of globalization, high technology, economic transformation, international competition and local development in the new century, teacher education institution in the Asia Pacific have made numerous educational reforms. As a result from that, it is believed that the traditional pre-service teacher education that emphasizes solely only on delivering subject knowledge has to be changed to a new pedagogical way, with less IT-absent environment. According to Cheng, with the effectiveness of innovation in teacher education will help to determine several matters:

i. How well the innovation can be through the technology globalize, localize and individualize student teachers' professional learning and development?

ii. How well the innovation can maximize teachers' professional learning opportunities through establishing the borderless technology environment, local and international networking, and various types of innovative learning programs?

1.7 Organization of Thesis

There are five chapters all together included. Chapter 1 illustrates the background of study, problem statement, research objective, research questions, and definition of variables. Chapter 2 presents the literature review, theoretical framework and hypotheses development. Chapter 3 will be discussing on the research methodology applied for this research as well as the detailed measurements and questionnaire. Chapter 4 will illustrate on the questionnaire's finding, data analysis and result. And last but not least, Chapter 5 will summarize and conclude on the research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter covers the literature on the dependent variable, which is teachers' innovativeness, independent variables, which are the Perceived Mobile Technology Attributes adopted at school (learnability, simplicity, efficiency, accessibility, usability, functionality and portability). On top of that, moderating variables, level of competency, will also be examined on the relationship. Teacher's morale will also be reviewed in order to test on its mediating function in between dependent variable and independent variables. In this chapter, theoretical framework developed.

2.1 Innovation

When innovation is taken in, especially in information technology, generally it is defined as the enthusiasm of an individual seeks out something different from the new technology. When talking about technology acceptance, innovativeness usually refers to the extent of interest in trying a new thing, new concept, or innovative product or service (Roger, 1995). It is acknowledgeable that innovativeness acts as a key for organizational capability. Researchers have certified the capability to innovate contributes to the performance of technology organization and direct firms to profitable result and outstanding business performance. Information and communication technologies have now become a crucial instrument for lots of service firms. The impressive of information and communication technologies can influence the *productivity* and growth of an organization. This has turned the technological advancement under the spotlight for service industries.

There are many types of innovation and they can be categorized as product innovation, process innovation, radical or incremental innovation, administrative or technological innovation (Utterback, 1994; Cooper, 1998). Process innovations focus on changing the process of the product or services that is manufactured or rendered. Technically, it can also be defined as a new organizational attempt to swift the production and service processes (Barney, 1991), and involve developments in processes, systems, and reengineering activities, for instance like constructing or improving methods in service operations (Khazanchi, Lewis & Bower, 2007).

Process innovation has been classified as firms' organizational ability to assemble, incorporate, and control organizational resources to improve or construct new processes. It also refers to organization's capability to involve in developing innovative ideas, experimentation, and creativity so that the production and management processes can be improved via the introduction of new production methods, new management approaches, and new technology (Wang & Ahmed, 2004). Through innovation, products or processes are difficult to duplicate and slow to disperse outside the organization as they require substantial organizational change as well as realignments in management philosophy, in which could lead to competitive advantage (Hayes, Pisano, Upton & Wheelwright, 2005). From the shift from manufacturing to service industries, the role of process innovations are even greater in service settings whereby customers can communicate directly with the operating environment since new services often require new operating capabilities (Hayes, Pisano, Upton & Wheelwright, 2005).

Product innovation, according to Zirger (1997) has been a most important interest that leads to significant antecedent to product success, which also link to sustainable business success. Decisive innovations allow organization to yield

dominant position in the competitive marketplace, and afford new comers a chance to obtain a place in the market (Danneels & Kleinschmidt, 2001). Besides that, product innovation has also been perceived as the contribution to newness, novelty, originality, or uniqueness of products (Henard & Szymanski, 2001). The attribute of newness includes two aspects, first is from the consumers' perspective and second is from the firm's perspective (Atuahene-Gima, 1995; Cooper & Brentani, 1991; Danneels & Kleinschmidt, 2001). From the customers' perspective, s such as innovation attributes are regarded as methods of product newness. Whereas from the firm's perspective, environmental familiarity and project-firm fit, and technological and marketing aspects are viewed as dimensions of product innovation.

