Influence of ICT Adoption on Agro-Enterprises: Conceptual Framework and Structural Model

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ABSTRACT

Information and communication technology (ICT) adoption studies have identified ICT as a tool capable of spurring innovative business development in small and medium-scale enterprises (SMEs) if used wisely. Adopting the Unified Theory of Acceptance and Use of Technology (UTAUT) model approach with adjustments by integrating two externally derived constructs (SME Managerial Creativity and SME Organisational Size as predictors), this study investigated factors that influence ICT usage among Malaysian agro-based SMEs. A pre-tested survey instrument consisting of 132 items was administered to 400 purposively selected workers from 43 agro-based SMEs that were randomly selected in Selangor. The study was mainly aimed to determine factors that influence ICT usage among the agro-based SMEs, determine the relationship between the six predictors: performance expectancy, effort expectancy, facilitating conditions, SME organisational size and SME creativity and innovativeness and (the dependent variable) ICT usage. Also aimed to be determined was the moderating effect of gender, age and experience on the relationship. Factor analysis was run and a new test model was designed with Structural Equation Modelling. The study concludes that integrating firm and management characteristic constructs into UTAUT model provides a scale capable of explaining ICT usage behaviour of Malaysian agro-based SMEs better.

Keywords: *Agro-based SMEs, Agro-enterprises, ICT Usage, SME Management Characteristics, SME Organisational Size*

INTRODUCTION

Information and Communication Technology (ICT) includes a wide range of technological applications, telecommunications technologies, digital broadcast technologies as well as electronic information facilities. ICT, therefore, encompasses a range of technologies, information and resources. ICTs have been identified as having the potential to boost small and medium-scale enterprises (SMEs) (Ismail, Jeffery & Van Belle, 2011). However, SMEs are often not willing to relinquish the traditional approaches and means of conducting business and firm operation and embrace technological change. For firms to be able to compete favourably in the modern market that is driven by technological innovations the numerous benefits of ICT should be taken into consideration. There is also the need for more awareness creation on the benefits of ICT to SMEs (Chitura, Mupemhi, Dube & Bolongkikit, 2008).

This study sought to determine the agro-based firms' organisational expectancy of ICT usage in business based on the UTATUT model perspective. The data was collected from employees of agro-based SMEs that are based in Selangor using a survey questionnaire. The theoretical perspective of the Unified Theory of Acceptance and Usage of Technology (UTAUT) model formulated by Venkatesh, Morris, Davis and Davis (2003) was adopted. ICT usage being the criterion variable, the four key predictors of the model in addition to other two predictors that were derived from the SME size and SME management characteristics literature and integrated into the model were applied to predict ICT usage. The model has been a comprehensive theme in ICT adoption studies for over one decade due to its parsimonious power to explain a range of organisational and individual ICT adoption expectations and usage behaviour (Ahmad, Tarmidi, Ridzwan, Abdul Hamid & Abdul Roni, 2014; Taiwo & Downe, 2013).

Although the literature has widely documented that the UTAUT model explains many organisational and individual ICT adoption issues, its application in the study of Malaysian agro-based SMEs that are based in Selangor is limited. Furthermore, the level of the usage of ICT, the factors that impede the actual adoption and usage of ICT and the perceptions of the SME personnel (including managers) with regard to the influence of the characteristics of management staff and firm organisational size on the adoption and usage of ICT in business have not been fully explored as yet. This study was expected to reveal the critical factors that influence ICT usage behaviour among Malaysian agro-based firms. Hence, this study was expected to be of immediate importance to the developing SME sub-sector in Malaysia's economy. In addition, the study was expected to contribute to the current literature of ICT and (agro-based) SMEs in the country.

Meanwhile, SMEs have been identified as a major business sector across the world, covering a wide range of industries, such as agro-based or farm-based, metal-based, cosmetic-based, garment-based, etc. In most countries, the number of SMEs tremendously exceeds the number of large enterprises and companies. One of the advantages of SMEs is that they contribute strongly to the gross domestic products (GDP) and provide ample employment opportunities in most countries (Malhan, 2015; Do, Mazzarol, Volery, Geoff & Reboud, 2015). The literature has given numerous instances where ICT contribute to economic development in of nations in several ways: as an important channel to convert innovative ideas into economic opportunities; as the basis for competitiveness through the revitalisation of social and productive networks as a source of new employment; and as a way to increase productivity (Sonawane, 2014).

LITERATURE REVIEW

In this section, relevant literature was reviewed under these sub-sections: UTAUT model, Malaysian agro-based SMEs, SME organisational size as a factor influencing ICT usage and SME management characteristics as factors influencing ICT usage among Malaysian SMEs.

