DETERMINANTS FOR ICT ADOPTION AND PROBLEMS: EVIDENCE FROM RURAL BASED SMALL AND MEDIUM ENTERPRISES IN MALAYSIA

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ABSTRACT

The purpose of this study is to investigate the information and communication technology adoption among rural based SMEs in Malaysia and identify the problems facing these SMEs in the implementation and usage of ICT. In addition, the study also attempts to determine whether significant relationships exist between owners' attitude, knowledge and innovativeness, and the ICT adoption. Questionnaire survey was used to obtain data from rural based SMEs in Malaysia. A total of 1000 questionnaires were distributed and 167 usable responses were received. The findings reveal a relatively high adoption of ICT among rural based SMEs while lack of funds and financing were the main problems to the success of its adoption and implementation. It was also found that only attitude had significant positive relationship with the ICT adoption. The findings of this study assist to owner/managers of rural based SMEs and also policy makers in Malaysia in finding strategies to cultivate culture of adopting and implementing of ICT for betterment of SMEs in Malaysia.

Keywords: Rural-Based SMEs, ICT Adoption, Owners' Attitude, Knowledge, Innovativeness.

INTRODUCTION

In the new global economy, advent of the Information and Communication Technology (ICT) has revolutionized the way of doing commercial activities. Moreover, it has changed dramatically many aspects of economic and social lives and established new standard of living. One of the notable changes in the millennium is transformation of the industry structure and its competitiveness in the market to a new level (Al Moawi, 2011). This transformation in the business environment has not only created more opportunities, it has also posed a threat for the Small and Medium Enterprises (SMEs) of being run over by large and more established companies. SMEs still lag behind in strategy development and implementation (Schlemmer & Webb, 2009), and this has jeopardized SMEs to be more relevant to current economic demand and remain competitive (Ahmedova, 2015; Arendt, 2008). The ICT is essential to business development and therefore access to technology is crucial for the SMEs to fully participate in the rapidly changing market environment. According to Jia et al. (2017), most of the millennial SMEs have begun to realize the usage of ICT in their daily operation due to ICT support in term of internal communication, team collaboration, virtual project management and information sharing with their business stakeholders.

ICT application certainly boost firm's reachability to information and access to experts, expansion of market and customer, increase exports, and improvement in managing organization (Wilcott et al., 2008; Rajabion, 2008). It can also create innovative products and be competitive (Barbra-Sanchev et al., 2007) besides lowering production and labour costs, adds value to product and services, and increases a firm's competitive advantage (Premkumar, 2003; Nguyen, 2009), and enhances the business process (Acar et al., 2005). Existing studies also recognizes the critical role played by ICT technologies to address some global issues affecting SMEs as well rural SMEs such as transformation of industry, transactional cost, efficiency of operation, easier collaboration, capital investment, and global accessibility (Martins et al., 2016; Rhodes, 2009).

ICT ADOPTION IN THE SMES

During the past decades, a significant number of research have been conducted in determining factors that influence the adoption of ICT (Beatty et al., 2001; Eze et al., 2018) but only little research has been carried out on the adoption of ICT in Small and Medium Enterprises (SMEs). It has been noted that Small firms differ from large companies because they have unique computing needs and different technology acceptance patterns. Corrales & Westhoff (2006) defined ICT adoption as "*the choice an individual makes to accept or reject a particular innovation and the extent to which that innovation is integrated into the appropriate context*." Ideally SMEs are better than large firms because of greater flexibility which allows them for the easier adoption of new technologies (Chang-Shuo, 2006; Awa et al., 2010; Nagayya & Rao, 2013). However, research has shown that SMEs are generally slower in adopting ICT compared to large enterprises.

