The Relationship Between the Characteristics of Innovation Towards the Effectiveness of ICT in Malaysia Productivity Corporation

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ABSTRACT

This study aims to investigate the relationship of innovation characteristics and demographic factors on the effectiveness of information and communication technology (ICT) utilization in Malaysian Productivity Corporation (MPC). The specific objective of this study is to understand the relationship between innovation characteristics and demographic factors in influencing the level of innovation adoption and which factors are most dominant in influencing the effectiveness of ICT. Using purposive sampling, a total of 210 respondents was selected consisting of MPC headquarters and 5 MPC branches throughout Malaysia. Data and information were collected using questionnaires. Quantitative data were analyzed using Pearson correlation statistical analysis, t-test and ANOVA. The findings showed that there is a significant relationship between innovation characteristics such as relative advantages, compatibility, complexity, observability and triability with the effectiveness of ICT in MPC. Observability has been identified as the major factor with the effectiveness of ICT in MPC with variants of 49%. The results of the analysis also proved that there is no significant difference between demographic factors with the effectiveness of ICT. The result also showed that age and level of academic is not a factor affecting the use of ICT in MPC. This has been proven by the findings of this study that the majority of respondents used ICT between 5 to 7 hours a day and 131 respondents has over 9 years of experience using computer at MPC. This finding suggests that innovation characteristics influenced the acceptance of innovation and will be the determinants of quality in an organization.

Keywords: *Innovation characteristic, ICT in public sector, effectiveness of ICT, diffusion of innovation, innovation.*

INTRODUCTION

Innovation has been identified as a key element in Malaysia's economic transformation to become a high-income nation by 2020. YAB Dato 'Sri Mohd Najib bin Tun Haji Abdul Razak spoke during the 10th ASEAN Telecommunications and Information Technology Ministers Meeting (TELMIN-10), emphasizing that infrastructure improvements communication and ICT will also help transform this process. In addition to Malaysia, in the United Kingdom, ICT was also used as the principal agent of the government to carry out its government transformation. The Modern Modernization Initiative of the United Kingdom aims to use ICT as a core for transformation by developing several ICT strategies to improve public service (Osmani, Weerakkody, Sivarajah & El-Haddadeh, 2014). The use of ICT will make the relationship between the people and the government more effective and cause the government to be closer to the people (Sheha Che Azemi, Rahim Romle, Mohd Udin, Suhaimi, Khairina & Sabrina, 2016).

Effective information and communications technology (ICT) agencies in various aspects of service delivery and operations within the government are one of the key attributes towards achieving the national aspirations (MAMPU, 2011). ICT has been widely used in the Malaysian public sector to enhance the delivery of electronic services. ICT provides ways to improve efficiency and effectiveness when dealing with both internal and external entities. ICT is also a method used to assist management, handling, processing, storage and decision-making for an organization to carry out efficient and effective daily functions. In a fast-paced and no geographical boundary right now, organizations that do not provide fast and efficient services will be left out and unable to achieve the objectives of the agency. Investment in ICT will help employees improve productivity and effective use of ICT will help organizations improve organizational efficiency (Gatautis, Medziausiene, Tarute & Vaiciukynaite, 2015).

ICT has been widely used in Malaysian public sectors to enhance electronic service delivery. ICT provides the means to improve the efficiency and effectiveness when dealing with both internal and external entities and as a medium used in assisting management, handling, processing, storing and decision making for an organization to carry out daily functions efficiently and effectively.

The use of ICT in Malaysia began as early as in the 60s. According to Zamree (2001) ICT has been utilized widely in the public sector to support the main functions of an organization. By the 1990s, ICT has been used for more strategic purposes. The Malaysian government has introduced two initiatives to increase the importance of ICT namely the Technology Development Action Plan that highlighted the importance of microelectronics and to enable Malaysia to become a developed country in reaching 2020 by Tun Dr. Mahathir Mohamad in February 1991.

The use of ICT in the MPC has grown rapidly since its inception. Now, ICT facilities in the MPC can be divided into five parts. The first component is the Desktop Software and Productivity, which includes elements that are used directly by MPC staff through the Application Personal Productivity and Collaboration Software. The second component is the Application Development Environment that includes the framework and other support software for the development and implementation of application software. The third component is the computing environment, which includes hardware, equipment and software system that provides access to the system connection.

The fourth component is the infrastructure which is a set of network that are joined to each other to form a framework that supports the entire structure of ICT and the fifth component is Control and Management which provides integrity, control and assurance.

LITERATURE REVIEW

According to Rogers (2003), diffusion of innovation theory is a process in which a new idea is spread through certain channels of communication among people in the social system. Botha and Atkins (2005), which has been conducting studies on the evaluation of five main theoretical frameworks on innovation adoption, said that this theory has been widely applied, especially in the industrial sector and the service and innovation diffusion theory has been put into use in the public sector.