The UTAUT Model in Research

The UTAUT model is a unified model that was formulated by Venkatesh, *et al*. (2003) based on social cognitive theory with a combination of eight key ICT adoption research models. The eight theories are the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Technology Acceptance Model (TAM). The remaining theories are the Motivational Model (MM), a model Combining the Technology Acceptance Model and the Theory of Planned Behaviour (C-TAM-TPB), the Model of PC Utilisation (MPCU), the Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT) (Taiwo & Downe, 2013; Taiwo, Downe & Mahmood, 2012). Therefore, it has been widely accepted that the UTAUT model surpassed the eight individual models, with an adjusted variance (R^2) of 70%.

The model uses four key determinants of ICT usage and intention: performance expectancy, which is "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh, *et al*., 2003, p .447). The second determinant is effort expectancy, which is "the degree of ease associated with the use of the system" (Venkatesh, *et al*. 2003, p. 450). The third determinant is social influence, which is "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh, *et al*., 2003, p.451). The fourth determinant is facilitating conditions, which is "the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the system" (Venkatesh, *et al*., 2003, p .453). The behavioural intention construct, whose core concept is "the subjective probability of a person that he or she will perform the behaviour in question" (Fishbein & Ajzen, 1985, p. 288) is the dependent variable. The UTAUT model also considers moderators influencing the four predictors namely, gender, age, experience and voluntariness of use (AlAwadhi & Morris, 2008).

AlAwadhi and Morris (2008) performed a survey on 880 students in the adoption of e-government services using the UTAUT model. The study revealed that performance expectancy, effort expectancy and peer influence determine behavioural intention. Similarly, facilitating conditions and behavioural intentions determine usage of e-government services. Cheng, Liu and Qian (2008) found that performance expectancy and social influence determine users' behavioural intention toward Internet banking. Similarly, an empirical study in the usage of Web 2.0 performed by Fang, Li and Liu (2008) suggests that performance expectancy, social influence and effort expectancy significantly predict firm managers' intention to engage in knowledge sharing using (Kaynak, Tatoglu & Kula, 2005; Taiwo & Downe, 2013; Taiwo, Downe & Mahmood, 2012).

Result of an empirical investigation conducted by Maldonado, Khan, Moon and Rho (2009) on 240 secondary school students in Peru in the acceptance of an e-learning technology suggests that social influence significantly predicts behavioural intention. Wu, Tao and Yang (2007) investigated the acceptance of 3G services in Taiwan and found performance expectancy and social influence as predictors of behavioural intention. They also found that performance expectancy, effort expectation, social influence and facilitating conditions as predictors of use behaviour.

ICT adoption in business by SMEs could provide many benefits to both retailers and consumers. Such benefits may come in the form of implementing and using online transaction applications such as e-commerce, e-shopping, and even e-banking. In addition, entrepreneurs can access narrow market segments that are widely distributed while buyers benefit by accessing global markets with larger product availability from a variety of sellers at reduced costs (Mohapatra, 2013); and product quality and the creation of new methods of selling existing products could improve.

The usage of ICT has become almost inevitable in businesses. However, globally, SMEs lag behind in terms of applications of ICT (Mohapatra, 2013; Burke, FitzRoy & Nolan, 2002). However, in spite of the many potential advantages of the use of ICT in SMEs, its adoption remains limited, particularly in developing countries. For example, a survey conducted by Verizon found that 36% of small businesses established web sites primarily to advertise and promote their business, compared to 9% that established web site to sell or market their goods and services online. Similarly, in a survey of 444 SMEs in 2002, a study found that many SMEs were reluctant to conduct transactions online, more than 80% were only using the Internet to communicate (via e-mail) and gather business information (Mohapatra, 2013). Some of the unique characteristics of SMEs are identified as lack of business and ICT strategy, limited access to capital resources, greater emphasis on using ICT and IS to automate rather than 'informate', influence of major customers and limited information skills (Burke, *et al.*, 2002; Mohapatra, 2013).

Malaysian Agro-based SMEs

Agro-based SMEs is a term that is often used to denote an aggregate view of agriculture and business-related activities that cover the myriad of functions and processes that are involved in modern food production and distribution (Food and Agricultural organisation [FAO], 2013). Agro-based SMEs have been given various definitions, though the key theme of the concept has been retained. Cited in FAO (2013) the United States Agency for International Development (USAID) (2008) defined agro-based SMEs as any business related to agriculture, including farming, processing, exporting, input suppliers, trading and retailing. Also cited in *ibid*, Encyclopaedia Britannica (2011) broadly defined agro-based SMEs as agriculture operated by business; specifically, a part of a modern economy devoted to the production, processing and distribution of food, fibre products and by-products including the financial institutions that fund these activities. Similarly, Sharma (2013) saw agro-based SMEs as those entrepreneurial firms that are engaged in the sourcing, production, processing (manufacturing) and distribution (marketing) of farm produces. Those three definitions were given from functionalist perspective.