The inability of the SMEs to adopt ICT can be attributed to a variety of reasons. Some SMEs have few resources to allocate to ICT and that they lack the ability to recognize the benefits that ICT may provide to the business (Owen & Darkwa, 1999; Roberts, 2000; Holmqvist, 2003; Wolcott et al., 2008). Others found SMEs having lack of top management engagement (Furuholt & Orvik, 2006), poor business skills, competencies, and literacy (Leenders & Wierenga, 2002; Duncombe & Heeks, 2003), lack of affordability of ICTs (Mansell & When, 1998; Hazan, 2002), poor infrastructure (Latchem & Walker, 2001; Michailidis et al., 2012; Roberts, 2000), and lack of adequate training and support (Wei & Morgan, 2004). It was also found that only one in every eight ICT projects in SMEs could be considered as truly successful (McManus & Wood-Harper, 2007). Among the problems identified are limited managerial abilities, poor project management, and lack of technical resources (Oz & Sosik, 2000). Stansfield & Grant (2003) identified the lack of knowledge, skills and support as the main barriers of ICT adoption in SMEs. Farhoornand et al. (2000) found lack of adequate infrastructure, resistance to change, cost of implementation, cultural and legal issues to have slowed down the acceptance of ICT among SMEs. Recent study established that some macro issues related to societal and organizational environment need to be critically examined to reduce barrier of ICT adoption especially in the developing countries (Venkatesh et al., 2016). Nevertheless, the significant contribution of SMEs to job creation, improvement of living standard and innovation is well known, and thus innovative strategies are clearly needed in the SMEs to improve survival and growth in the ever changing business environment, and effective deployment of ICT is likely to be a critical part of such strategies (Jones, 2011).

ICT also vital for rural SMEs for more for sustainable economic development. According to Narula & Arora (2010), rural based SMEs could be benefited in the context of extension of communication, business involvement, dissemination of information as well as knowledge

sharing among their business network. Despite several studies has been conducted on ICT adoption, relatively empirical researches on ICT adoption among rural based SME still very limited. The limited research that has been done also shows that SMEs in the rural areas have not kept up with technology implementation in comparison to SMEs in the urban setting and companies of bigger size (Arenius & Cleriq, 2005). Many rural business communities facing some problems in accessing up-to-date ICT infrastructure: to be more competitive in the industrial revolution 4.0. In addition, the rural entrepreneurs highly required to adopt current technologies and maximize usage of most fitting ICT technologies to maintain their relevance in the current business setting.

There is no ambiguity that awareness is considered that one of the major constraint of ICT adoption among rural based SME entrepreneurs Kyobe (2011). Corrales & Westhoff (2006); Kapurubandata & Lawson (2008); Yu et al. (2017) pinpointed several factors that influence rural based SMEs. Taken together, these studies highlighted some issues such as limited information literacy, limited skills, poor investment of ICT, lack of research on innovation, poor infrastructure, myths associated with ICT, lack of national policy on ICT development, technology supply problems, education problems, and economic factors. Corrales & Westhoff (2006) also strongly pointed out other factors such as exposure, capacity to adopt and use ICT, and state policies. They also conclusively reported that ICT adoption take place if SME owners affordable to acquire certain technology that subjected to financial position of the firm, required skills and adequate technological infrastructure to adopt the technologies. According to Huggins & Izushi (2002); Friedlander (2002); Galloway & Mochrie (2005), poor technological infrastructure is a major hindrance to implementation of ICT projects in rural areas, while Smallbone et al. (2002) highlighted facilitating condition especially lack of telecommunication infrastructure in the rural settings as major impediment of ICT. More recent example of ICT adoption study within rural context can be found in the work of Okon (2015). Moreover, lack of accessibility to high speed and economical telecommunication service, the aim of rural businesses to maximize the benefits of ICT become debatable (Anderson, 2001; Deakins et al., 2003). In addition, commercial feasibility and capability of the technology are required for the suitability of adoption (Galloway & Mochrie, 2005). Thus, adequate infrastructure is essential for improved access and capability to utilize technology among the rural based SMEs.

The lack of awareness and information on the perceived benefit of ICT is an important issue, which hinders the implementation of ICT projects. This lack of information has been found to be the main reason why SMEs in the rural areas become less growth oriented and lack of global orientation (Hawkins & Prencipe, 2000; Deakins et al., 2003). Studies have found out that low levels of awareness and skills on ICT were due to the low levels of income and education (Leatherman, 2000; Narula, 2008). Because the businesses in these areas lack exposure, the opportunity to develop new ICT related business skills and expertise are limited (Huggins & Izushi, 2002; Smallbone et al., 2002; Galloway & Mochrie, 2005). Therefore, according to Ramsay et al. (2003); Grant (2003); Narula & Arora (2010), the effective implementation of the technologies depends mainly on raising awareness of the potential and benefits of ICT, and increasing business skills of the rural based SMEs.