Market innovation somehow relates to product innovations or product-market innovation. Market innovation basically refers to innovation on market researching, advertising and promotion (Andrews & Smith, 1996), as well as discovery of new market opportunities and entry into new markets (Ali, 1995). Organization with market innovation emphasis can easily make an entry into market or identify a new market place and launch products with advanced technological application. Furthermore, organization could also make market innovation with existing products through the adoption of new marketing programs in order to endorse the products and services. Although they are treated as salient factors, product and market innovation are inevitably intertwined.

2.2 Teaching Innovation

The process of being innovative is decisive in knowledge society and this could be explained by the fact that, this society is based on knowledge management, new technological knowledge production and their dissemination through more

effective electronic devices. Therefore, education must adapt itself to the society demand and each person must be able to learn during their lives. As technology is taking place, its usage in education represent a crucial encouragement and support in the learning process, but do not eliminate teacher assisted learning traditional methods (Vasilache, 2008). In fact, usage of technologies in educational process had resulted positively, in the sense of reducing the time in the training process, the possibility to adapt programs to the learner's needs, and reducing cost of continuous education (Isaila & Smeureanu, 2010).

Bruce (1989) says that innovation in teaching and learning happens in the interaction between the learner and the learning environment when the right skills and strategies are applied to technology use, turning it a favourable tool for teaching by developing between teaching effectiveness. Lin (2002) has faith that teacher that are innovative will have an open mind, the ability to think "out-of-the-box" and reflect on teaching. She also believes that innovative teacher is able to use cogitative skills of reflection, questioning, deconstruction, and reconstruction to guide students to learn correctly and develop student's critical thinking and creative capabilities. Chen (2010) defines teaching innovation as the ability of teacher having the creativity, designing and applying new and diverse teaching methods or activities, having a clear idea on individual differences of students, cultivating student's learning motivation and interests, enhancing student's learning effectiveness, either before teaching, during teaching and student assessment.

Lee (2011) consolidates and conceptualizes teaching innovation into two dimensions and their operational definitions:

i. Innovation of teaching methods means the method of teacher uses is new and meaningful. For instance, the application of cloud technology, online education, use of electronic whiteboard to solve teaching issues and able to lead the teacher's creativity into place.

ii. Innovation of course design means the implementation of innovative course design that motivates student to apply knowledge with practical basis, flexible innovative capability, have the student to be a more substantial contribution to relevant areas in the future.

2.3 Importance of Teaching Innovation

In United Kingdom, the Department of Innovation, Universities and Skills in 2008 claim innovation as essential to their economic prosperity and quality of life. They believe that innovation is crucial for the country to meet the economic and social challenges of the 21st century. In fact, the UK government has implemented the need for the state schools to foster their teacher and student the new capacities of innovative thinking, to enhance the development of skills in areas of science, technology, engineering and math. As our world has now become a knowledge-based economy, the ability to be innovative has now been a decisive source of competitive advantage. Innovation provides the ability to develop new methods, markets, and opportunities and be more disciplined to reach organizational goals. Florida (2002) and Davies (2005) claim that a tiny but speedily growing population of teachers or educators is comprised of creative people with diverse characteristics. They are innovative and energetic individuals, who commence, raise and contribute new ideas, which hence, create economic and social progress (Pitta and Fowler, 2005).

2.4 Perception on Mobile Technology

There are two areas involve when talking about mobile wireless technology, mobility and computing (Malladi & Agrawal, 2002). It can be defined as a technological tool for user to connect or access to network at anytime and anywhere without using wire or cable to link to wired LAN network. It can also allow data transmission and communication in between others with no limitation of location and time. Mobile technology has been widely used, for instance in Ballard High School in Seattle, Washington, usage of handheld devices by student to organize personal information, assignment calendar, contacts and to-do lists (Brown, 2001). Apart from that, there are some employees that is working in a mobile office have the corresponding communication tools and technologies as a guide of assistance on their work without time and space limits. Definition of mobile office, according to Bredin, (2001), is a temporary office at different locations such that employees could carry on with their works by using technologies anyway, anytime and anywhere. For example, in the year of 2000, Intel has actually mould the Virtual Private Network (VPN) architecture to start a wide-ranging internet access of the company. Furthermore, some efficient maintenance that has involvement in the usage of mobile technology, also focus on mobile device architectures, in which the mobile device can be of a assistance for the maintenance engineer to perform maintenance tasks (Campos, Jantunen & Prakash, 2009). This can help in bringing maintenance management one step nearer to the daily practice in the field and lead to more efficient maintenance operations.

