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Effects of Demographic Characteristics, Educational Background, and Supporting Factors on ICT Readiness of Technical and Vocational Teachers in Malaysia

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Abstract

The aim of this study was to examine ICT readiness and the effects of demographic characteristics, educational background, and support factors on the ICT readiness of technical and vocational teachers in Malaysia. The questionnaire was administered to 329 technical and vocational teachers who are teaching engineering subjects in Malaysian technical and vocational schools. The questionnaire consisted of items related to ICT knowledge, ICT skills, and attitudes toward ICT. The findings in this study indicated that the teachers' ICT knowledge was above average, the teachers' ICT skills were at a moderate level, and their attitudes toward ICT were positive. There was a significant effect of gender on teachers' ICT readiness in terms of ICT knowledge, ICT skills, and attitudes. No significant effect of teachers' educational background and support factors on teachers' overall ICT readiness was discovered.

Keywords: ICT readiness, technical and vocational teachers, ICT knowledge, ICT skills, attitudes toward ICT, ICT integration in classroom

1. Introduction

Integrating information and communication technology (ICT) in education is an important agenda of all countries because in the world with rapid changes occurring every now and then, no one country is willing to be left out. In fact, ICT is the tool for rapid advancement in the 21st century. Through ICT every part of the world is connected. Thus, the citizens of each country should acquire ICT skills and knowledge to be able to go through the ever changing world. As a result of the explosion of ICT, the world is the classroom and the world exists in the classroom. Students are easily connected to the rest of the world and information is easily accessible with a click of a mouse. Thus, teaching approaches need to be changed and the role of teachers need to be changed too. The classroom itself needs changes to cater for the new way of learning and teaching.

It is the vision of Malaysia to be a fully developed country by 2020 and as such Malaysia needs high quality and high skill human capital. Technical and vocational education is one of the avenues that was explored to ensure high skill workforce is produced in Malaysia. As such, technical and vocational education need to bring innovation into teaching in ensuring that its product is capable of making changes to the world of work. One of such innovations is the integration of ICT in the delivery of knowledge and skills to students. The integration of ICT in teaching has been implemented years ago in all areas of education including technical and vocational education.

Numerous studies show the importance of the ICT integration into TVE. For example, Moreno, Helenius, and Jarmo (2001) noticed that by the incorporation of ICTs into the TVE programs, schools can be provide good opportunities for students to communicate with the world of work not just outside the school but also around the world. In fact, the integration of ICT in TVE programs enables students and teachers to explore the world of work with ease thereby, makes teaching and learning more meaningful. In the world full of sophistication and connectivity, no one person should be working in silo. The integration of ICT in the classroom enables both teachers and students to connect to the rest of the work with ease. To enable the integration of ICT to be successful, teachers should be equipped with knowledge and skills and importantly, teachers should have the

right attitudes. According to Kumar, Rose, and D'Silva, (2008), the teachers' knowledge, skills, and attitudes toward the ICTs are absolutely necessary as they play a significant role during the process of teaching.

1.1 Research Problem

Various studies have been conducted related to ICT readiness in terms of knowledge, skills, and attitudes among the teachers in this country (examples: Paryono & Quito, 2010; Sukri, 2010; Mahmud & Ismail, 2010; Ngah & Masood, 2006; Wahab & Kaur, 2006; Mustapha, 2000; Bakar & Mohamed, 1998). It should be noted that these studies are used to assess the teachers' basic knowledge and skills about ICT on the presumption that any teacher of any subject would acquire them. However, such types of knowledge and skills are not enough for teachers who are teaching technical and vocational subjects that are specifically related to engineering subjects, as they require different knowledge and skills about ICT, because different situations will call for different technologies as well as different knowledge and skills. Teachers of TVE program need to have different types of ICT skills that are related to courses they teach. TVE teachers must incorporate ICT efficaciously in classrooms; thus, it is of utmost importance to look at teachers' readiness in terms of their ICT knowledge and skills related to TVE, and attitudes toward the integration of ICT in teaching.

1.2 Objectives of the Study

This study attempted to achieve the following objectives:

1) To identify the ICT readiness in terms of ICT knowledge, ICT skills, and attitudes toward ICT among technical and vocational teachers in Malaysia and
2) To determine whether TVE teachers' ICT readiness is a function of :
   (a) demographic characteristics (gender, age, and years of teaching experience)
   (b) educational background (level of qualification, type of ICT training)
   (c) supporting factors (administrative support, ICT availability).

2. Review of Literature

ICT across the education system became very important for most nations; for this reason, ICT has been related to educational purposes during the past two decades, and there has been an increase in research and publication in this area. Previous studies have noted a solidarity in the importance of using ICT in technical and vocational education and specifically in the engineering subjects area (Abdulrasool & Mishra, 2009; Alseddiqi, Mishra & Abdulrasool, 2009; Jamsek & Kocijancis, 2007); these studies indicated that ICT tools could to be used for engineering subjects in technical and vocational schools are: computer-aided drawing and design (CAD), AutoCAD software, simulation products, animation, and multimedia.