This paper seeks to investigate the adoption and acceptance of ICT among SMEs in the rural areas so that the strategic benefits of the technology could be fully exploited. Specifically, this study seeks to answer the following research questions:

1. What is the extent of ICT adoption among rural based SMEs in Malaysia?
2. What are the problems encountered in adopting ICT among rural based SMEs in Malaysia?

3. Are there significant relationships between owner/managers' attitude, knowledge, and innovativeness and ICT adoption among rural based SMEs?

HYPOTHESES DEVELOPMENT

The adoption of ICT relies heavily on the acceptance of technology by the firm's owners. If the owner does not identify the usefulness of the technology, or has a limited understanding of its potential, then naturally the owner will be reluctant to adopt it. Thong & Yap (1995) found the owner's attitude crucial in determining the technology adoption by SMEs. Similarly, the owner's attitude toward new technology had a direct impact on decisions to innovation adoption (Mehrten et al., 2001; Seyal & Rahman, 2003; Levy & Powell, 2003; Chang-Suo, 2006). Thus the following hypothesis:

H1: There is significant relationship between owner's attitude and ICT adoption in the rural based SMEs.

If the owner is well-versed with global technological development and the benefits that can be harnessed from it, he or she will be more likely to adopt the technology. Most firms were found to delay their innovation adoption because of insufficient technological knowledge (Attewell, 1992). Lack of knowledge was also found to be the main barrier to the use of ICT among SMEs (Antonelli et al., 2001; Mallah, 2003; Chang-Suo, 2006). Therefore, the following hypothesis is formulated:

H2: There is significant relationship between owner's knowledge and ICT adoption in the rural based SMEs.

Firms need innovative leaders who will definitely identify the advantages of incorporating new technology into the business (Sanchez, 2002). Lee & Runge (2001) also identified owner's innovativeness as the strongest determinant for the adoption of information systems. Similarly, Thong & Yap (1995); Thong (1999) found the owner/manager's innovativeness on a positive relationship to SME's decision to adopt information system. The following hypothesis is thus suggested:

H3: There is significant relationship between owner's innovativeness and ICT adoption in the rural based SMEs.

METHODOLOGY

Sampling and Data Collection

Rural entrepreneurship is a term frequently used in the literature, but to date there is no specific description of 'rural' and rural setting have been described in descriptive terms. This including the level of population density or the rate of population loss or gain, or in terms of context including different requirements (Zampetakis & Kanelakis, 2010; Arzeni et al., 2002). Therefore, this study focused only on SMEs registered with various agencies under the Ministry of Rural and Regional Development (MRRD). Given the situation, this study utilized purposive sampling of rural entrepreneurs based on the contextual definition. Commonly, purposive sampling took into consideration when research specified units that are representative or

emblematic of the population, mostly relying on researcher`s expert judgment (Singleton et al., 2005).

Specifically, the data were collected from Malaysian entrepreneurs except Sabah and Sarawak states. It is because of some impediments such as location, time and cost. Data were collected by means of a mail survey questionnaire completed by the owner/managers of these SMEs. A period of 30 days from the date of distribution of questionnaire was allowed for questionnaires to be completed and returned back for further process. A total of 1000 owner/managers from the sampling frame were chosen for this study. However, only 167 usable questionnaires were returned and resulted 16.7 percent of response rate. Traditionally, low response rate usually linked to SMEs nature and thus this response rate considered satisfactory for further analysis. Similar studies by Mahmood & Hanafi (2012); June & Mahmood (2011) revealed response rates of 15.86% and 20.0%, respectively.

Scale Reliability

All A reliability test was conducted to determine the internal consistency of the instruments used. Table 1 shows the variables' Cronbach Alpha values ranges from 0.639 to 0.795. Although two variables, owner's attitude and ICT adoption were below 0.7 which is interpreted as low reliability, it is still within the acceptable limits (Hair et al., 2003).

