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Analysing Factors that Influence eBidding Adoption in Malaysian Public Sector

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ABSTRACT

This study analysed the use of eBidding system by Malaysian government agencies, which, despite its obvious benefits in cutting down red-tape and lessening workloads among the agencies officials, is plagued by low usage. As such, the objectives of the study are to examine the factors that affect system utilisation by Malaysian public sector procuring officials and to understand their behavior toward adopting the eBidding system. A self-administrated questionnaire was utilised and responses from 150 officers from various Malaysian government ministries were gathered and evaluated using structural Equation Modelling (SEM). The findings indicate that *performance expectancy*, *effort expectancy*, *social influence*, *facilitating conditions* and *information quality* significantly influence the adoption behaviour toward eBidding. *Satisfaction*, on the other hand, is concluded to have a mediating influence on the relationships between *system quality*, *information quality* and *service quality* with *eBidding adoption*. Given the significant impact of the behavioural factors of officials in eBidding adoption and role satisfaction, organisational administrators and managers can introduce key changes in the workplace to increase satisfaction among those using the eBidding system.

Keywords: eBidding, online procurement, electronic government, technology management, Malaysia.

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INTRODUCTION

Online reverse auctions system provides real-time internet transactions between a purchaser and multiple suppliers. In this type of auction, suppliers compete among themselves online using specific software by continuously offering lower-priced bids during a specified transaction cycle

(Carter *et al*., 2004). For a government, the system offers many compelling benefits in terms of cost and time savings and increased offerings from various types of suppliers. These factors contribute to a more effective and transparent procurement process. From the perspective of the suppliers to the government, they can expect to increase market penetration and decrease transaction costs by using the system (Geyskens *et al*., 2002). Due to its benefits, this system is beginning to replace traditional paper-based and manual transactions, and it is expected to be widely embraced by governments all over the world (Beall *et al*., 2003; Wyld, 2012).

eBidding is the Malaysian government's version of online procurement reverse auctions system. It is a part of the larger government online procurement system. eBidding allows the suppliers to advertise and offer their goods and services to the public sector by connecting them to the buyer communities (Pekeliling Perbendaharaan, 2009). The system was first introduced in 2006 by the Ministry of Finance (MoF) to improve efficiency in public sector procurements. By 2014, many government agencies have been utilising eBidding for procuring supplies, products and services. These agencies can procure goods and services provided by registered suppliers via the eBidding system. The procuring authority for eBidding is the respective Secretary Generals of the Ministries and Heads of Departments of the agencies, while the monitoring agencies are the Malaysian Administrative Modernisation and Management Planning Unit and the ePerolehan Unit.

The system allows an option for the procuring agencies, either to employ conventional procurement process or to use eBidding as the venue to source for goods and services. eBidding is suitable for agencies procuring goods and services that cost RM50,000 or more, and that need complex technical evaluations. They have the option to buy the goods and services via tender evaluation process, or through eBidding (Pekeliling Perbendaharaan, 2009).

Since its implementation in 2006, the eBidding system is experiencing an issue of low usage among government officials and suppliers (eBidding Transaction Perolehan Malaysia, 2012). This low usage poses serious implications for the continuous utilisation and development of the system. It was reported that the low rate of adoption indicates inherent government officials' problem with eBidding rather than with the suppliers' side (Laporan Audit, 2010). This issue not only can result in the failure to increase efficiency in the government operations, but also can lead to waste of huge IT investment dollars in the system.

Literature on online auction and procurement comprises mainly of descriptive studies and in the form of cases. These studies focused on usage of online auction and procurement system in the private sector for business purposes, usually at the organisation level of analysis. These include studies conducted by Anthony and Law (2012), Eu-Gene (2010), Kamarulzaman and Rahman (2009), Gan *et al*. (2009) and Khairul Akmaliah (2007). Only very few studies, like those of Murali *et al*. (2010) and Settoon and Wyld (2003), have focused on adoption of online auction

and procurement system within the public sector. Moreover, studies that specifically examined online reverse auction system, particularly the eBidding system, are still lacking. Thus, this study attempts to fulfil this gap. Its objectives are to identify variables affecting eBidding adoption by procurement officials in the Malaysian public sector, and to understand the effect of these variables on their behaviour in adopting the system.