Although, the integration or the use of ICT in teaching and learning process benefits both students and teachers, its implementation is dependent on teachers readiness in order to be successful. Inan and Lowther (2009) defined teachers' readiness as teachers' perceptions of their capabilities and skills required to integrate technology into their classroom instruction, and teachers' readiness to integrate technology is the most important factor that has a direct impact on technology integration. Carl (2005) stated that the readiness with regard to teaching with technology refers to the ability to demonstrate an understanding of what tools and skills are necessary to integrate technology into teaching. Three aspects of the ICT readiness among teachers (basic ICT knowledge, skills, and attitudes) are worth investigation. A review of the literature (Agyei & Voogt, 2011; Mahmud & Ismail, 2010; Chen, 2008; Levin & Wadmany, 2008; Lau & Sim, 2008; Valcke, et. al. 2007; Tella, et. al. 2007; Hennessy, et. al. 2005; Bebell, et. al 2004; Vannatta & Fordham, 2004; Mustapha, 2000; Bakar & Mohmad, 1998) showed that the integration of ICT in teaching among teachers may not be successful due to reasons such as: the lack of knowledge, lack of skills, lack of teaching experience, lack of ICT availability, lack of training, and lack of administration support.

Teachers' readiness in this study is measured in terms of ICT knowledge, skills, and attitudes. Knowledge and skills are measured based on the Adaptive Control of Thought (ACT) theory, which was proposed by Anderson (1983) through the integration of declarative knowledge into functional units that incorporate domain-specific strategies. It is measured in a form of the teachers' level of knowledge about system hardware, software, and the Internet. In terms of ICT skills, Anderson (1983) claimed that the skills are a series of procedures related to declarative knowledge. Hence, the following skills in this study refer to the skills on software packages, programming languages, and World Wide Web. The attitudes are measured by the Technology and Acceptance Model (TAM) introduced by (Davis, et. al. 1989). Fundamentally, the attitude is a disposition to respond either

favorably or unfavorably to an object, person, institution, or event (Ajzen, 1988). The disposition may be either a positive or a negative one: Usefulness, confidence, anxiety, and aversion are dimensions of attitudes.

3. Methodology

A quantitative survey method was used to determine the ICT readiness among Malaysian technical and vocational teachers. The population of this study was 1666 technical and vocational schools teachers who are teaching engineering subjects in 81 technical and vocational schools in Malaysia in 2011. The sample size for a population of 1666 teachers was 329 teachers selected using a cluster random sampling procedure.

3.1 Instrumentation

The instrument comprised four parts—A, B, C, and D—as follows:

Part A contains questions about teachers' demographic variables (gender, age, teaching experience, level of qualification, and type of training) and support factors (ICT availability and administrative support).

Parts B and C contain questions related to teachers' ICT knowledge and skills. Questions related to teachers' ICT knowledge and skills were developed based on books (1) *Understanding Computers Today and Tomorrow* by Morley & Parker (2009); (2) *Computer Graphics* by Sourin (2005); (3) *Computer Education for Classroom Teaching* by Fook, Sidhu, Baba & Parman (2007); (4) *Principles of Multimedia* by Parekh (2006); (5) *Engineering Drawing and Design* by Madsen, Madsen P & Turpin (2007); (6) *AutoCAD 2009 in 3D, A modern perspective* by Puerta (2009); (7) *A Guide to Programming Languages* by Cezzar (1995); and (8) *Foundations of Programming Languages* by Roosta (2003). These were in addition to the instruments that were adopted by (Evaluation and Accountability, Department of Education and Training, Western Australia, 2006; & Jawarneh, EL-Hersh & Khazaleh, 2007). Teachers' ICT knowledge was assessed using 14 questions. Respondents were required to answer YES or NO to questions related to system software, hardware, Internet, and the Web. Every correct response was given a score of one and every incorrect response was given a score of zero. Teachers' ICT skills are scored based on a five points Likert scale (unskillful, less skillful, moderately skillful, skillful, and very skillful). Questions were related to software packages that include Microsoft Excel, digital video, animation, simulation, AutoCAD, and CAD), programming languages, and World Wide Web.

Part D contains 23 items from instruments adopted by (Wong, 2002 & Cavaz, et. al. 2009) that explore teachers' attitudes toward information and communication technology. The 23 items asses the usefulness, confidence, anxiety, and aversion. Teachers' attitudes were scored based on five-point Likert scale, ranging from (strongly agree = 5, agree = 4, moderately agree = 3, disagree = 2, strongly disagree = 1). For negative items, the scoring was reversed (strongly disagree = 5, disagree = 4, moderately agree = 3, agree=2, strongly agree =1).

The instrument of this study was validated by a panel of experts in the field. The internal consistency reliability for the instrument was estimated using Cronbach alpha coefficient. The reliability of the items was established at .85 for the ICT knowledge items; 0.97 for ICT skills items, and 0.86 for attitude items (Appendix A, B, and C).