Rogers (2003) also mentioned that innovation is an idea, practice or object that is considered new by an individual or group who receives it. This study has selected five factors influencing innovation. Rogers (2003) believed that these factors are relative advantage, compatibility, complexity, trialibility and observability.

Relative Advantage
Relative advantage can be defined as the degree to which an innovation is perceived as better than the existing idea (Rogers, 1995). Relative advantage is an important factor in determining the acceptability of an innovation (Tornatzky & Klein, 1982). In the context of ICT, saving time to do tasks efficiently can be regarded as a relative advantage to this study. A study by Shahid, Ridzuan, Faridah and Vijayesvaran (2014) regarding online market communication patterns in developing countries found that most respondents are more to online shopping rather than traditional shopping. Hing (2009) also discovered that relative advantage is one of the factors affecting respondents in the technology adoption mainly because of time saving and ease of use. A study conducted by Wei, Marthandan, Chong Ooi, and Arumugam (2009) regarding the factors influencing the utilisation of technology businesses using mobile phones in Malaysia also found that relative advantage plays an important role in influencing technology adoption. The number of ICT users was found to increase if they understand that innovation is beneficial to them. Hence, the first hypothesis is:
Ha1a = There is a positive relationship between relative advantage towards the effectiveness of ICT in MPC.

Compatibility
Compatibility refers to the degree of innovation or change to the extent that it is consistent with the values that are inherent with past experiences and needs of potential adopters (Rogers, 2003). Tornatzky and Klein (1982) found that innovation will be sooner accepted if it is in accordance with the duties and norms of their lives. For example, the usage of email and search data using the Internet are two important points that are used by small and medium sector in Malaysia because the technology is appropriate to facilitate them (Tan & Eze, 2008). Akmal and Salman (2015) also discovered that most youth in Klang Valley is adopting the Internet as a new media for the democratization of information. Therefore, the second hypothesis is:
Ha2a = There is a positive relationship between compatibility towards the effectiveness of ICT in MPC.

Complexity
Rogers (2003) concludes that, complexity can be referred to a degree where innovation is felt difficult to understand and use. Therefore, complexity is considered giving a negative relationship while adopting innovation. People will easily accept an innovation if they do not experience difficulty as compared to other innovations.

Results of a study conducted by Vijayakumar (2010) found that the complexity of technology greatly affects the adoption of an innovation. Junaidah (2007) found that

complexity has the highest impact on ICT adoption in small and medium company. Therefore, the third hypothesis is:

Ha3a = There is a negative relationship between complexity towards the effectiveness of ICT in MPC.

Triability

Trialibility is a condition to which innovation should be experimental or tested (Rogers, 2003). Innovation will be easier to accept if the user is given the chance to try it out first. A study conducted by Junaidah (2007) proves that owners of small and medium companies in Malaysia agree triability has a huge impact in ICT adoption on SMEs in Malaysia. According to Hing (2009), the opportunity to try Internet banking services will definitely increase the confidence in Internet banking users, especially for those who are concerned with the security of the service. Therefore, the fourth hypothesis is:

Ha4a = There is a positive relationship between the triability towards the effectiveness of ICT in MPC.

Observability

Observability as defined by Rogers (2003) is the ability to see the benefits and results of an innovation. Innovation will be easily adopted if the impact of these innovations can be seen. For example, the effect of using computers will make completing task quicker and saves time. Study on SMEs owner in Malaysia by Tan and Eze (2008) found out that companies would use ICT if they can see its benefits. The finding is supported by Shahrul Nazmi and Normah (2015) in their study regarding the use of e-newspaper that proves that there is an increase of 60% of e-newspaper in 2014. Observability will unblock the psychological barriers experienced by users after they discover the positive impact of these innovations. Junaidah (2008) depicted that psychological barrier is the belief held by individuals or perceptions that hinder participation in learning activities. Therefore, the fifth hypothesis is:

Ha5a = There is a positive relationship between observability towards the effectiveness of ICT in MPC.

Demographic Factors

Demographic factors in this study are namely age, gender and education level. A study conducted by Norfazida (2014) discovers that there were significant differences in terms of demographic factors such as gender, age, education level with computers and the Internet usage in Majlis Agama Islam Negeri Kedah. In contrast, the study done by Abdul Wahab, Kamaliah and Hasrina (2006) on the use of computers in teaching and learning among secondary school teachers, found that there was no significant difference between male and female, between age categories and major subjects taught in terms of the use of computers in teaching and learning.