Table 1
RELIABILITY SCORES

Variable	Items	Alpha Value
Owner's attitude	4	.639
Owner's knowledge	9	.795
Owner's innovativeness	11	.787
ICT adoption	7	.697

RESULTS

Sample Characteristics

Table 2 below describes the profile of respondents by gender, age, academic qualifications, and number of years of working experience. The table shows that 131 (78.4%) of the respondents were males and the remaining 36 (21.6%) respondents were females. This shows that males are still dominating the business in the rural areas although the number of women participating in the business as owner managers is increasing. The table also shows that 85 or 50.9 percent of the respondents were in the range of 30 to 39 years old. Another 21 or 12.6 percent were below the age of 30 while only 13 or 7.8 percent of the respondents were in the age range of 50 years and above. In terms of academic qualifications, more than 50 percent attained only SPM/SPTM levels of qualifications while 60 or 25.9 percent of the respondents possessed Diplomas. Another 7.8 percent obtained a degree qualification and only 4 or 2.4 percent of the respondents graduated with a master or a post degree. It can be concluded that the majority of respondents in this study only achieved a relatively lower level of academic qualifications. The analysis on the profile of respondents also revealed 74 or 44.3 percent of them had between 10 to 15 years of working experience, and 65 or 38.9 percent of the respondents had at least 5 to 9 years working experience. There were 4 respondents (2.4%) who have had a working experience

of more than 20 years while those with working experience of between 16 to 20 years made up the fourth largest group (6.0%). Only 14 or 8.4 percent of the respondents had less than 5 years of working experience.

Table 2
PROFILE OF THE RESPONDENTS (OWNER MANAGERS)

Variable		Frequency	Percentage
Gender	Male	131	78.4
	Female	36	21.6
	Total	**167**	
Age (Years)	Below 30	21	12.6
	30-39	85	50.9
	40-49	48	28.7
	50 and above	13	7.8
	Total	**167**	
Qualifications	SPM/STPM	90	53.9
	Diploma	60	35.9
	First Degree	13	7.8
	Post Degree	4	2.4
	Total	**167**	
Working Experience (Years)	Less than 5	14	8.4
	5-9	65	38.9
	10-15	74	44.3
	16-20	10	6.0
	Above 20	4	2.4
	Total	**167**	

Table 3 shows the firm's background such the structure of ownership, number of employees, years of establishment, and nature of business. The ownership structure of the responding firms revealed that 71% or 42.6% were registered as sole proprietors, 48 or 28.7 percent were partnerships, and the remaining 48 or 28.7 percent of the firms were incorporated as limited companies (Sendirian Berhad). The majority of these firms employed 5 or more employees with 7.2% of them had more than 20 employees. A firm which employs less than 5 employees is considered as a micro enterprise, and those with 5 to 50 employees are considered as small while those with 51 to 150 are classified as medium enterprises.

In terms of years of establishment, 80 firms (47.9%) were established between 5 to 9 years ago, 58 firms (34.7%) between 10 to 15 years, and 13 firms (7.8%) were established between 16 to 20 years. Only 12 firms (7.2%) were established in less than 5 years, while 4 firms (2.4%) were in existence for more than 20 years. The SMEs usually comprised of several sub-sectors. The analysis subdivided the firms into sub-sectors according to the businesses these firms were operating. 27 or 16.2 percent of these firms were in the food and beverages, 38 or 22.8 percent were in the service sector, and the rest were categorized as retailing (7.2%), manufacturing (7.8%), ICT (9.0%), transportation (1.8%), textiles (6.6%), agriculture (9.6%), contracting (8.4%), and others (10.8%).

Table 3 PROFILE OF THE RESPONDENTS (FIRMS)			
Variable		Frequency	Percentage
Ownership Structure	Sole proprietor	71	42.6
	Partnership	48	28.7
	Sendirian Berhad	48	28.7
	Total	**167**	
No of Employees	Less than 5	23	13.8
	5-9	74	44.3
	10-15	42	25.1
	16-20	16	9.6
	More than 20	12	7.2
	Total	**167**	
Establishment (Years)	Less than 5	12	7.2
	5-9	80	47.9
	10-15	58	34.7
	16-20	13	7.8
	More than 20	4	2.4
	Total	**167**	
Nature of Business	Food/Beverages	27	16.2
	Retailing	12	7.2
	Manufacturing	13	7.8
	ICT	15	9.0
	Transportation	3	1.8
	Service	38	22.8
	Textiles	11	6.6
	Agriculture	16	9.6
	Contracting	14	8.4
	Others	18	10.8
	Total	**167**	

Extent of ICT Adoption

Table 4 presents the means and standard deviation of the items measuring the extent of ICT adoption. Mean scores are computed by equally weighting the mean scores of all items. On a five-point scale, the mean score for the extent of ICT adoption ranged from the highest of 4.47 to the lowest of 4.31. The standard deviation ranged from 0.490 to 0.524. The mean score for the ICT adoption can be classified as very high.