4. Findings

A total of 329 teachers participated in this study. Almost 63% of them were male teachers and the other 37% were female teachers. They were between 27 and 57 years old and more than one-third (37.1%) were between the age of 42 to 49 years old. With regard to teaching experience, about 32% have been in the teaching profession for less than 10 years, approximately 31% were between 11 and 18 years and about 11% had been in the teaching profession between 27 and 34 years.

The respondents were asked if they attended any ICT related courses. Forty-one per cent of them indicated that they have attended ICT basic course. A little bit more than 39% attended courses related to world-wide-web design, multimedia, and programming. Ten per cent of the respondents attended courses related to ICT integration in teaching and learning and 9.7% of the respondents never attended any ICT related training. The success of ICT integration in teaching and learning process is very much dependent on the administrative support and the availability of the ICT facilities. The majority (75%) of the respondents indicated that they have the support from the administration in the integration of ICT in teaching. With regard to the ICT facilities, 62.9% of the respondents felt that there was highly adequate ICT facilities in their schools, 27.7% thought that the ICT facilities in their schools were adequate and 9.4% thought that ICT facilities in their schools were inadequate.

4.1 ICT Readiness among Technical and Vocational Teachers

Descriptive analysis was used to describe the level of ICT knowledge among technical and vocational teachers. Teachers' ICT knowledge was assessed using 14 questions. Every correct answer was given a score of one and

every incorrect answer was given a score of zero. Table 1 depicts the frequencies and percentages of respondents who answered the questions correctly. Question number 5 was answered correctly by majority of the respondents (287, 87.2%), and question number 7 was answered least correctly by the respondents (171, 52.0%).

Table 1. Frequencies and percentages of respondents who gave correct answers to the questions (N = 329)

ICT knowledge	**F**	**Percentage (%)**
JPEG file format for graphics is considerably more appropriate than GIF for use as a WWW standard photo format.	246	74.8
A Plotter is an advanced computer game.	227	69.0
The Wireless Electronic Tablet allows the teacher to stand at the back of the room and control a presentation.	215	65.3
MATLAB is a convenient environment for simulation.	205	62.3
CAD drawings may be either two dimensional (2D) or three dimensional (3D).	287	87.2
Use MATLAB to create simulation for engineering because of a shorter and simpler code than other programming languages.	200	60.8
The maple worksheet is a computer printing vector graphics and is primarily used in technical drawings and CAD applications.	171	52.0
The Document Camera will enable you to display real engineering materials and the components.	208	63.2
Web-based multimedia refers to sound, video, or animation, text, and images located on Web pages.	259	78.7
Plug-in or helper application is used to provide a sense of motion and touch to the user motion simulator.	204	62.0
Some of the multimedia on the Web is developed in Java.	233	70.8
Macromedia flash is a time sequence of changes of colors.	209	63.5
XHTML is an older version of HTML.	195	59.3
Java is a programming language that is specifically designed for use on the Internet.	254	77.2

Teachers' ICT knowledge ranged from 0 to 14. The mean score was 9.46 (SD. = 3.17). Their ICT knowledge was divided into three categories (less knowledge, moderate knowledge, and high knowledge). As shown in Table 2, 12% of the TVE teachers was categorized as having little knowledge, 78.1% was categorized has having moderate knowledge of ICT, and 19.6% was categorized as having high knowledge of ICT.

Table 2. Level of ICT knowledge among TVE teachers

Range of scores	Level of knowledge	Percentage
Less than 6.0	Low	12.8
6 to 12.63	Medium	78.1
More than 12.63	High	19.6%

Seven types of ICT skills among TVE teachers were assessed (Table 3). The ICT skills among technical and vocational teachers was found to be at a moderate level (Mean = 2.42, S.D. = 0.64). Among the seven skills that were assessed, it was found that respondents possess the highest skills in AutoCAD Software (Mean = 3.25, SD. = 1.07). They have the lowest skills in Simulation (mean = 1.77, SD. = 0.77). Teachers ICT skills related to the World Wide Web was also moderate (Mean= 2.75, S.D. = 0.81), They were moderately skilful (Mean = 2.62, S.D. = 1.02) in Computer-Aided Design and Drafting (CADD) and Microsoft Excel (Mean = 2.48, S.D. = 0.83). They were less skilful in Digital Video and Animation (Mean = 2.27, S.D. = 0.83), Programming Languages (Mean = 1.83, S.D. = 0.72), and Simulation (Mean = 1.77, S.D. = 0.77).