RESEARCH FRAMEWORK AND HYPOTHESES DEVELOPMENT

This study analysed variables in technology adoption models in the literature, focusing on web-based system, government sector, technology adoption and individual level of analysis. The review concentrates on factors influencing individual users' acceptance and utilisation of information technology. The models that are reviewed include Technology Acceptance Model (TAM), Diffusion of Innovation Theory (DOI), Unified Theory of Acceptance and Use of Technology (UTAUT), and Model of Information System Success (ISSM). Based on the literature, this study selected several variables from the four models, especially those suggested in UTAUT (Venkatesh *et al*., 2003) to develop the research framework (Fig.1).

The review of literature identified eight variables that are applicable to this research contexts and incorporated them as the study's framework; seven were recognised as independent variables (performance expectancy, effort expectancy, social influence, facilitating conditions, information quality, system quality and service quality), one as a mediating variable (satisfaction), and another as a dependent variable (eBidding adoption). These variables and their association to each other are explained as follows.

eBidding Adoption

Even though some studies also analysed users' intention toward usage, this study focused solely on actual technology usage. This is because a strong correlation was determined to exist between intention and actual adoption (Sun & Zhang, 2005; Davis, 1992). As such, it is reasonable to test only the actual adoption because of the positive significant relationship between actual adoption and intention toward usage.

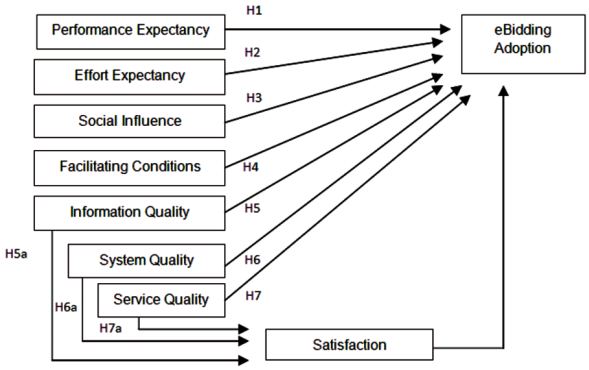

Fig.1: Research framework

Performance Expectancy (PE)

Performance expectancy refers to the notion that users utilise an information system to help them to complete their tasks (Venkatesh *et al*., 2003). PE was determined to have a significant effect on mobile service users in Lu *et al*. (2009). It is shown to significantly influence behavioural acceptance both in voluntary and mandatory system adoption situations (Venkatesh *et al*., 2003). In this study, PE refers to the perception that the procuring officials use eBidding in order to assist them to achieve certain outcomes such as improving job performance and productivity in their working environment. When they perceive that using the system help them increase performance, the officials are more likely to have the propensity to utilise the eBidding system. Therefore, it is posited that:

H1: Performance expectancy is significantly related to officials' adoption of eBidding.

Effort Expectancy (EE)

Effort expectancy is described as the degree of the system's ease of usage. It is suggested to be an antecedent of behaviour adoption and use. Carlsson *et al*.'s (2006) findings concluded the existence of relationship between EE and technology adoption. Previous research also concurred to the contention that lesser effort in learning and using a system would ultimately influence its acceptance (Gefen & Straud, 2000). In this study, EE is the belief that using eBidding assists the procuring officials to gain certain advantages such as improving job performance and increasing productivity in their work environment. As they are increasingly becoming familiar with the use of the technology, less effort is needed in order to use eBidding. In other words, the more they feel that the system is user-friendly and the more skillful they become in using the system, the more inclination they have in using eBidding. Hence, it is put forward that:

H2: Effort expectancy is significantly related to officials' adoption of eBidding.

Social Influence (SI)

The variable is described as the extent a user feels that other significant individuals (senior managers/peers) believe he should employ the innovation. Previous research indicates that peers, superiors and other people who are important to a user often affect the user's behaviour toward adopting a system (Wolin & Korgaonkar, 2003). In the context of this study, SI refers to the extent in which officials' belief that their colleagues and superiors feel they should be utilising eBidding. The study posited that the more they believe the head of departments, superiors and others around them support their use of eBidding, the higher their propensity to use the system. Therefore, it is suggested that:

H3: Social influence is significantly related to officials' adoption of eBidding.