Table 4 EXTENT OF ICT ADOPTION			
No.	**Items**	**Mean**	**SD**
1.	Our firms allow customers to locate and send information electronically to appropriate contacts within the firm	4.47	0.524
2.	Our firm provides solutions to customer problems and allows them to track and inquire about their orders electronically	4.46	0.512
3.	Our firm accepts orders and payments electronically from customers	4.46	0.499
4.	Our firm provides after sales service to our customers via online information	4.44	0.509
5.	Our firm provides information in response to customer questions and requests	4.40	0.492
6.	Our firm send customers regular update electronically about new products and other developments within the firm	4.37	0.495
7.	Our firm provides customer with general information about firm via email, websites etc.	4.31	0.490

Barriers to ICT Adoption

The respondents were also asked on the problems encountered in adopting ICT in their businesses. It has been argued that many SMEs do not realize the short term and long-term benefits from ICT, and this lack of benefit may be caused by unrealistic expectations rather than unrealized benefit (Poon & Swatman, 1999). Table 5 shows that a big majority of the respondents (86.8%) agreed that they had difficulty obtaining funding/financing to support ICT implementation in their businesses. The lack of financial resources is a common constraint among SMEs. However, a slight majority of these respondents (50.9%) disagreed with the statement that they (owner managers) lack ICT skills that sometimes affect the adoption of ICT in their business. This finding contradicts most of the past research that SME owner managers had insufficient ICT knowledge to address the information related challenges facing the business. More than two thirds of the respondents (71.3%) also disagreed with the statement that their employees did not possess ICT skills. A similar number of respondents (71.9%) did not find any lack of ICT support system in implementing the technology in their business. The respondents also did not agree with the statements relating to high costs (76.0%), lack of exposure (76.0%), too technical (82.6%), unsuitable for business (89.2%), lack of training (89.0%), lack of government support (94.0%), unsuitable software (94.0%), environment not conducive (96.4%), and lack of confidence (97.0%). Finally, the respondents agreed that the location was not an issue in adopting and implementing ICT to the rural based SMEs.

Table 5
PROBLEMS IN IMPLEMENTING ICT

Rank	Problem	Frequency	Percentage
1.	Lack of funds/financing	145	86.8
2.	Owner's lack of ICT skills	82	49.1
3.	Employees' lack of ICT skills	48	28.7
4.	Lack of ICT support system	47	28.1
5.	High costs	40	24
6.	Lack of exposure	40	24
7.	Too technical	29	17.4
8.	Unsuitable for business	20	10.8
9.	Lack of training	18	10.9
10.	Lack of government support	10	6.0
11.	Software not suitable	10	6.0
12.	Environment not conducive	6	3.6
13.	Lack of confidence	5	3.0
14.	Remote location	4	2.4

Tests of Hypothesis

There are significant relationships between owner's knowledge, attitude, and innovativeness and ICT adoption. In order to assess these relationships, a multiple regression analysis was conducted, and the results are shown in Table 6. The overall model was significant ($F=7.923$, $p<0.001$) accounting for 35.7 percent of the variance in ICT adoption. When all three independent variables were considered simultaneously in the model, only attitude showed significant positive contribution, while knowledge and innovativeness had shown no significant relationship with ICT adoption. Therefore, only *Hypothesis 1* is supported, and *Hypotheses 2* and *3* are not supported.

Table 6
REGRESSION OF KNOWLEDGE, ATTITUDE, AND INNOVATIVENESS ON ICT ADOPTION

Variable	B	SE B	B	Sig.
Knowledge	.088	.081	.089	.276
Attitude	.284	.067	.331	.000*
Innovativeness	- .018	.055	-.027	.749
R Squared		.127		
F		7.923**		

Note: Significant at *p<0.05, **p<0.001.