For Microsoft Excel related skills, the highest mean score was 2.82 (S. D. = 0.95). The skill was related to "using lookup and information functions in Excel." For skills related to digital video and animation, the highest mean score was 2.88 (S.D. = 1.10). It is a skill on creating animation in Power-Point. For skills related to simulations, the highest mean 1.85 (S.D. = 0.90). It is a skill about "Entering a design for simulation with Pspice software". For AutoCAD related skills, the highest mean was 3.48 (S.D. =1.12). It is a skill about "Drawing lines, polylines,

rectangles, circles, and arcs." For skills related to Computer-Aided Design and Drafting (CADD), the highest mean score was 2.77 (S.D. = 1.13). It is a skill about "Creating a new drawing and a wireframe and solid model." For skills related to programming languages, the highest mean was 1.97 (S.D. = 0.86). It is a skill about "Parameter entry in Java language." For skills related to the World Wide Web, the highest mean was 3.36 (S.D. = 1.04). It is a skill about "sending a data file from your computer to other co-workers". A detailed description about respondents' ICT skills is in Appendix B. Teachers ICT skills related to the World Wide Web was also moderate (Mean= 2.75, S.D. = 0.81), They were moderately skilful (Mean = 2.62, S.D. = 1.02) in Computer-Aided Design and Drafting (CADD) and Microsoft Excel (Mean = 2.48, S.D. = 0.83). They were less skilful in Digital Video and Animation (Mean = 2.27, S.D. = 0.83) and skills of Programming Languages (Mean = 1.83, S.D. = 0.72), and of Simulation (Mean = 1.77, S.D. = 0.77).

Table 3. Means and standard deviations for ICT skills (N = 329)

ICT Skills	Mean	S.D.
Microsoft Excel	2.48	0.83
Digital Video and Animation	2.27	0.83
Simulation	1.77	0.77
AutoCAD Software	3.25	1.07
Computer-Aided Design and Drafting	2.62	1.02
Programming Languages	1.83	0.72
World Wide Web	2.75	0.81
Total	***2.42***	***0.64***

As shown in Table 4, the attitudes toward ICT in terms of four dimensions (usefulness, confidence, anxiety, and aversion) among technical and vocational teachers was highly positive (Mean = 4.06, S.D. = 0.44). The result indicated that technical and vocational teachers found ICT in the classroom very useful in improving their teaching, and the mean for usefulness domain was at (Mean = 3.79, S.D. = 0.59). The result also indicated that the teachers had great confidence in ICT, and the mean for the confidence domain was at (Mean = 4.02, S.D. = 0.51). These findings outlined the means and standard deviations of items in attitudes (Appendix C). The highest mean of item answered by respondents for attitudes in terms of usefulness was item 1 (M = 3.86, S.D. = 0.70). It states, "The use of electronic mail, Facebook, Twitter and Skype make it easier to communicate with my students."

In terms of confidence, the highest mean score was for item 10 (M = 4.25, S.D. = 0.68). It states, "Using ICT in teaching gives me a headache." For attitudes in terms of anxiety, the highest mean of item answered by respondents was item number 13 (M= 4.27, S.D. = 0.62). It states, "Using ICT in classroom frustrates me." For attitudes in terms of aversion, the highest mean score was for item 22 (M = 4.36, S.D. = 0.62). It states, "Using ICT for teaching wastes time."

For anxiety and aversion domains, the means were 4.21 (S.D. = 0.57) and 4.24 (S.D. = 0.61), respectively. Based on these scores, it showed that technical and vocational teachers had low anxiety and aversion toward ICT. Moreover, it can also be observed that the teachers are exhibiting the tendency of usefulness and felt comfortable with ICT.

Table 4. Means and standard deviations of four dimensions of attitudes among technical and vocational teachers in Malaysia (N = 329)

Dimensions of Attitudes	Mean	S.D.
Usefulness	3.79	0.59
Confidence	4.02	0.51
Anxiety	4.21	0.57
Aversion	4.24	0.61
Total	***4.06***	***0.44***

4.2 Teachers' ICT Readiness as a Function of Their Demographic Characteristics

Table 5 presented the effect of demographic characteristics (gender, age, and teaching experience) on ICT readiness in terms of (ICT knowledge, skills, and attitudes) among technical and vocational teachers in Malaysia. Pillai's Trace test indicated that there were no significant age and teaching experience effects on teachers' overall ICT readiness (p = 0.92, and 0.25, respectively).

Table 5. MANOVA of demographic characteristics on ICT readiness among technical and vocational teachers in Malaysia (N = 329)

Effect	Pillai's Trace value	F	Sig
Gender	<.05	6.01	<001
Age	<.01	.42	.92
Teaching experience	<.04	1.27	.25

Note: Effect was significant at .05 level.

However, there was a significant effect of gender on teachers' ICT readiness at F (3,319) = 6.01, P <. 05 (Table 6). For ICT knowledge and attitudes, there were no significant differences among gender at p >. 05. However, a significant difference of ICT skills as a function of gender was observed (p < 0.05). Among gender, the ICT skills for men (M = 2.50, S.D. = .68) was greater than it was for women (M = 2.29, S.D. = 53).