The result was supported by Morshedi and Noordin (2013) who conducted a study to find the relation of ICT in English class in Malaysian schools which found that young English teachers are prone to using ICT compared to the senior teachers. His research showed that the majority of teachers who use ICT are in the range of 25 to 35 years old. A study conducted on

JKKK members in Peninsular Malaysia by Hassan, Samah, Shaffril and D'Silva (2011) found that the level of education is also one of the factors affecting the adoption of ICT. According to the study, people who have a higher education level are more likely to accept and understand the importance and advantages of using ICT. Therefore, the sixth hypothesis is:

Ha6a = There is a significant difference between demographic factors towards the effectiveness of ICT.
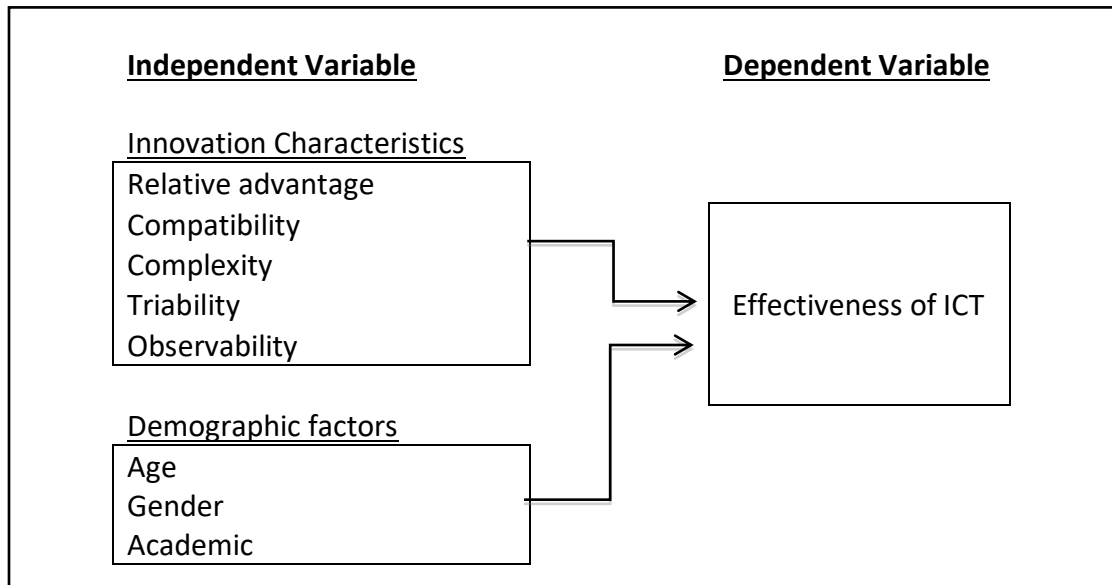

Figure 1: Illustrates the theoretical model based on all related literatures and hypotheses.

RELATIONSHIP BETWEEN INNOVATION CHARACTERISTICS WITH ICT

Mirzajani, Rosnaini Mahmud, Ahmad Fauzi Mohd Ayub and Su Luan Wong (2016) in their study related to the integration of ICT in the classroom in Iran shows that the main problem is to maximize the use of ICT that has been invested by the government to improve the standard of education. Their findings are in line with Rogers (2003), which found that the characteristics of innovation namely relative advantage, compatibility, complexity and trialibility can affect the rate of technology adoption.

These findings are consistent with the study by Norfazida (2014) which shows that management practices of the administration of Jabatan Agama Islam Negeri Kedah is still lagging as far as ICT is concerned. According to her, the result shows that characteristics of innovation such as relative advantage, compatibility, complexity and trialibility have a significant relationship in the adoption of ICT. These findings are supported by Tornatzky and Klein (1982) that proves the characteristics of innovations have significant strong relationship with the acceptance of innovation.

In another study, the findings by Noraihan and Mohd Sobhi (2013) found that among the factors that influence the use of technology is social media has a major influence of an organization's internal factors for example on skills and support management, organizational culture and organizational size. External influences also affect organizations in technology acceptance the common factors are the pressure of competition, the effect of government

policy and current market trends. Although these factors affect the acceptance of technology, she found that the most significant factor is the factors related to the characteristics of innovations for instance the of easy to use, relative advantages and compatibility. According to her, technology has become an intermediate factor in the relationship between the organization and the acceptance of the technology.

RELATIONSHIP BETWEEN INNOVATION CHARACTERISTICS WITH DEMOGRAPHIC FACTORS

Demographic factors will influence the acceptance of innovation (Junaidah, 2008). Study by Junaidah (2008) discusses the ICT adoption by gender differences. According to the findings, female users have a medium level of ICT skills compared to male users. The study also reveals that complexity is the main factor influencing female users to adopt innovation and the need of special ICT training for female users is important to enhance the understanding of female users of ICT.

Apart from gender, age differences also affect the acceptance of technology according to Lawson-Body, Willoughby, Illia and Lee (2014). In a study conducted by Lawson-Body et al., (2014), there are differences in the adoption of ICT among different age of military pensioner. Younger military pensioners are more likely to use ICT as compared to old military retiree. The main factor for this is because younger military pensioners use ICT regularly and has no difficulties in usage.