Facilitating Conditions (FC)

Facilitating conditions refer to the extent a user perceives the technical supports provided by the organisation will facilitate a system adoption (Venkatesh *et al*., 2003). The variable includes characteristics of the technological or organisational conditions (e.g., regulations, incentives and training) that facilitate the use of the system. Prior literature indicates that FC significantly influences system acceptance behaviour (Wu *et al*., 2007). In this study, FC refers to the perception of the users on the supporting infrastructure that is made available to them in using the information system. Availability of supporting infrastructure is important because without it, the officials may feel that it will be more difficult to conduct the auctioning process. As such, it is posited that:

H4: Facilitating conditions is significantly related to officials' adoption of eBidding.

Information Quality (IQ)

Information quality refers to the user's belief on the quality of output generated by a system (Wixom & Todd, 2005). Nelson *et al*. (2005) describe IQ as information that is accurate, complete, up-to-date, and in the right format based on the user's perspective. Wang (2008) contends that IQ significantly influences users' perception of value, which increases their intention to use an information system. In this study, IQ is defined as the procuring officials' perception that the output generated by eBidding is beneficial. When an official perceives that the information generated by the eBidding system is useful and accurate, he or she is likely to view the technology usage positively.

Hence, it is recommended that:

H5: Information quality is significantly related to officials' adoption of eBidding.

System Quality (SQ)

System quality is described as the performance quality of the system. Nelson *et al*. (2005) define system quality as useful system attributes such as, flexible, reliable, responsive, accessible, and integrative. SQ was found to be associated with users' satisfaction of the system (Wixom & Todd, 2005). Lin (2006) concluded that SQ is a factor that affects users' participation in a virtual community, and also found it to significantly influence users' utilisation of online learning (Chiu *et al*., 2007). In this study, if the officials perceived that the system is flexible, reliable, fast and accessible, the level of satisfaction with the usage of the system would be higher, resulting in higher tendency to use eBidding. Hence, it is posited that:

H6: System quality is significantly related to officials' adoption of eBidding.

Service Quality (SVQ)

Service quality (SVQ) is defined as the quality of support offered by the system provider (DeLone & McLean, 2003), particularly in the dimensions of tangibility, reliability, assurance and empathy provided by the system service providers

(Nelson *et al*., 2005). SVQ is measured by attributes such as response to queries, problem solving, availability of transaction processes information, or capability to query on tenders (Wu *et al*., 2007). Cai and Jun (2003) identify four key dimensions of SVQ, namely website design, website content, trustworthiness, promptness, and reliability of service and communication. In this study, SVQ is described as the level of responsiveness and assurance provided by the service providers to the officials in helping to make their tasks completion more effective when using eBidding. The availability of support for the government users is imperative for the success of the eBidding system. The officials will be more inclined to use eBidding if they are satisfied with the service quality which is perceived as fast and with high empathy and supportive service providers on their side. Hence, it is suggested that:

H7: Service quality is significantly related to officials' adoption of eBidding.

Satisfaction

Satisfaction refers to how users feel throughout their transaction experiences with the system (Reichheld & Schefter, 2000). Wixom and Todd (2005) argued that satisfaction has mediating effects on information, system and service qualities, and subsequently affect individual adoption of the system. Satisfaction is a confirmed mediator between perceptions of quality and behavioral intentions (Cronin & Taylor, 1992). In this study, satisfaction is predicted to play a mediating role in the adoption of eBidding, particularly when the system involves new technology and complex process, which require excellent web design, good services, and technical support. The more the officials believe in the output quality, the more likely they will adopt eBidding due to their higher user satisfaction. Similarly, if the officials have more positive perception of the services provided by the system providers, they will be more inclined to use eBidding due to their increased satisfaction. Moreover, if the officials have positive perception of the quality of eBidding performance, they will be more inclined to adopt the system due to their higher satisfaction. Hence, it is posited that:

H5a: Satisfaction significantly mediates relationship between information quality and eBidding adoption.

H6a: Satisfaction significantly mediates relationship between system quality and eBidding adoption.

H7a: Satisfaction significantly mediates relationship between service quality and eBidding adoption.