Table 6. Means and standard deviations of teachers' ICT knowledge, skills, and attitudes by gender (N = 329)

ICT Readiness	Gender	N	Mean	S.D.	F	Sig
ICT knowledge	Males	206	9.41	3.20	.16	.69
	Females	123	9.55	3.13		
ICT skills	Males	206	2.50	.68	8.44	.002
	Females	123	2.29	.53		
Attitudes	Males	206	4.08	.45	.34	.56
	Females	123	4.05	.44		

4.3 Mean Differences in Teachers' ICT Readiness as a Function of Educational Background

Table 7 shows the effect of educational background (level of qualification and type of training) on ICT readiness in terms of ICT knowledge, skills, and attitudes among technical and vocational teachers in Malaysia. Pillai's Trace test showed that there was no significant effect of qualification and type of training effects on overall ICT readiness at p = 0.05.

Table 7. MANOVA of educational background on ICT readiness among technical and vocational teachers in Malaysia (N = 329)

Effect	Pillai's Trace value	F	Sig
Level of qualification	<.04	1.90	.09
Type of training	<.04	1.60	.11

4.4 Mean Differences in Teachers' ICT Readiness as a Function of Supporting Factors

Table 8 shows that the support factors (ICT availability and administration support) has no effect on ICT readiness among technical and vocational teachers. Pillai's Trace test indicated that there were no significant effects of ICT availability and administration support on overall readiness factors at p = 0.05.

Table 8. MANOVA of support factors on ICT readiness among technical and vocational teachers in Malaysia (N = 329)

Effect	Pillai's Trace value	F	Sig
ICT availability	<.01	.67	.67
Administration support	<.01	.23[a]	.88
ICT availability*administration support	<.01	.53	.79

5. Discussion

The first objective of this study was to examine the teachers' ICT readiness in terms of ICT knowledge, skills, and their attitudes toward the integration of ICT in teaching. . To examine the level of teachers' knowledge about ICT, respondents were asked to respond to a 14 ICT related questions. Anderson (1983) explained that the type of knowledge as a form of explicit memory and conscious efforts should be made to retrieve this information. Moreover, Anderson mentioned the second type of knowledge that was transferred from declarative knowledge to procedures. So, it is evidence and necessary to check out the declarative knowledge before proceeding to the procedures that present the skills. In this study, the ICT knowledge test measures the declarative knowledge about ICT.

This study indicated that the 66.9% of the respondents possess an above average knowledge about ICT with a mean score of 9.46 (S.D. = 3.17). Previous studies have stated the importance of ICT knowledge as a critical factor among teachers' ICT readiness to integrate ICT into classroom teaching (Buntat et al, 2010; Mahmud & Ismail, 2010; Paryono and Quito, 2010; Sukri, 2010; Bakar & Mohamed, 1998). In a nutshell, the studies just mentioned agreed that technical and vocational teachers should be equipped and it is necessary to be ready in terms of ICT knowledge. Moreover, the ICTs are becoming more ubiquitous with the rapid rate of development; so, the teachers should continue to improve and gain more knowledge about ICTs.The result is similar to the results of the studies conducted by (Mahmud & Ismail, 2010; Koc, 2010; Mohamed & Bakar, 2008; Wahab & Kaur, 2006; Kotrlik, Harrison, & Redmann, 2000; Bakar & Mohamed, 1998). They reported that teachers had a moderate level of ICT knowledge.

With regard to the level of ICT skills among technical and vocational teachers in Malaysia, this study found that the ICT skills among technical and vocational teachers was at a moderately skillful level (Mean = 2.42, S.D. = 0.64). The skills of AutoCAD Software were at a high level (Mean = 3.25, S.D. = 1.07), and the skills of programming languages and skills of simulation were at a low level (Mean = 1.83, S.D. = 0.72 and Mean = 1.77, S.D. = 0.77), respectively. It is interesting to note that all the seven packages of ICT skills were at moderate levels except the skills for AutoCAD and the skills of simulation.

Previous literature has noted solidarity in the importance of ICT skills for the integration of ICT into the classroom of technical and vocational schools (Buntat et al, 2010; Paryono & Quito, 2010; Sukri, 2010; Usman & Pascal, 2009; Kumar, Rose & D'silva, 2008). This literature agreed that the teachers need to be ready and keep improving their skills about ICT, and we should not underrate the importance and the benefit of ICT which belongs under the main heading of technical and vocational education (TVE). There are many different types of ICT skills needed to teach technical and vocational subjects in vocational schools. These ICT skills are as follows: CADD, AutoCAD, animation, video clips with multimedia, and simulation The findings of this study about teachers' ICT skills are consistent with those in previous studies. In this study, a vast majority of the technical and vocational teachers involved in this study possessed a moderate level of ICT skills. These results are similar with the results of the studies conducted by (Mahmud and Ismail, 2010; Bakar & Mohamed, 1998). They reported that teachers had a moderate level and a below average to average ICT skills.