METHODOLOGY

This study is a quantitative study using descriptive and inference methods. According to Sekaran and Bougie (2010), quantitative study is to get data through structured items. This method allows researchers to measure key factors that influence the acceptance of innovation with the effectiveness of ICT as well as the relationship and influence between the variables. The method of this study is consistent with Creswell's opinion (2009) which says that quantitative research is a way to test the objective theory by examining the relationship between measurable variables, usually using an instrument, so that the number data can be analyzed using statistical procedures. The study conducted by Noor Azahariah (2008) on the perception of the students on the implementation of information and communication technology in teaching and learning states that descriptive method is preeminent because the study of perception has a close relation to behavior.

Purposive sampling is used to select the sample data for this study. The respondents of this study were obtained from Malaysia Productivity Corporation (MPC). Therefore, the population comprises of 353 people that includes MPC headquarters and its branches throughout Malaysia. A total of 210 respondents was taking part in the study. This study uses a questionnaire that was improvised from previous studies as the main method in obtaining raw data. According to Sekaran and Bougie (2010), a questionnaire is a very efficient mechanism to collect data, especially when researchers know how to measure the variables.

To determine the validity and reliability of the method used, the pilot study of this research was conducted on 31 respondents. According to Hing (2009), through pilot study, researchers can determine the reliability, validity of the research tool and determine the extent to which respondents understand the instructions.

DATA ANALYSIS

Table 1 shows the Cronbach's alpha for all perceived characteristics and ICT adoption are much higher than 0.6. Therefore, the constructs used in this study are deemed to have adequate reliability.

Table 1: Cronbach's Alpha for each variable

Variables	Alpha	Items
Relative advantage	0.936	7
Compatibility	0.804	5
Triability	0.792	4
Complexity	0.814	5
Observability	0.772	4
Effectiveness of ICT	0.956	8

Table 2 shows respondents profile analysis of gender, age, race and academic qualifications.

Table 2: Respondents profile analysis

	Respondents	n	Percentage (%)
Gender	Male	92	43.8
	Female	118	56.2
	Less than 20 years old	1	0.5
Age	21 - 30 years old	43	20.5
	31 - 40 years old	75	35.7
	41 - 50 years old	47	22.4
	More than 50 years old	44	21
	Bumiputera	204	97.1
Race	Chinese	3	1.4
	Indian	2	1.0
	Others	1	0.5
	SRP/PMR/LCE	3	1.4
	SPM/MCE/O-Level	28	13.3
	STPM/HSC/A-Level	1	0.5
Academic	Certificate	3	1.4
	Diploma	14	6.7
	Degree	95	45.2
	Masters	65	31
	PhD	1	0.5
	Others		

There was a total of 98 male staff (43.8%) and female staff of 118 people (56.2%). The majority of respondents were Bumiputera (97.1%), followed by Chinese (1.4%), Indian (1%) and other races (0.5%) respectively. Most respondents aged between 31 and 40 years (35.7%). Highest respondents were employees with first degree with 95 staff (45.2%), followed by respondents with Masters with a total of 65 people (31%). Table 3 shows the results of cross tabulation analysis between gender and age.

Table 3: Cross tabulation analysis between gender and age

Age Gender Crosstabulation				
		Gender		Total
		Male	Female	
Age	Less than 20 years old	0	1	1
	21-30 years old	18	25	43
	31-40 t years old	26	49	75
	41-50 years old	24	23	47
	More than 50 years old	24	20	44
	Total	92	118	210

From the table, the number of respondents in the age group between 31 to 40 years have female n = 49, compared to men who were only n = 26. There was not much difference between men and women for respondents with an age range between 41 to 50 years where the number of female respondents is 24 people and male respondents is 23. For the age categories over 50 years old, male respondents were n = 24 and women were n = 20. HRMD Unit Records found that male staffs were more likely to continue working at the age of 50 years above compared to female workers. Table 4 shows the results of cross tabulation analysis between gender and academic levels.

Table 4: Cross tabulation analysis between gender and academic levels

Academic Gender Crosstabulation				
		Gender		Total
		Male	Female	
Level	SPM PMR LCE	3	0	3
	SPM MCE OLEVEL	5	23	28
	STPM HSC ALEVEL	0	1	1
	CERTIFICATE	0	3	3
	DIPLOMA	2	12	14
	DEGREE	48	47	95
	MASTERS	33	32	65
	PhD	1	0	1
	Total	92	118	210

Male respondents with a degree is n=48 compared to women n=47. From HRMD record, many E41 grade consultants have a degree and have not yet advanced to the next level. For post-graduate level, the number of Masters holders for male is 33 while 32 for female respondents. Table 5 shows the results of the Pearson Correlation analysis for all the variables.