RESEARCH METHODOLOGY

The study's population consisted of 1,507 officials from 604 government responsibility centres (RCs) located in Klang Valley and Putrajaya. This population group was selected because the centres are well-equipped with the eBidding systems and have conducted the highest number of procurement transaction activities in the public sector (ePerolehan

PTJ, 2012). The government procuring officials included personnel from grades 27 to 54, who perform various tasks including supervisory, requisition, goods receiving, payment and supporting roles in the RCs. This study utilised self-administered questionnaire. A simple random sampling was conducted as it is deemed appropriate since there was adequate sampling frame and the population was geographically concentrated (Hair *et al*., 2006). In this study, the minimum sample size was determined to be 112 responses based on the calculation table suggested by Bartlett *et al*. (2001). A total number of 150 usable questionnaires were gathered and utilised for further analysis using Structural Equation Modelling (SEM) technique.

The instruments were adapted with some modifications made to fit to the context of government sector, based on the studies of DeLone and McLean (2003) and Venkatesh *et al*. (2003). Table 1 summarises the research instruments according to the variables, number of items of each variable, scale of measurement, and their sources of reference. Items for PE, EE, SI, and FC were drawn from user behavior studies by Venkatesh *et al*. (2003), while the items for SQ, IQ, SVQ and satisfaction were adapted from DeLone and McLean (2003) with some adjustments made to reflect the specific target behaviour of eBidding adoption/actual use. Measurement items of satisfaction were adapted from the work of Wixom and Todd (2005). Except for the demographic section, the items were processed utilising a seven-point Likert scale.

TABLE 1
Description of Research Instruments

No	Variables	No. of items	Scale of Measurement	References
1	Performance expectancy (PE)	7	Interval	Venkatesh *et al*. (2003)
2	Effort expectancy (EE)	7	Interval	Venkatesh *et al*. (2003)
3	Social influence (SI)	7	Interval	Venkatesh *et al*. (2003)
4	Facilitating conditions (FC)	7	Interval	Venkatesh *et al*. (2003)
5	System quality (SQ)	7	Interval	Delone and Mclean (2003)
6	Information quality (IQ)	7	Interval	Delone and Mclean (2003)
7	Service quality (SVQ)	7	Interval	Delone and Mclean (2003)
8	Satisfaction	7	Interval	Wixom and Todd (2005)
9	Actual Use	4	Interval Nominal	Venkatesh *et al*. (2003)
10	Respondent's profile			

FINDINGS

Reliability and Validity

In this study, Cronbach's alpha was utilised to measure the reliability between the items. The value of 0.5 and higher is considered as sufficient in determining their reliability (Sekaran, 2003). Other than this test, confirmatory factor analysis

(CFA), average variance extracted results (AVE), and composite reliability tests were also performed in this study. Average variance extracted (AVE) value, which is higher than 0.5, indicates the presence of convergent validity, while AVE variance from 0 to 1 refers to the ratio of the total variance. Composite reliability measures the overall reliability of the whole scale. The recommended value for the composite reliability test is above 0.7, and more than 0.50 for AVE (Hair *et al*., 2006).

The results presented in Table 2 indicate that all factor loadings for the study constructs are significant and surpass the 0.5 value suggested by Hair *et al*. (2006). All the constructs variance extracted estimates surpass the minimum suggested value. The composite reliability values are also higher than 0.6, ranging from 0.82 to 0.94. In short, these constructs are proven to have adequate convergent reliability.

TABLE 2
Result on Reliability and Validity Tests

No	Construct	Factor loading	Average Variance Extracted (AVE)	Composite Reliability	Cronbach's Alpha
1.	**Performance Expectancy (PE)**		.75	.92	.929
	PE1	.888			
	PE2	.949			
	PE3	.831			
	PE4	.798			
2.	**Effort Expectancy (EE)**		.79	.94	.932
	EE4	.948			
	EE5	.974			
	EE6	.897			
	EE7	.703			
3.	**Social Influence (SI)**		.7	.9	.908
	SI 1	.873			
	SI 3	.879			
	SI 5	.686			
	SI 7	.888			
4.	**Facilitating Conditions (FC)**		.66	.88	.886
	FC2	.787			
	FC 4	.763			
	FC 5	.733			
	FC 7	.95			
5.	**Information Quality (IQ)**		.7	.9	.891
	IQ2	.822			
	IQ4	.803			
	IQ5	.735			
	IQ6	.957			
6.	**System Quality (SYQ)**		.72	.91	.891