The attitudes toward ICT among technical and vocational teachers in Malaysia, this study found that the attitudes toward ICT among technical and vocational teachers in terms of four dimensions (usefulness, confidence, anxiety, and aversion) were found to be positive (Mean = 4.06, S.D. = 0.44). The result showed that technical and vocational teachers believed that the integration of ICT in the classroom very useful for improving their teaching. The result also indicated that the teachers had high confidence on ICT. They have low anxiety and aversion toward ICT. These results are similar with the results of the studies conducted by (Agyei & Voogt, 2011; Pynoo et al, 2011; Al-Zaidiyeen, Mei & Fook, 2010; Inan & Lowther, 2009; Tezci, 2009; Kumar, Rose & D'Silva, 2008; Chao, 2005, Sa'ari, Wong & Samsilah Roslan, 2005). They reported that the teachers in their

studies had positive attitudes toward ICT and low anxiety, because it is both useful and easy. On the other hand, they revealed that anxiety is the most important domain of attitudes toward ICT. The attitude is deemed to play a critical role in determining whether a teacher is ready to use ICT or not, and to identify between more and less successful integrators as a form of positive or negative preference. The previous literature has noted commonalty in the importance of attitudes for the orientation toward the great ICT readiness to integrate ICT into the classroom, (Agyei & Voogt, 2011; Pynoo et al, 2011; Al-zaidiyeen, Mei & Fook, 2010; Mahmud & Ismail, 2010; Inan & Lowther, 2009; Afshari et al, 2009; Valck et al, 2007). The literature agreed that the teachers' attitudes are the most important factor for reaching a great and successful ICT integration in the classroom. Moreover, any successful integration depends first on the attitudes factor.

The second objective of this study was to determine whether there are significant mean differences in ICT readiness due to demographic characteristics, educational background, and support among technical and vocational teachers. MANOVA was used to analyse the effects of teachers' demographic characteristics, which include (gender, age, and years of teaching experience), on teachers' ICT readiness that consists of (ICT knowledge, skills, and attitudes). In general, the findings indicated that there were no significant age and teaching experience effects on teachers' ICT readiness. The findings on non-significant age effect were coherent with (Inan & Lowther, 2009; Sukri, 2005; Yang, Mohamed & Beyerbach, 1999). However, in contrast with the findings of studies conducted by (Kalogiannakis, 2008; Lau & Sim, 2008), it was found that the teachers' age influences their readiness and adoption to use ICT during the teaching process. Similarly, Mueller et al (2008) also did not find any significant effect of teaching experience on teacher readiness to integrate ICT in teaching. However, these results are inconsistent with the results of the study conducted by Inan & Lowther (2009); they found that years of teaching experiences affect teachers' computer proficiency in a negative manner. Findings of the the current study also differ from studies conducted by (Kalogiannakis, 2008; Ertmer, 2005; Bebell, Russell & O'Dwyer, 2004), which state that teachers' years of work experiences influence the teachers' readiness and beliefs to ICT integration in teaching.

On the other hand, the finding of this study indicated that there were significant effects of teachers' demographic characteristics in terms of gender on teachers' ICT readiness. The findings of this study indicated that there were no significant effects of gender on ICT knowledge and attitudes but they were significant with regard to ICT skills. The findings on non-significant gender effect were coherence with Cavas et al (2009) and Mueller et al (2008); they reported that there were no significant effects on teachers' attitudes and knowledge according to their gender; but in contrast with the findings by Tezci (2009), there were differences in effects between male and female teachers' knowledge of ICT, their attitudes toward ICT, and also in contrast with the studies conducted by (Romina et al, 2006; Samak, 2006; Sadike, 2005; Lu & Mille, 2002). They found that there were differences in effects between male and female teachers' attitudes toward ICT. The findings of this study indicated that there was a significant effect of gender on teachers' ICT skills. These findings are congruent with the findings of studies conducted by (Jawarneh, El-Hersh & Khazaleh, 2007; Sabariah Sharif & Khaziati Osman, 2005; Aloston et al, 2003). They reported that there were differences in effects between teachers' gender and their level of ICT skills and competency. These findings are contradictory to the studies conducted by (Cavas et al, 2009; Mueller et al, 2008; Busch, 1995; Eastaman & Krend, 1987).

In terms of teachers' educational background and its effect on their ICT readiness, the findings based on Pillai's Trace test showed that there was no significant effect of teachers' educational background on teachers' overall readiness to integrate ICT in teaching. This result was not in agreement with the study conducted by Lau & Sim (2008) that explored the extent of ICT adoption among secondary school teachers in Malaysia. They reported that there was an effect of the level of teachers' academic qualification on ICT ICT adoption. On the other hand, these results are inconsistent with the study conducted by Mahmud & Ismail (2010). In their study, they indicated the impact of training on basic ICT literacy among secondary school teachers in Malaysia, that ICT training contributed to teachers' ICT literacy significantly. Similar to a study conducted by Tezci (2009), teachers' training had a significant effect on teachers' ICT skills and resulted in the effective use of ICT in classroom teaching.