However, agro-based SMEs are often defined from a size perspective, i.e., capital-base (annual turnover) and number of employees (Bernaert, Poels, Snoeck & De Barker, 2013; SMECORP 2014). Agro-based SMEs in Malaysia are grouped under manufacturing industry. The Small and Medium Enterprises Corporation (SMECORP) of the country has provided a working definition for SMEs based on their size and capital base. Small enterprises are business firms with an annual turnover ranging from RM340,000 to RM17 million, or comprising of between 5 and 75 employees, or both. Medium enterprises are business firms with an annual turnover ranging from RM17 million to RM56 million or comprising between 75 and 200 employees, or both (SMECORP, 2015).

Furthermore, recent statistics indicate that SMEs constitute 99.2% of total business establishments in Malaysia (645,136) and employs over 4,854,142 people, which is 56.4% of total SMEs employment figure, 8,460,971 in 2012 and contributes 31% to the GDP. Agricultural sector with 34,188 SMEs (6.2%), contributes 6.6% to GDP and grows at 3.3% rate per annum (DOSM, 2014a, b; SMECORP, 2014), which is low compared to services and manufacturing sectors that recorded 7.2% and 5.7% annual growth rates respectively. However, only 27.0% of the 645,136 SMEs in Malaysia use high-tech ICT even though most (67.0%) of them use the Internet (MCMC, 2014). The relatively low annual growth rate and low contribution to GDP attributed to SMEs in Malaysia may be attributed to some of the factors that the literature identified as instrumental to the failure or below-expectation performance by SMEs, especially with regard to technology adoption and usage.

SME Organisational Size as Factor Influencing ICT Usage by SMEs

The literature focusing on the determinants of ICT adoption suggests a grouping of variables into three categories namely, (1) characteristics of the SME, (2) management factors, which in general refer to entrepreneurial and management characteristics and (3) a group of variables related to the firm's environment (Bayo-Mariones & Lera-Lopez, 2007). This study focused on the first two variables. Moreover, SME characteristics include those variables related to structural factors of the SMEs. The relationship between ICT adoption and SME size has been extensively studied (Bayo-Mariones & Lera-Lopez, 2007).

According to the Schumpeterian arguments large firms are better placed to develop and exploit new ICTs because of economy of scale, better working conditions and greater ability to benefit from scale economies. Rogers (2003) argues that SMEs may be alternatively adoptive to new technology as they respond to changes in customers' needs and socio-economic conditions. However, the debate on the role of SME size is still ongoing, as empirical studies have reached mixed conclusions.

SME Management Characteristics as Factors Influencing ICT Usage by SMEs

The unique nature of SMEs has proven to be an important consideration for any research interest (Dholakia & Kshetri, 2004). A past study has found that firm managers play a significant role in the establishment, development and advancement of the organisation (Abdullah, Shamsuddin, Wahab & Abdul Hamid, 2012), which significantly influences the firms' policies and operations. Therefore, any major decisions regarding technology adoption would reside on the SMEs' managers (Taalika, 2004).

Rogers (2003), Bayo-Moriones and Lera-Lopez (2007), Bayo-Moriones, Billo´n and Lera-Lopez (2013), (Petroni & Rizzi 2001) and Higon (2011) claimed that technology adoption is based on three stages of cognitive, affective and behaviour. They explained that at the cognitive stage, SMEs' managers become aware of the technology and through analysis of benefits and feasibility, they develop feelings towards it. If the feeling is favourable, the SME will move to behavioural stage in terms of actual usage of ICT, which is translated into organisational willingness. Hence, it is suggested that the success of any technology adoption will depend on various factors such as technology characteristics, external characteristics and organisational characteristics (Abdullah, *et al.*, 2012).

Management strategy and creativity and firm size (population of employees and capital-base) have also been found to influence ICT adoption behaviour among entrepreneurs and

workers (Idota, Bunno, & Tsuji, 2011; Idota, Ueki, Bunno, Shinohara & Tsuji, 2014). Firms and individuals' distinctive expectations of ICT usage may either permit or limit change, innovation and performance (Fink & Disterer, 2006). Therefore, it is important to investigate whether these perceptive expectations affect organisational adoption and usage of technology in business.