2.4.1 Dimensions of Mobile Technology Attributes

Mobile technology has been widely accepted in today's society due to its several characteristics. Apart from avoiding oneself from falling behind the current trend technologically, the attributes of the mobile technology are also the factors that would actually determine whether one would accept and use the mobile technology or otherwise. Mobile technology adoption may facilitate communication among teachers and students through the enhancement of communication efficiency and information timeliness, which consequently increase the productivity and creativity of teachers (Lee & Ke, 2001). Among all the attributes that have in the mobile technology as suggested (learnability, simplicity, adaptability, efficiency, comprehensibility, accessibility, functionality, usability, portability), seven of them have been selected with the frequent usage by scholars in their study as shown in Table 2.1:

Table 2.1

Mobile Technology Attributes by Scholars

Mobile Technology Attributes	Scholars							
	Nielsen (2000)	**Sharples (2000)**	**Hartnell & Heymn (2008)**	**Kakihara and Sørensen (2002)**	**Shackel (1990)**	**Danesh et al., (2001)**	**Chiew & Salwa(2003)**	Total
Learnability	**X**				**X**	**X**	**X**	**4**
Simplicity	**X**	**X**				**X**		**3**
Adaptability		X						1
Efficiency	**X**	**X**			**X**	**X**	**X**	**5**
Comprehensibility						X		1
Accessibility		**X**			**X**		**X**	**3**
Functionality	**X**			**X**		**X**		**3**

Usability		**X**	**X**				**X**	**3**
Portability		**X**	**X**	**X**				**3**

Learnability, according to Norman (1991), refers to the mobile technology feature interaction that allows user to understand how to take on a specific device and how to increase the performance level quickly. The system in the mobile application should be easy to learn so user could quickly get the work done. The number of errors is taken into account when a user using the device. A lower number of errors means more efficient in completing a task for the first time using the application of the device.

On the other hand, the attribute of simplicity, is defined as a key factor when designing easy-to-use product and it is crucial to develop the usability of information (Koohang & Ondracek, 2005). As well as suggested by Gabriel (1994) that the interface simplicity of mobile technology should be considered as the most important factor when designing a system, rather than just focusing on consistency.

Nielsen (1993) stated that efficiency is one of the vital attribute for mobile technology users. It refers to the immediate increase in job productivity of the users after they have learned how to use the device. ISO9241-11 (1998) also categorized efficiency as how user performs a job to achieve particular goals accurately and completely with the use of the technology.

In simple definition, accessibility refers to user could user the mobile technology at anytime and anywhere. Accessibility, as stated by Min, Ji and Qu

(2008), means mobile technology have the exclusiveness of omnipresent and universal information openness. Balasubramaniam and Jarvenpaa (2002) also said that mobile technology does not set any information restriction due to time and space concern. This gives a good standpoint for mobile user who needs time-sensitive and location-based content and services (Doyle, 2001).

Moreover, functionality usually referring to whether a mobile technology is easy to be used depending on the application it has over its device. Sometimes, memorability is also one the functions for mobile technology. Harrison (2013) says that the memorability function should enable the system to remember easily so that the casual user is able to return to use it after a period of not using it, without having the need to learn all over again.

Usability has been defined by International Organization for Standardization as the extent of which a product could be used by particular user to achieve goals with effectiveness and satisfaction in a specified context of use. As shown by Harrison (2013) in his study, he newly proposed a PACMAD (People At the Centre of Mobile Application Development) usability model for mobile application by identifying three crucial factors: User and Task. User is important when an application is being developed. User may find mobile technology is difficult to be used if an application is designed with too complex. An interface that is intuitive and easy to navigate allow user to discover what they need. Task also is crucial when developing an application. Task referring to the goal the user try to accomplish when using the mobile application. Additional feature of mobile application can be added during the development process to allow user to accomplish specified goals with the software.