Table 5: Pearson Correlation analysis

Variable	Correlation	Sig. (2-tailed)	Variants (r^2)
Relative advantage	0.138[*]	0.046	1.90%
Compatibility	0.426[**]	0.000	18.14%
Complexity	-0.265[**]	0.000	7.02%
Triability	0.408[**]	0.000	16.64%
Observability	0.699[**]	0.000	48.86%

The analysis shows that correlation of r = 0.138, p < 0.05, is very weak and the relationship between variables are positively related. It is also shown that the variants are 1.90%. Compatibility results indicate the correlation of r = 0.426, p < 0.05, and the correlation is weak with positively related variables. The analysis shows that compatibility influenced ICT effectiveness by 18.14%.

Analysis of complexity found that the correlation value, r = -0.265, p < 0.05, and the strength of the relationship is very weak. With variants of 7.02%, these results indicate that complexity gives very little effect towards the effectiveness of ICT. Correlation for triability shows r = 0.408, p < 0.05, and the correlation is weak with the relationship between variables is positive. The value for variants is 16.64%. These results suggest that triability had some impact on the effectiveness of ICT. The findings indicate that if the staffs are given the opportunity to try the systems and applications, they will be most likely to adopt ICT.

The analysis for observability found that the correlation is r = 0.699, p < 0.05, and the strength of the relationship is medium. The value for variants is 48.86% indicating that the observability has an impact towards the effectiveness of ICT. Table 6 shows the ANOVA analysis for age and academic qualification.

Table 6: ANOVA analysis for age and academic qualification

	df	Within group	Mean Square	F	Sig.
Age	4	205	0.654	1.435	0.224
Academic	7	202	0.245	0.526	0.815

The analysis for age showed the value of F (df = 4, 205, p> 0.05) = 1.435 is not significant and analysis for academic showed the value of F (df=7, 202, p >0.05) = 0.526 which is also not significant. Therefore, there is no significant difference between level of education and age with effective implementation of ICT. Table 7 shows the results of t-test analysis of gender.

Table 7: Results of t-test analysis for gender

		Independent Samples Test	
		Gender	
		Equal Variances assumed	**Equal Variances not assumed**
t-test for Equality of Means	**t**	-0.518	-0.514
	df	208	189.271
	Sig. (2-tailed)	0.605	0.608
	Mean Difference	-0.04894	-0.04894
	Std. Error Difference	0.09443	0.09519

Analysis showed the t value is not significant (t = -0.518, df = 208, p > 0.05). The findings show no significant difference between men and women in the effective use of ICT.

DISCUSSION

The findings show that most MPC staff use ICT in their daily work. Output showed that 98.1% (42.8% male, 55.3% female) respondents used ICT. The results also show that respondents (35.2%) use ICT more than 7 hours a day to perform their duties at MPC. The majority of respondents (41.4%) use ICT between 5 to 7 hours a day. The finding shows that 131 respondents (62.4%) had over 9 years of experience in using a computer at MPC and 45 respondents (21.4%) had used computers between 7 and 9 years. The results of this study are consistent with the study by Gatautis et al. (2015) found that ICT skills are vital to the ICT industry and the entire economy. The ICT industry relies on highly educated scientists and engineers, while companies in all sectors need to implement new technologies and depend on skilled labor.

The analysis results showed that relative advantage, compatibility, complexity, trialibility and observability have a significant relationship towards the effectiveness of ICT in MPC. Effectiveness of ICT cannot be maximized if the user fails to identify the advantages of using it. This could be summarized that, the higher the impact of relative advantage, the higher the effectiveness of ICT in MPC. The results of this study are in line with the study conducted by Noraihan and Mohd Sobhi (2013) which shows that relative advantages have significant relationships in the acceptance of technological innovation. Research findings by Lawson-Body, Willoughby, Illia and Lee (2014) in their study of factors affecting veterans to use e-government applications also agree that relative advantage is among the key factors in the adoption of new innovations.

The findings also depicted that MPC staff has used ICT for a long period of time, they have no problem accepting new technology if it is introduced. This assertion is supported by the results of the demographic survey in which a majority of respondents has been using computers for more than 9 years. In a study conducted by Kirkman (2000) on the effectiveness of the Management of Information Management and Communication Technology models in schools found that the experience of using ICT affects the use of new innovations in ICT. For

example, a poor experience with ICT will result in users not wanting to use ICT in the future. The results of this study are consistent with the findings of Gatautis et al. (2015) which states that approximately 20% of total employment in the modern economy can be classified as an ICT-skilled worker.

Results showed that there was a significant relationship between complexity and effectiveness of ICT. The relationship between variables associated was negative. This negative correlation can be concluded that, the harder an IT system or application, the less people will use it. In the case of MPC, there is a weak complexity relationship towards the effectiveness of ICT. Thus, making MPC staff less affected by complexity factor. The finding of this study is supported by Lawson-Body, Willoughby, Illia and Lee (2014), showed that, more users will use less complicated application. He further explained that the high degree of complexity required users to have higher knowledge and skills to enable them to use the application. Users who have been trained and knowledgeable will not encounter problems using them.