CONCEPTUAL FRAMEWORK

The conceptual framework was designed based on the UTAUT model (Venkatesh, *et al.*, 2003) perspective, with some modifications. The UTAUT model is robust, comprehensive and is one of the most used models in ICT adoption studies (AlAwadhi & Morris, 2008). Because this study focused on organisational ICT usage by both employees and managers (workers) of SMEs, the study deemed it necessary to incorporate external predictor variables into the framework as shown in Figure 1.
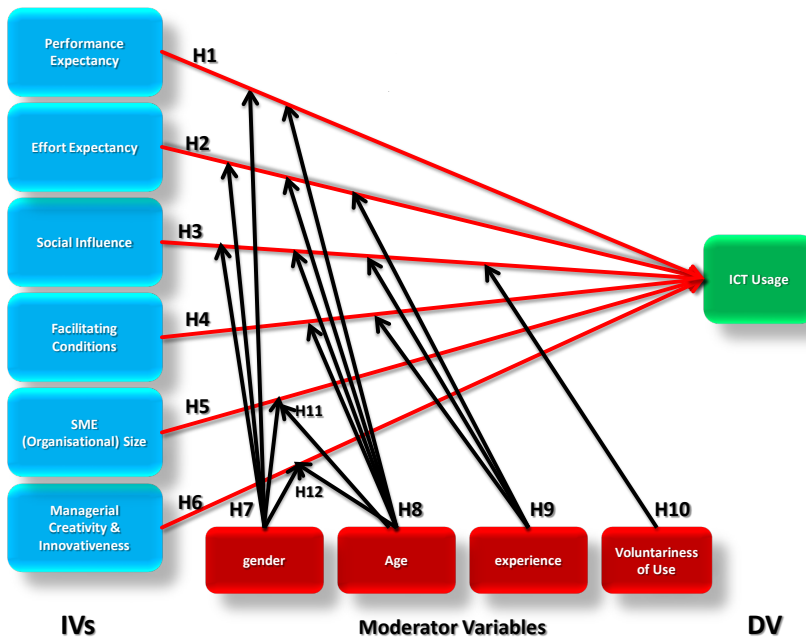

Figure 1: The Conceptual Framework of this Study

Source: Adapted and modified from Venkatesh et al. (2003)

The adjustments performed on the model, which yielded this conceptual framework, were few. The original four predictors in the model were left unmodified. However, adopting the modification approach adopted by AlAwadhi and Morris (2008) in the study they conducted in the usage of e-Government where the researchers adopted the UTAUT model with some adjustments, this study integrated two additional predictors to the model. The resulting research framework therefore consisted of six key predictors (independent variables) namely, performance expectancy, effort expectancy, social influence, facilitating conditions, SME Managerial Creativity and Innovativeness and SME Organisational Size.

The UTAUT predictors are moderated by four variables namely, gender, age, experience and voluntariness of use. As part of the modification however, only the moderating influence of gender and age was investigated for the two externally incorporated predictors (see Bayo-Moriones & Lera-Lopez, 2007; Dholakia & Kshetri, 2004; Rahman & Ramos, 2014). There is a large number of studies on the influence of firm management characteristics and firm size on ICT adoption (see Bayo-Moriones & Lera-Lopez, 2007; Bayo-Moriones, Billo´n & Lera-Lopez, 2013; Dholakia & Kshetri, 2004; Higon, 2011).

Those and many other similar studies on firm leadership characteristics and organisational size provided the researcher a strong, empirical underpinning to merge the four original predicting variables in the UTAUT model with the two afore-mentioned derived predictors and investigate their influence on the ICT usage behaviour of the agro-based SMEs. Prior to that however, after performing an extensive and critical review of literature in firm characteristics studies the researcher perceived the urge to determine whether SME organisational size and SME management qualities influence the usage of ICT by Malaysian agro-based SMEs. Therefore, this study modelled the conceptual framework into a six-predictor research model with ICT usage as the independent variable. However, this study does not claim that the UTAUT Model could not provide an appropriate scale to measure the concept. Rather this study wanted to explore (innovate in) another approach that combines concept-specific and concept-inclusive constructs to solve the research problem.

The SME managerial creativity and SME organisational size constructs that were integrated are concept-specific constructs, directly focusing on a particular concept (Rahman & Ramos, 2014). The UTAUT Model is largely a concept-inclusive model, focusing on measuring a wide range of ICT adoption problems (AlAwadhi & Morris, 2008; Venkatesh, et al., 2003). This study focused on determining ICT usage behaviour rather than ICT usage behavioural intention as suggested by Venkatesh, et al., (2003) in the model. This was because the ICT adoption literature is already 'replete' with studies focusing on usage intention (AlAwadhi & Morris, 2008). In addition, it has been nearly two decades since the new technologies have evolved (Njoh, 2012); hence, adoption may have substantially improved from mere intention to actual usage. This study aimed to contribute toward closing that literature gap, which Ramayah, Ling, Taghizadeh & Rahman (2016) also suggest exists in the Malaysian ICT adoption literature.