No	Construct	Factor loading	Average Variance Extracted (AVE)	Composite Reliability	Cronbach's Alpha
	SYQ3	.568			
	SYQ5	.906			
	SYQ6	.899			
	SYQ7	.969			
7.	**Service Quality (SVQ)**		.65	.88	.878
	SVQ1	.803			
	SVQ3	.883			
	SVQ5	.78			
	SVQ6	.754			
8.	**Actual Use (USE)**		.67	.89	.892
	USE1	.756			
	USE2	.934			
	USE3	.911			
	USE 4	.638			
9.	**Satisfaction**		.53	.82	.818
	Satisfaction1	.76			
	Satisfaction2	.66			
	Satisfaction3	.69			
	Satisfaction4	.80			

Discriminant Validity

Discriminant validity measures whether one variable is internally correlated, unique and distinct from other variables (Tong, 2007). In this study, correlation tests were used to examine this type of validity to determine the directions in the correlation relationships (Hair *et al*., 2006). A correlation value of 0.5 shows a distinct concept, whereas a correlation value of 0.8 and higher shows a lower distinct concept.

TABLE 3
Results of the Discriminant Validity Test

Variable	X1	X2	X3	X4	X5	X6	X7	X8	X9
PE (X1)	1								
Adoption/Use (X2)	.660**	1							
EE (X3)	.643**	.771**	1						
SI (X4)	.462**	.809**	.605**	1					
FC (X5)	.129	.406**	.242**	.622**	1				
SQ (X6)	.683**	.542**	.425**	.379**	.039	1			
IQ (X7)	.423**	.698**	.513**	.798**	.785**	.328**	1		
SVQ (X8)	.437**	.721**	.543**	.723**	.561**	.358**	.675**	1	
Satisfaction (X9)	.710**	.815**	.696**	.570**	.191*	.557**	.482**	.522**	1
**. Correlation is significant at 0.01 level (2-tailed)									
*. Correlation is significant at 0.05 level (2-tailed)									

Table 3 shows that the values of all the variables are below 0.8, denoting the presence of discriminant validity. There are two correlations which display the value of Pearson's Correlation greater than 0.8, which are 0.809 (Social influence and Adoption of e-Bidding) and 0.815 (Satisfaction and Adoption). However, these values are considered as low and acceptable. Therefore, the results of the analysis indicate that the scales developed for this study have a good discriminant validity.

Revised Measurement Model

Confirmatory factor analysis (CFA) is used to improve the Goodness-of-fit (GOF) indices of the model. After re-specification, the overall fit for the revised model were examined based on the obtained output. Table 4 provides a summary of the results of this model.

TABLE 4
Results of the Goodness-of-fit Tests for the Revised Model

GOF Indices	Value
CMIN	788.38
CMIN/DF(1)	1.91
GFI	.80
CFI	.93
NFI	.87
TLI	.92
RMSEA	.08

The test of fitness produces a χ^2 value of 788.38 while the CMIN/DF is reported to be 1.919. Other indices were also used as indicators to determine the fitness level of the study's model. The TLI (0.92) and GFI (0.8) values are within desirable ranges, which suggest that the model is a fit one. CFI and NFI show reasonable values of 0.93 and 0.87 (close to 1), which also indicate that the model and the data are harmonious with one another. Additionally, the RMSEA value is 0.08, which is within the desirable range for model's fit. In other words, the re-specification process has improved the model's fit.

The revised model is shown to have a good fit, and thus, it was used to examine the proposed hypotheses in this research. The relationships between the independent variable and eBidding adoption were analysed by identifying the strength of the path coefficients in the model. Then, the data were analysed to determine the effect of the mediating variable. The results for the independent and mediating variables are shown in Tables 5, 6, 7 and 8.