The results also proved a significant relationship between trialibility towards the effectiveness of ICT. The chances to try out the systems and applications before actually using it will enhance staff confidence. The study by Mirzajani, Rosnaini Mahmud, Ahmad Fauzi Mohd Ayub, and Su Luan Wong (2016) regarding teachers' acceptance of ICT and ICT integration in the classroom also found that when users are more confident in using ICT, they will have higher adoption rates.

The study also showed that the observability is the dominant factor that influences the effectiveness of ICT in MPC. Information regarding the advantages and importance of ICT is a key factor in encouraging MPC staff to use ICT. IT training and relevant information is important to ensure that all staff can obtain the advantages of ICT. A study by Mutula (2016), Taylor and Packham (2016) and Ud Din et al. (2017) also agreed that an understanding of the importance of ICT can be given to ICT users in various ways such as training, seminars, workshops and storytelling. The findings of this study showed the effectiveness of training and human capital development programs undertaken by the MPC Human Resource. In line with the second objective of MPC's establishment, which emphasizes on human capital development, MPC Human Resource unit efforts have shown positive results. The study conducted by Al-Khasawneh (2012) on ICT in the teaching and learning environment of higher learning institutions in Jordan also shows that observability affects the acceptance of ICT in the education sector in Jordan. According to the study, observability is one of the important factors that influence the acceptance of ICT even though the user has not received education in technology before. The study conducted by Mirzajani et al., (2016) also proves that teachers will be more open to using ICT if they are able to see the benefits of ICT.

All demographic factors had no significant difference towards the effectiveness of ICT in MPC. This is because they have been using ICT and make it their way of life. The use of smartphones, computers and the Internet has made them more comfortable in using ICT. The result proves that age is not a factor affecting the effectiveness of ICT in MPC. This has been proven by the findings of this study that the majority of respondents (41.4%) also uses ICT between 5 to 7 hours a day and the findings show that 131 respondents (62.4%) have over 9 years of experience using computer at MPC. This situation explains that MPC staff is already experienced using ICT facilities regardless of their age. The findings of this study are consistent

with the findings of the study by Abdul Wahab, Kamaliah and Hasrina (2006) who have studied the use of computer in teaching among secondary school teachers in Penang that show there is no significant difference between the age category of teachers in teaching and learning. The study by Alazam, Bakar, Hamzah and Asmiran (2012) which examines teachers' ICT skills and ICT integration in learning in Malaysia also found no significant relationship between age and teachers' ICT skills.

The t-test analysis showed that there was no significant difference between gender and the effectiveness of ICT implementation in MPC. The finding was supported by the study conducted by Abdul Wahab et al., (2006) which shows that there is no significant difference between male and female teachers in terms of computer usage in teaching and learning. A study conducted by Lin, Shih and Lu (2013) in ICT and gender-based differences also found that there was no significant difference in the use of ICT between men and women.

The finding also shows that there is no significant relationship between education level and the effective use of ICT in MPC. Although the findings show that the number of staff with a degree is the highest with N = 95 followed by Master category with N = 65 while SPM /MCE/O-Level with N=28, the diversity of education level MPC staff is not a factor for the effective use of ICT. The main reason behind this situation is that despite the different backgrounds of staff education, ICT usage has become their lifestyle. For example, the use of a mobile phone has become a must of all MPC staff who have multiple applications used for everyday tasks such as searching for information, applying for leave, checking salary and accessing the file sharing server. The findings of this study are supported by the study conducted by Abu Obaideh Alazzam, Bakar, Ramlah Hamzah and Asimiran (2012) which conducts studies on the readiness of ICT acceptance among vocational teachers in Malaysia also found that there is no significant relationship between the level of teachers' Vocational with their willingness to use ICT. According to the study, frequent ICT usage in everyday life has provided them with the adaptability regardless of their level of education.

Since ICT has been introduced in the public sector, government agencies have begun to provide and streamline their infrastructure in line with the organization's strategic direction and objectives to keep with government aspirations. The ICT Strategic Plan for example will examine the level of use, identifying various issues, challenges and weaknesses in ICT development in each of these agencies. The focus on creating an integrated, efficient and effective application through the latest ICT technology can drive the service delivery system more effectively.