HYPOTHESES OF STUDY

Taking into account the extensive literature review performed by the researcher, 12 hypotheses were tested; six of them focused on the correlation between the predicting and criterion variables while the remaining six focused on moderation influence as shown in Table 1.

The conceptual framework provided a cogent research model from which a valid and reliable instrument was designed that was employed to collect data, which yielded interesting results. Table 2 shows the degree of the reliability of the constructs (both for pre-test and actual data collection) and the cumulative standard deviation of the various variables.

Table 1: Hypotheses of this Study with their Attributes

	Hypothesis	Variable(s)	Statistic
H_1	There was a significant relationship between performance expectancy and ICT usage.	PE & IU	Pearson Product Correlation/ Factor Analysis
H_2	There was a significant relationship between effort expectancy and ICT usage.	EE & IU	"
H_3	There was a significant relationship between social influence and ICT usage.	SI & IU	"
H_4	There was a significant relationship between facilitating conditions and ICT usage.	FC & IU	"
H_5	There was a significant relationship between SME (organisational) size and ICT usage.	SS & IU	"
H_6	There was a significant relationship between SME managerial creativity and innovativeness and ICT usage.	C&I & IU	"
H_7	The influence of performance expectancy on ICT usage would be moderated by gender, age and experience.	PE, IU, GDR, Age & EXP	Moderating Effect
H_8	The influence of effort expectancy on ICT usage would be moderated by gender, age and experience.	EE, IU, GDR, Age & EXP	"
H_9	The influence of social influence on ICT usage would be moderated by voluntariness of use.	SI, IU, & VOU	"
H_{10}	The influence of facilitating conditions would be moderated by gender, age and experience.	FC, IU, GDR, Age & EXP	"
H_{11}	Gender, age and experience moderated the relationship between SME (organisational) size and ICT usage.	SS, IU, GDR, Age & EXP	
H_{12}	Gender, age and experience moderated the relationship between SME (organisational) size and ICT usage.	SS, IU, GDR, Age & EXP	"

Note: PE = Performance Expectancy
        EE = Effort Expectancy
        FC = Facilitating Conditions
        SI = Social Influence
        SS = SME (organisational) Size
        C&I = SME Creativity and Innovativeness
        IU = ICT Usage
        GDR = Gender
        EXP = Experience
        VOU = Voluntariness of Use

Table 2: Degree of Reliability of Constructs and Summary of Descriptive Statistics of Result Yielded by the Conceptual Framework

Variable	No. of Items	Cronbach Alpha (α)		SD	Mean
		Pre-test study (n = 40)	Actual study (n = 382)	(Actual study)	
SME Managerial Creativity and Innovativeness	8	0.888	0.847	4.25	0.020
Performance Expectancy	10	0.899	0.796	4.14	0.035
Facilitating Conditions	10	0.848	0.849	4.07	.039
Social Influence	10	0.868	0.889	4.03	0.018
ICT Usage	17	0.965	0.951	3.95	0.54
SME Organisational Size	8	0.822	0.808	3.85	0.040
Effort Expectancy	10	0.857	0.757	3.49	0.997

The preliminary/summary of the descriptive findings presented in Table 2 was for actual study only. As one of the two integrated predictors, SME managerial creativity and innovativeness scored the highest Mean value (M = 4.25, SD = 0.020) the other incorporated predictor, SME organisational size recorded the lowest mean value (M = 3.49, SD = 0.997). Both constructs however, recorded a high degree of reliability, α = 0.888, 0.847 and α = 0.857, 0.757 for both pre-test and actual study respectively. In addition, both variables were measured with eight items in the scale respectively. Performance expectancy scored higher mean value of M = 4.14, SD = 0.035, with a high Chronbach alpha coefficient of α = 0.899, 0.796 for both pre-test and actual study respectively.

Although the dependent variable, ICT usage scored a moderate mean value of M = 3.95, SD = 0.054, measured with 17 items, the construct recorded the highest degree of reliability α = 0.965, 0.951 for both pre-test and actual study respectively. With the exception of the independent variable, which was measured with 17 items and the each of the two imported variables, which were measured with eight items each, the rest of the variables were measured with 10 items each; and all of the variables recorded a range of degree of reliability value from very high to high.