DISCUSSION

The findings reveal that the extent of ICT adoption among the rural based SMEs ranged from 4.47 to 4.31 measured on a Likert scale of 5.0 point. Generally, a mean value of 4.21 and above is considered *"very high"*, and thus the finding shows that the level of ICT among the rural based SMEs in Malaysia was significantly high. The findings also indicate that the owner/managers of rural based SMEs generally had positive attitudes towards new technology, and its benefits, and the employment of the new technology is viewed as the fundamental part of creating competitive advantage of the firms. The main problem to the successfully adoption and implementation of ICTs was the lack of funds and financing. SMEs in general have few resources to allocate to ICT and they also lack the ability to recognize the advantages stemming from advanced technologies. However, the findings also reveal that a big majority of the rural based SMES did not find the location as a disadvantage to successfully implementing ICT in their firms. Similarly, their confidence level was high as well as the environment that did not deter them from usage of the technology. In addition, unsuitable software for the business, lack of government support and lack of training were not the issues to the owner/managers of this study.

The result of the regression analysis provides support for the hypothesis that significant relationship exists between owner/manager's attitude and ICT adoption. Higher levels of owner's attitudes were normally related to higher ICT adoption. According to Lubbe & Heerden (2003), the attitude influences a firm's ability and readiness to adopt new technology. Moreover, if the attitude of the owner is positive-that is, if he or she is well aware of the intricacies of computers and has some knowledge of technology and how to reap its benefits-then the business is likely to adopt it. The attitude factor has been examined in previous studies (Seyal & Rahman, 2003; Levy & Powell; 2003; Chang-Shuo, 2006; Al Moawi & Mahmood, 2011) and they found the management's attitude support or owner's attitudes had a positive relationship with ICT adoption. The result of this study is in line with the above studies. However, the hypothesis that there is significant relationship between the owner/manager's knowledge and the ICT adoption was not supported. According to Antonelli et al. (2001) & Raghuprasad et al. (2013), lack of knowledge is the main barrier to the use of ICT among SMEs. The technology knowledge factor has been examined in previous studies (Thong, 1999; Thong & Yap, 1995; Jeon et al., 2006). The result of this study is not in line with the study of Lee et al. (2006) and Al Moawi & Mahmood (2011). However, it confirms Mallah's (2003) study that indicated the relationship between the status of technology adoption among SMEs and the perception of lack of knowledge as a barrier is not statistically significant.

The findings also did not support the third hypothesis, that is, significant relationship exists between owner's innovativeness and the ICT adoption. Interpretation of these results could lead to two possibilities regarding the factor of owner/manager's innovativeness in rural-based SMEs. One of them could be used alone to determine its impact on the adoption of new

technology in the SMEs. The other can be used in the same context within other factors, taking into account the desire of owners to accept the new thing that will improve their budget against unexpected risks in the future. This result is not in line with prior researchers (Thong, 1999; Thong & Yap, 1995; Al Qirim, 2006) who conducted studies of technology adoption among SMEs. However, the result is in line with the study by Chang-Shuo (2006) and Al Moawi & Mahmood (2011) who found the innovativeness not statistically significant with the extent of technology adoption among SMEs.

CONCLUSIONS

The findings of study on the adoption of technology can put these firms within the space of competition and improve their business, as well as gain customers outside the domestic sphere. Moreover, previous studies have shown the importance of the application and use of technology as an important marketing strategy for firms and individuals. These studies have focused on some advanced models that have achieved positive results and helped to learn the extent of technology acceptance among firms or decision makers. This study has also significant implications for owners/managers of rural-based SMEs facing a problem and with an intention to adopt new technology, or who were looking for full advantages from ICT adoption, the government agencies that are attempting to encourage the use of ICT applications by rural-based SMEs, and private organizations that are planning to extend their marketing with ICT strategy among SMEs, especially those in the rural areas. These could lead to successfully implementation of ICT in SMEs in the rural setting. ICT adoption has the potential to dramatically improve quality of the firms and is an increasingly essential dimension for the firms to improve their competitive edge. Without adequate access to ICT, SMEs especially those in the rural areas may not be able to fully participate and survive in the increasingly highly volatile and dynamic markets.

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