Diffusion of innovation theory used in this study examines the context of acceptance of ICT in the Malaysian public sector. According to Mohamed Jalaldeen, Nor Shariza and Norshidah (2014), Noraihan and Mohd Sobhi (2013), Ismail, Zorn, Boo, Murali and Murphy (2013) and Singeh, Abrizah and Karim (2013), Diffusion Theory of Innovation is best used to identify problems in the implementation of a new innovation to the society. Innovation characteristics such as relative advantages, compatibility, probability, complexity and observability have been an important factor in the process of acceptance of innovation in this study. In the context of the effectiveness of ICT utilization in MPC, the staff as a whole has no problem receiving and using ICT in their daily tasks and they are aware of the advantages of using ICT. This study has proven that the majority of respondents who use ICT between 5 to 7 hours a day. Research

findings show that 131 staff has over 9 years of experience in computer use in MPC causing them to have no problem adapting to technology because the use of technology has become part of their life routine. MPC staff is less affected by the complexity of ICT usage and they will continue to use ICT. The variety of smartphone applications used by MPC staff for everyday tasks such as finding information, hiring, checking payroll and accessing the department's official servers also gives them confidence in using ICT.

The most important factor in the effectiveness of ICT in MPC is observability. According to Rogers (2003), observability enables one to see the benefits of an innovation. Innovation will be more acceptable if the impact of innovation can be seen and felt. MPC staffs are aware of the importance and advantages of using ICT in their daily work. The impact of ICT usage can be seen and fully utilized by all staff. The effectiveness of training and human capital development programs conducted by the MPC Human Resource Unit has helped MPC staff to recognize and understand the importance of ICT at MPC.

CONCLUSION

Theoretically, discussion of this research was associated with findings from previous studies. This study examined the relationship between the characteristics of innovation (relative advantage, compatibility, complexity, trialibility and observability) towards the effectiveness of ICT and research results have shown a significant relationship. This study also found no significant differences between demographic factors towards the effectiveness of ICT in MPC.

LIMITATIONS AND FUTURE DIRECTIONS

This research focuses on the extent to which the effectiveness of the implementation of ICT in MPC. The instrument is focused on the use of questionnaires and accuracy of the data obtained from respondents is dependent on the honesty and understanding of respondents when answering the questionnaire.

In addition, the study examines the effectiveness of the implementation of ICT in MPC based on independent variables. This study was conducted at Malaysia Productivity Corporation headquarters and branches throughout Malaysia. The findings of this study may not be true in other organizations.

In future studies, it is suggested that further studies conducted will involve larger samples. This research only involves one government agency that has a population of 352 people. Further research could be carried out on a ministry level such as the Ministry of International Trade and Industry, which has seven sub agencies. Using the same variable, the result will be more accurate and precise.

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REFERENCES

Abdul Wahab Ismail Gani, Kamaliah Hj Siarap, & Hasrina Mustafa. (2006). Penggunaan komputer dalam pengajaran-pembelajaran dalam kalangan guru sekolah menengah: Satu Kajian kes di Pulau Pinang. Diperoleh dari http://web.usm.my/km/24-06/km%20art%2011.pdf

Abu Obaideh Alazzam, Bakar, A. R., Ramlah Hamzah, & Asimiran, S. (2012). Effects of demographic characteristics, educational background, and supporting factors on ICT readiness of technical and vocational teachers in Malaysia. *International Education Studies*, 5(6), 229–243.

Akmal, F., a Salman, A. (2015). Partisipasi politik belia secara "online" melalui ruang demokrasi maklumat media baru. *Jurnal Komunikasi, Malaysian Journal of Communication,* 31(1), 81–100.

Al-Khasawneh, M. M. F. (2012). *Adoption of information and communication technology in teaching and learning environment in Jordanian higher education institutions* (Doctoral thesis, Universiti Utara Malaysia).

Alazam, A., Bakar, A. R., Hamzah, R., & Asmiran, S. (2012). Teachers' ICT skills and ICT integration in the classroom: The case of vocational and technical teachers in Malaysia. *Creative Education*, 3(December), 70–76.

Botha, N., & Atkins, K. (2005). *An assessment of five different theoretical frameworks to study the uptake of innovations*. Paper presented at Tahuna Conference Centre 26-27, 2005, Nelson, New Zealand.

Creswell, J. W. (2009). *Research design - Qualitative, quantitative and mixed method approches* (3rd ed.). Thousand Oaks: Sage Publications.

Gatautis, R., Medziausiene, A., Tarute, A., & Vaiciukynaite, E. (2015). Towards ICT impact framework: Private and public sectors perspective. *Journal of Economics, Business and Management*, 3(4), 465–469.

Hing, Y. K. (2009). *Faktor berkaitan dengan penerimaan guna perbankan Internet dalam kalangan kakitangan Universiti Tunku Abdul Rahman* (Master's thesis, Universiti Putra Malaysia).

Mutula, S. M. (2016). Knowledge retention strategies in public sector organizations. *Sage Journal*, 32(3), 362–376.

Osmani, M. W., Weerakkody, V., Sivarajah, U., & El-Haddadeh, R. (2014). The public value of social media in the UK public sector. *Electronic Government and Electronic Participation: Joint Proceedings of Ongoing Research and Projects of IFIP WG 8.5 EGOV and ePart 2014*, 21, (pp. 276–286).