FACTOR ANALYSIS AND THE RESULTANT RESEARCH MODEL

Most of the items in the instrument were derived (rather than adopted) from previous literature. This simply implies that the items in the questionnaire were fresh, and therefore, needed some sort of cleansing and purification in order to generate reliable data hence, exploratory factor analysis (EFA) was run (see Cudec, 2000). Table 3 shows the principal component analysis (PCA) for the six independent variables. Unfortunately however, after running the analysis, out of the battery of six predictors one predictor (social Influence [SI]) was reduced to only two items, which fell short of the three minimum required items to be eligible for computation (see Hair, Black, Babin, Anderson & Tatham, 2010; Malhotra ,2004). Therefore, the SI construct was omitted from further analysis. Consequently, five independent variables (predictors) remained and were factor-loaded according into five components.

Table 3: Principal Component Analysis of the Independent Variables

Item		Component				
		1	2	3	4	5
MC&I1	I believe the management of this enterprise has the ability to increase goods production/processing strategically using ICT.	0.928				
MC&I2	I have confidence in the ability of the management of this enterprise to use ICT to gain new customers.	0.704				
MC&I3	I think the management of this enterprise is capable to use online business platforms to sensitise customers to purchase its products.	0.628				
SOS1	The population of employees of this enterprise is large enough to encourage me to use ICT for sustaining the enterprise.		0.923			
SOS2	If the number of the workers of this enterprise were fewer, I would not have been using ICT for sustaining the enterprise.		0.864			
SOS3	The number of employees of this enterprise gives me the confidence to use ICT for sustaining the enterprise.		0.797			
PE1	ICT usage would make it easier to do my business for sustaining this agro-based enterprise.			0.877		
PE2	ICT usage would improve my job performance for sustaining this agro-based enterprise.			0.850		
PE3	I use ICT because of the proportion of my co-workers who use ICT, for sustaining this agro-based enterprise.			0.649		
PE4	My close friends think that I should use ICT in my job.			0.586		
FC1	I think that ICT usage fits well with the way I like to run my work in this agro-based enterprise.				0.862	
FC2	ICT usage is compatible with all aspects of this agro-based enterprise.				0.798	
FC3	ICT usage fits into my work style for sustaining this agro-based enterprise.				0.745	
EE1	I would find ICT easy to use.					0.855

Item		Component				
		1	2	3	4	5
EE2	It is easy for me to increase my income through the usage of ICT in this enterprise.					0.796
EE3	It would be easy for me to become skilful at using ICT in my work for sustaining this agro-based enterprise.					0.787
EE4	It takes very little effort to use ICT in this enterprise.					0.570

Note: Extraction Method: Principal Components Analysis (PCA)
Rotation Method: Promax with Kaiser Normalisation
Rotation converged in 6 iterations

In the loadings, each of these constructs: managerial and creativity and innovativeness (C&I), performance expectancy (PE) and effort expectancy (EE) was reduced to only four items. Initially, C&I had eight items while PE and EE had 10 items each. Interesting however, the C&I construct that was at the bottom of the survey form originally was moved up, leading the battery of five predictors; and it recorded one of the highest loading scores. Since the factor loading of the C&I construct was not double-pronged like those of the independent variable, the definition of each of the items remained intact and they were therefore, code-named MC&I in order to highlight the managerial component of the construct's name.

Two deviant items were deleted each from the PE and EE constructs because the items did not belong and fit to either of the constructs, and leaving them could negatively affect the loadings values of the constructs (see Hair, *et al*., 2010). The definition of each of the items of the PE and EE constructs selected by EFA remained intact, hence, they code-name of the constructs remained PE and EE respectively. PE and EE constructs that originally were at top of the list of the predictors have been moved to the bottom by EFA.

Similarly, the definition of each of the three items in the SME (organisational) size (SS) construct remained unchanged since no deviant items were imported and since the loadings of the construct was not double-pronged as those of the independent variable. Originally, SS was the first of the two predicting variables that were incorporated into the conceptual framework (refer to Figure 1); however, in this environment EFA has loaded it at the second level. The definition of each of the three items in SS that were selected by EFA remained intact as the only deviant item that was loaded in the construct was omitted from further analysis because it did not fit, and the construct was loaded in single component. Hence, the construct's ode-name remained unaltered. However, the researcher added the organisational' component of the construct thus code-naming it as SOS. Generally, however, the loadings of the items were above the 0.50 cut-off point recommended by Hair, *et al*. (2010), Malhotra (2004) and Nunnally (1978). This suggests that all the items were fit based on PCA.