We tested the hypothesis that there is an effect of support factors on teacher readiness to integrate ICT in teaching. The findings based on with Pillai's Trace test showed that there was no significant effect of support factors on teachers' overall readiness to integrate ICT in teaching. These results were consistent with most of the studies about the contribution of administrative support and ICT availability on teachers' readiness to integrate ICT in teaching. Studies by Inan and Lowther (2010); Inan and Lowther (2009); and Ogunkola (2008) indicated that the overall support and availability of computers were strong effects and exerted a positive influence on

teachers' readiness. They indicated that the ownership of computers has the biggest influence on teachers' literacy and attitudes toward computers.

6. Conclusion

This study examines the level of ICT readiness in terms of ICT knowledge, skills, and attitudes as well as the effects of demographic characteristics, educational background, and supporting factors on technical and vocational teachers in Malaysia readiness to integrate ICT in teaching. In terms of teachers' ICT knowledge, the finding of this study shows that a vast of majority of the technical and vocational teachers involved in this study possess a moderate level of knowledge about ICT. Teachers were found to have a moderate level of ICT skills. Teachers were found to have a high level of skills related to AutoCAD software were at a high level, and low level of skills related to programming languages and simulation. While in terms of attitudes toward ICT, the findings of this study indicated that the majority of the technical and vocational teachers involved in this study possessed positive attitudes toward ICT integration in teaching.

We also tried to determine the effects of technical and vocational teachers' demographic characteristics, educational background, and supporting factors on their ICT readiness. The findings of this study indicated that there was no significant effect related to age and years of teaching experiences on teachers' overall ICT readiness. However, there was a significant effect of teachers' gender on their readiness, specifically teachers' ICT skills. The present study also failed to discover the effect of educational background and support factors on teachers' overall readiness to integrate ICT in teaching.

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Appendix

Appendix A. ICT knowledge

ICT Knowledge questions	
Reliability	0.85
JPEG file format for graphic is considerably more appropriate than GIF for use as a WWW standard photo format.	
A Plotter is an advanced computer game.	
The Wireless Electronic Tablet allows the teacher to stand at the back of the room and control a presentation.	
MATLAB is a convenient environment for simulation.	
CAD Drawings may be either two dimensional (2D) or three dimensional (3D).	
Using MATLAB to create simulation for engineering because of shorter and simpler code than other programming languages.	
The maple worksheet is a computer printing vector graphics and is used primarily in technical drawing and CAD application.	
The Document Camera will enable you to display real engineering materials and the components.	
Web-based multimedia refers to sound, video, or animation, text and images located on web pages.	
Plug-in or helper application is used to provide a sense of motion and touch to the user motion simulator.	
Some of the multimedia on the web is developed in Java.	
Macromedia flash is a time sequence of changes of colors.	
XHTML is an older version of HTML.	
Java is a programming language specifically designed for use on the internet.	

Appendix B. ICT Skills

	Cronbach's Alpha	**Factor loading**	**Mean**	**S.D**
Microsoft Excel	0.96			
Using lookup and information functions in Excel.		0.70	2.82	0.95
Using advanced filters, lists features and dynamic tables in Excel.		0.80	2.54	0.92
Summarizing data with Pivot Tables in Excel.		0.87	2.58	0.98
Create Bullet Graphs to Replace Ganges in Excel.		0.87	2.34	0.95
Create and using Excel Dot Plot chart.		0.88	2.47	1.01
Create and using Excel chart Tricks and tutorials.		0.90	2.41	0.98
Performing calculations with "IF" function in Excel.		0.82	2.52	1.06
Finding a local minimum using the Excel Solver.		0.86	2.30	0.94
Using Customization options in Excel.		0.84	2.38	0.92
Digital Video and Animation	0.97			
Importing video clips into the video editing software.		0.89	2.75	1.09
Trimming a clip in video editing software.		0.94	2.61	1.09
Split a video clip into any part with video editing.		0.95	2.47	1.10
Manipulate the audio content with video editing software.		0.94	2.38	1.08
Change the speed of a clip in video editing software.		0.94	2.37	1.06
Create animation in Power-Point.		0.70	2.88	1.10
Create animation in Excel.		0.73	2.25	1.00
Create animation in html.		0.72	2.05	0.96
Create animation in illustrator.		0.71	1.95	0.89
Make animations with maple.		0.62	1.81	0.84
Create graphics objects and surface object with Mathlab.		0.60	1.82	0.88
Analyzing data and make descriptive statistics for measurement with Mathlab.		0.60	1.86	0.94