Ismail, A. F., Zorn, S. F., Boo, H. C., Murali, S., & Murphy, J. (2013). Information technology diffusion in Malaysia's food service industry. *Journal of Hospitality and Tourism Technology*, 4(3), 200–210.

Junaidah Hashim. (2007). Information communication technology (ICT) adoption among SME owners in Malaysia. *International Journal*, 2(2), 221–240.

Junaidah Hashim. (2008). Learning barriers in adopting ICT among selected working women in Malaysia. *Gender in Management: An International Journal*, 23(5), 317–336.

Kirkman, C. (2000). A model for the effective management of information and communications technology development in schools derived from six contrasting case studies. *Journal of Information Techology for Teacher Education*, 9(1), 37–52.

Lawson-Body, A., Willoughby, L., Illia, A., & Lee, S. (2014). Innovation characteristics influencing veterans' adoption of e-government services. *The Journal of Computer Information Systems*, 54(3), 34–44.

Lin, S., Shih, T. H., & Lu, R. (2013). ICT proficiency and gender: a validation on training and development. *International Journal of Technology and Design Education*, 23(2), 179–190.

Mirzajani, H., Rosnaini Mahmud, Ahmad Fauzi Mohd Ayub, & Su Luan Wong. (2016). Teachers' acceptance of ICT and its integration in the classroom. *Quality Assurance in Education,* 24(1), 26–40.

Morshedi Hendehjan, N., & Noordin, N. (2013). Level of information & communication technology (ICT) usage among ESL teachers in Malaysia. *International Journal of Education and Literacy Studies*, 1(1), 7–14.

Noor Azahariah Zainon. (2008). *Persepsi pelajar terhadap pelaksanaan teknologi maklumat dan komunikasi dalam pengajaran dan pembelajaran* (Master's thesis, Universiti Utara Malaysia).

Noraihan Mohamad, & Mohd Sobhi Ishak. (2013). *Pengaruh faktor teknologi terhadap hubungan antara faktor organisasi dengan penerimaan media sosial dalam pemasaran penginapan bajet*. Kertas kerja dibentangkan di Terengganu International Tourism Conference 2013 (TITC2013), 23-25 August, Kuala Terengganu.

Norfazida Abdul Rashid. (2014). *Majlis Agama Islam Negeri: Suatu kajian terhadap keberkesanan penggunaan teknologi maklumat dan komunikasi (ICT) dalam meningkatkan produktiviti pengurusan* (Master's thesis, Universiti Utara Malaysia).

Rogers, E. M. (2003). *Diffussion of innovations* (5th ed.). NY: The Free Press.

Sekaran, U., & Bougie, R. (2010). *Research methods for business - A skill building approach* (5th ed.). USA: John Wiley & Sons.

Shahid, B., Ridzuan, M., Faridah, I., & Vijayesvaran, A. (2014). Online market communicational patterns in developing countries: A Malaysian perspective. *Malaysian Journal of Communication*, 30(2), 61–70.

Shahrul Nazmi, S., & Normah, M. (2015). Digital version newspaper: Implication towards printed newspaper circulation in Malaysia. *Jurnal Komunikasi, Malaysian Journal of Communication,* 31(2), 687–701.

Sheha Che Azemi, H., Rahim Romle, A., Mohd Udin, M., Suhaimi Mohd Yusof, M., Khairina Muhammad Husin, N., & Sabrina Sofian Shahuri, N. (2016). The implementation of ICT towards improving service quality in public sector. *World Applied Sciences Journal*, 34(4), 499–505

Singeh, F. W., Abrizah, A., & Karim, N. H. A. (2013). Malaysian authors' acceptance to self-archive in institutional repositories towards a unified view. *The Electronic Library*, 31(2), 188–207. doi: https://doi.org/10.1108/02640471311312375

Tan, K. S., & Eze, U. C. (2008). An empirical study of internet-based ICT adoption among Malaysian SMEs. *Communications of the IBIMA*, 1, 1–12.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta analysis of findings. *IEEE Transactions on Engineering Management*, EM-29(1), 28-45.

Vijayakumar Rajathinam. (2010). Internet banking users's competence and its influence on usage satisfaction – A view from India. *Journal of Internet Banking and Commerce*, 15(1), 1–11.

Wei, T. T., Marthandan, G., Chong, A. Y.-L., Ooi, K.-B., & Arumugam, S. (2009). What drives Malaysian m-commerce adoption? An empirical analysis. *Industrial Management & Data Systems*, 109(3), 370-388.

Zamree Yaacob. (2001). *Teknologi komunikasi di organisasi awam: Faktor-faktor berkaitan penggunaan computer* (Master's thesis, Universiti Putra Malaysia).