Table 4 shows the PCA of the dependent variable, ICT usage. Three items were eliminated; thus, the variable was reduced to 14 items. In addition, the variable was divided into a double-pronged factor loading. Referring each component to the literature, Component 1 was discovered to focus on ICT usage in entrepreneurial communication activity and was

therefore, named ICTCom. While Component 2 focused on ICT usage in product processing, so it was named ICTPros.

Table 4: Principal Component Analysis of the Dependent Variable (ICT Usage)

Item		Component	
		1	**2**
ICTCom1	ICT is used in this enterprise in conducting its commercial transactions.	0.962	
ICTCom2	ICT is used in this enterprise in communicating with its online customers.	0.880	
ICTCom3	ICT is used in this enterprise in ensuring its online security.	0.832	
ICTCom4	ICT is used in this enterprise in guaranteeing trust and reliability.	0.831	
ICTCom5	ICT is used in this enterprise in rendering speedy services.	0.814	
ICTCom6	ICT is used in this enterprise in protecting its online privacy.	0.736	
ICTCom7	ICT is used in this enterprise in conducting customer services.	0.716	
ICTCom8	ICT is used in this enterprise in boosting its competence to run business in the market.	0.669	
ICTCom9	ICT is used in this enterprise in indicating online its location address (on maps).	0.580	
ICTPros1	ICT is used in this enterprise in conducting its market research/surveys.		0.991
ICTPros2	ICT is used in this enterprise in managing costs of web-based operations.		0.841
ICTPros3	ICT is used in this enterprise in its products manufacturing/processing.		0.802
ICTPros4	ICT is used in this enterprise in its products promotion/advertising.		0.699
ICTPros5	ICT is used in this enterprise in its employee/staff management.		0.666

Note: Extraction Method: Principal Components Analysis (PCA)
Rotation Method: Promax with Kaiser Normalisation
Rotation converged in three iterations

The factor loadings of all the items ranged between 0.991 and 0.570 as shown in Tables 3 and 4. This exceeds the threshold set by Hair, *et al*. (2010) and demonstrates a high convergent validity at the item level (Teo, Su Luan & Sing, 2008). Generally, however, the structural research model yielded after running exploratory factor analysis (EFA) explained 31% of the variation in ICT usage as shown in Figure 2.
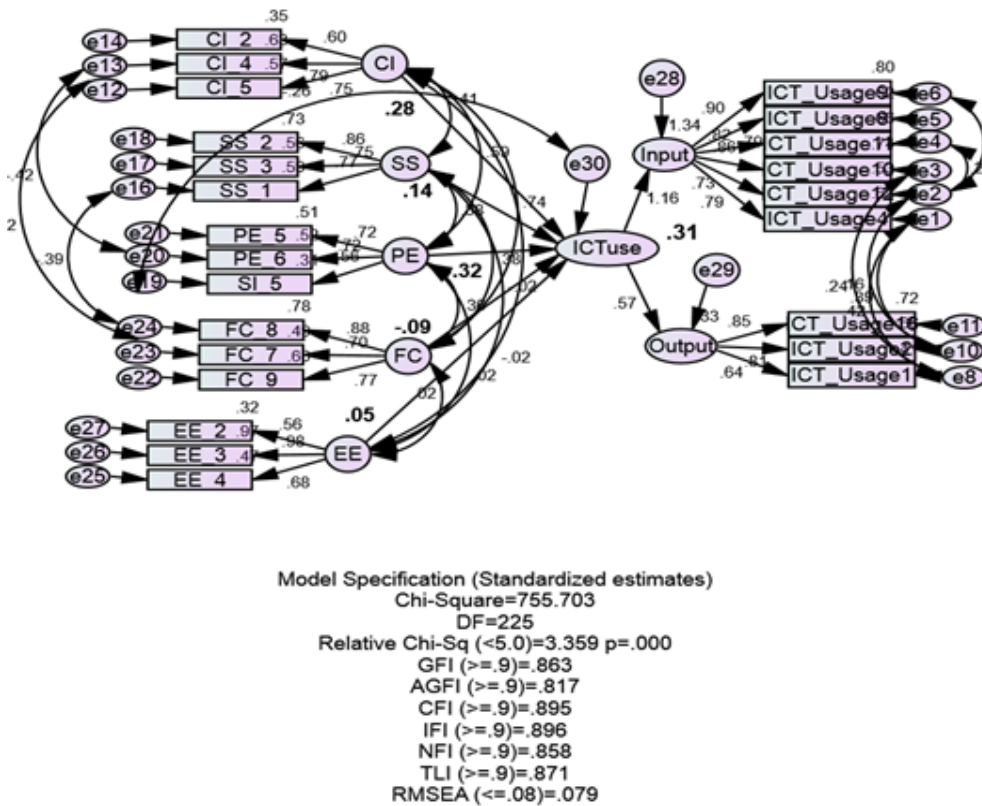
Model Specification (Standardized estimates)
Chi-Square=755.703
DF=225
Relative Chi-Sq (<5.0)=3.359 p=.000
GFI (>=.9)=.863
AGFI (>=.9)=.817
CFI (>=.9)=.895
IFI (>=.9)=.896
NFI (>=.9)=.858
TLI (>=.9)=.871
RMSEA (<=.08)=.079