Simulation	0.98			
Enter a design for simulation with Pspice.		0.96	1.85	0.90
Edit stimulus and run parametric analysis with Pspice software.		0.97	1.82	0.86
Create linear and nonlinear transformer with Pspice software.		0.98	1.80	0.84
Enter a design for simulation with Crocodile Technology software.		0.92	1.73	0.80
Run parametric analysis with Crocodile Technology software.		0.91	1.70	0.79
Create linear and nonlinear transformer with Crocodile Technology software.		0.77	1.70	0.76
AutoCAD Software	0.96			
Drawing lines, polylines, rectangles, circles, and arcs.		0.91	3.48	1.12
Using erase, stretch, trim, fillet, copy, and mirror.		0.94	3.43	1.14
Adding text, dimensions, and hatching.		0.96	3.37	1.13
Using layouts to create views of designs.		0.96	3.22	1.13
Plotting, and working with grips.		0.95	3.19	1.18
Create and editing blocks.		0.93	3.12	1.16
Advanced editing commands and coordinates entry.		0.85	2.92	1.14
Computer-Aided Design and Drafting (CADD)	0.98			
Create a new drawing and a wireframe and solid model.		0.88	2.77	1.13
Using appropriate symbols and symbol libraries.		0.91	2.66	1.09
Create 2-D drawings from 3-D models.		0.94	2.64	1.10
Create 3-D wireframe models from 2-D geometry.		0.94	2.53	1.07
Move, copy, and scale primitives.		0.94	2.61	1.09
Plot drawing using correct layout and scale.		0.93	2.69	1.13
Using layering techniques and grouping methods.		0.93	2.58	1.08
Develop geometry using parametric programs.		0.91	2.48	1.03
Programming Languages	0.97			
Parameter entry in Java language.		0.77	1.97	0.86
Calculation work in Java using logs, square, roots, and formulae.		0.81	1.95	0.84
Display results in Java language.		0.87	1.88	0.83
Create basic diagramming with Java.		0.91	1.85	0.81
Curve fitting in Java.		0.91	1.81	0.77
Create numerical approximation in Java.		0.92	1.79	0.78
Create numerical integration using the trapezoid method into the C++ language.		0.95	1.79	0.76
Create plotting graphs in C++ language.		0.94	1.78	0.76
Make statistical computations with C++ language.		0.94	1.79	0.78
Using matrix math operation and using structures to simplify parameter passing with C++.		0.94	1.78	0.77
Create a table with a wizard in Visual Basic.		0.94	1.81	0.78
Set and remove key in Visual Basic.		0.92	1.82	0.81
Entering and editing data in Visual Basic.		0.91	1.79	0.77
Create filters by selection and forms in Visual Basic.		0.90	1.80	0.79
Create forms and make reports in Visual Basic.		0.89	1.81	0.80
World Wide Web	0.94			
Using Internet to access we-based textbooks.		0.76	3.04	0.99
Using Internet to access public forum to obtain information and other opinions.		0.79	3.23	1.00
Sending a data file from your computer to other co-workers' computer.		0.72	3.36	1.04
Designing a home page and web page.		0.73	2.56	1.05
Publishing instructional software on the Internet.		0.73	2.40	1.01
Building a Tube Websites tutorial.		0.70	2.21	0.99
Expanding the knowledge with appropriate web links and reading.		0.77	2.70	1.10
Sign up to a weekly newsgroup.		0.78	2.44	1.03
Subscribe to any online engineering journal and magazine for latest technology.		0.77	2.50	1.07
Using Videoconferencing, Facebook, and skype.		0.75	3.10	1.10

Appendix C. Attitudes toward ICT

Items	Cronbach's Alpha	Factor loading	Mean	S.D
Attitudes	0.86			
The use of electronic mail, Facebook, Twitter and Skype make it easier to communicate with my students.		0.63	3.86	0.70
The use of simulation allows me to create some aspects of real-world learning in the classroom.		0.92	3.78	0.67
The use of simulation enables me to focus on the elements of a real problem or system.		0.75	3.71	0.73
I feel that I will not master advance ICT skills.		0.50	3.90	0.78
I feel that using ICT in the class is difficult and hard for me.		0.65	4.06	0.71
I feel uncomfortable when using ICT in my teaching.		0.71	4.20	0.68
The thought of using ICT in teaching make me anxious.		0.72	4.13	0.72
Using ICT in teaching confuse me.		0.83	4.21	0.66
The challenge of solving problems with ICT does not appeal to me.		0.85	4.18	0.67
Using ICT in teaching gives me a headache.		0.90	4.25	0.68
I hesitate to use ICT for fear of making mistakes I cannot correct.		0.88	4.24	0.67
I avoid using ICT at all cost.		0.82	4.22	0.70
Using ICT in classroom frustrates me.		0.89	4.27	0.62
I sometimes get nervous just thinking about ICT.		0.73	4.20	0.75
I have high confidence to use ICT in my classroom.		0.56	3.56	0.89
I feel that I take a long time to understand some issues on the use ICT my classroom.		0.56	3.97	0.73
The thought of using ICT for teaching makes me feel uncomfortable.		0.73	4.20	0.73
The use of ICT in classroom is burdensome.		0.65	4.25	0.73
The use of ICT in classroom makes students passive.		0.60	4.20	0.78
The use of ICT prevents me from being creative.		0.80	4.25	0.74
Only people who are skilled should use ICT.		0.81	4.13	0.79
Using ICT for teaching wastes time.		0.87	4.36	0.62
The time used for learning ICT is better spent on learning something else.		0.66	4.23	0.77