Figure 2: The Structural Equation Model of this Study

Note: R = 0.31 (31%)

Regarding the fitness of the model to the data, Malhotra (2004), Kenny, Kaniskan and McCoach (2014) and Kenny (2014) have recommended that the Root Mean Square Error of Approximation (RMSEA) is another important parameter that can be used to measure model fitness to a research data. They also suggested that the acceptable guideline values for RMSEA should be 0.080 even though Kenny (2014) suggests that a RMSEA value of 0.100 could be acceptable for moderately fitted models. However, the RMSEA value of the structural model of this study (0.079) has virtually reached the maximum threshold of the 0.080 cut-off point. Therefore, the model was strongly and significantly fit to measure the data.

Furthermore, the incremental-fit-index (IFI) parameters as shown in Table 5, have moderately fitted having scored slightly less than the 0.9 cut-off point: Comparative Fit Index (CFI) = 0.895, Normed Fit Index (NFI) = 0.858, Tucker-Lewis Index (TLI) = 0.871 and Incremental Fit Index (IFI) = 0.896. Malhotra (2004), Kenny (2014) and Nunnally (1978) have indicated that incremental-fit-index values of slightly less than 0.90 can be accepted. Hence, the incremental-fit-index values of the model of this study are acceptable; therefore, the model has fitted the data. Collectively, however, the results of fit indices imply an ideally structural model fit of the data. However, Hair, et al. (2010),

Kenny (2014), MacCallum and Browne and Sugawara (1999) have suggested that it is sufficient to use only three or four fit indices in order to provide adequate evidence of model fit of a model.

Table 5: Goodness-of-fit (GOF) Indices of Structural Model of this Study

Index	CMIN (χ^2)	Relative ^{2}	GFI	CFI	NFI	IFI	TLI	RAMSEA
Value	755.703 ($p = 0.000$)	3.359	0.863	0.895	0.858	0.896	0.871	0.079

Note: CMIN = Value of Chi-square (Chi-square Minimum of Discrepancy); χ^2 = Chi-square

CONCLUSION

This study empirically determined the critical factors that influence the usage of ICT by Malaysian agro-based SMEs. The perspective of the UTAUT model was adopted. After the review of relevant literature, which gave strong theoretical and conceptual underpinning for an integrated conceptual framework to be designed, the six-predictor research model that was yielded explained 31% of the variance in ICT usage after running confirmatory factor analysis CFA.

This study yielded unpredicted result, in that one of the two external variables that were incorporated into the UTAUT Model i.e., SME managerial creativity and innovativeness scored the highest mean value followed by performance expectancy. Even though after CFA the social influence construct was eliminated due to poor loading (see Hair, *et al.*, 2010), thus consequently dislodging the two hypotheses derived from it, the fitness of the structural research model was not affected negatively, as it recorded a good RMSEA value (0.079) (see Kenny, 2014). Therefore, this study concludes that the composite conceptual framework and structural model were validly and reliably capable of explaining almost one-thirds (31%) of the variance in the ICT usage behaviour of Malaysian agro-based SMEs.

IMPLICATIONS OF STUDY

This study reveals that incorporating external constructs into the UTAUT research model can yield better outcomes. The study identified SME managerial and organisational size characteristics have significant and positive impact on ICT usage. Reinforcement of the research model with two constructs, one from SME managerial characteristics studies, i.e., SME managerial creativity and innovativeness and the other from SME organisational characteristics study, i.e., SME organisational size (see Higon, 2011; Bayo-Moriones & Lera-Lopez, 2007). Both constructs loaded strongly in CFA and significantly predicted ICT usage, (refer to Figure 2), suggesting that a hybridisation of constructs focusing on ICT usage behaviour with those focusing on management qualities and organisational size should be paid attention to when studying ICT usage by SMEs.

RECOMMENDATIONS FOR FUTURE RESEARCH

Since this study adopted and modified the UTAUT Model, it recommends that future research should retain the methodology but adopt the model without modification. Because the gap that was created by the elimination of the social influence construct may be closed. Alternatively, this study recommends further research to identify additional variables, which might be more significant in understanding ICT usage by Malaysian SMEs.

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