TABLE 5
The SEM Output for Hypotheses Testing

Parameter			*Estimate*	*S.E.*	*C.R.*	*P*
PE	➔	eBidding adoption	.106	.04	2.64	.008
EE	➔	eBidding adoption	.407	.097	4.212	***
SI	➔	eBidding adoption	.307	.086	3.57	***
FC	➔	eBidding adoption	-.606	.163	-3.715	***
IQ	➔	eBidding adoption	1.069	.332	3.217	.001
SQ	➔	eBidding adoption	-.044	.037	-1.176	.239
SVQ	➔	eBidding adoption	.106	.06	1.768	.077

Note: Significance level is at 0.05

TABLE 6
The Hypotheses Testing of the Mediating Effects
(Satisfaction on Information Quality-Adoption Relationship)

Step				**Estimate**	**SC**	**C.R./t**	**Results**
1	Adoption	<---	IQ	.73	.553	7.658	Significant
2	Satisfaction	<---	IQ	.666	.664	7.099	Significant
3	Adoption	<---	Satisfaction	.494	.375	4.62	Significant
	Direct effect			.553			
	Indirect effect			.249			

TABLE 7
The Hypotheses Testing of the Mediating Effects
(Satisfaction on the System Quality-Adoption Relationship)

Step				**Estimate**	**SC**	**C.R./t**	**Results**
1	Adoption	<---	SQ	.069	.039	.642	Not Significant
2	Satisfaction	<---	SQ	.638	.57	6.044	Significant
3	Adoption	<---	Satisfaction	1.464	0.918	9.771	Significant
	Direct effect				.039		
	Indirect effect				.52326		

TABLE 8
The Hypotheses Testing on the Mediating Effects
(Satisfaction on the Service Quality-Adoption Relationship)

Step				**Estimate**	**SC**	**C.R./t**	**Results**
1	Adoption	<---	SVQ	.462	.272	3.02	Significant
2	Satisfaction	<---	SVQ	.943	.735	7.935	Significant
3	Adoption	<---	Satisfaction	.952	.719	6.266	Significant
	Direct effect			.272			
	Indirect effect			.528			

The results indicate *performance expectancy* (hypothesis H1, with β=0.106, p=0.008 <0.05), *effort expectancy* (hypothesis H2, with β=0.407, p=0.00<0.05), *social influence* (hypothesis H3, with β=0.307, p=0.000<0.05), *facilitating conditions* (hypothesis H4, with β=-0.606, p=-3.715<0.05) and *information quality* (hypothesis H5, and β=1.609, p0.001<0.05) have strong and positive relationships with *eBidding adoption*.

However, for the next two hypotheses, the results prove to be contrary to the previous findings. Hypotheses H6 and H7 are not validated, with *system quality* (with β=-0.044, p=0.239>0.05) and *service quality* (with β=0.106, p=0.077>0.05) found to have insignificant correlation with the dependent variable. These suggest that both are not significant predictors of *eBidding adoption*.

The findings also show *information quality* influences both *eBidding adoption* (with β=0.73, p<0.05) and *satisfaction* (with β=0.66, p<0.05), while *satisfaction* has a strong influence on *eBidding adoption* (β=0.494, p<0.05). Direct effect is reported to be a value of 0.553 versus indirect effect of 0.249. Therefore, it can be concluded that satisfaction becomes a partial mediator between *information quality* and *eBidding adoption*, and thus, hypothesis H5a is supported.

As shown in Table 7, the results on *system quality* reveal that it has a minor effect on *eBidding adoption* (with β=0.069, p>0.05), but a significant influence on *satisfaction* (with β=0.638, p<0.05). A significant relationship is also determined between *satisfaction* and *eBidding adoption* (with β=1.464, p<0.05), with a direct effect reported as 0.039, while an indirect one as 0.523. Hence, it can be concluded that *satisfaction* fully mediates the relationship between *system quality* and *eBidding adoption*. These findings validate hypothesis H6a.

The results also show the strong relationships between *service quality* and both *eBidding adoption* (with β=0.462, p<0.05) and *satisfaction* (with β=0.943, p<0.05), while *satisfaction* is proven to be significantly related to *eBidding adoption* (with β=0.952, p<0.05). Their direct effect is reported at 0.272, while the indirect effect is recorded as 0.528. Therefore, *satisfaction* is determined to act as a partial mediator in the relationship between *service quality* and *eBidding adoption*.

In summary, the results of this study have shown that *performance expectancy*, *effort expectancy*, *social influence*, *facilitating conditions*, and *information quality* significantly affect the adoption behaviour of eBidding system by the procurement officials. On the other hand, *system quality* and *service quality* are proven to have insignificant associations with the system adoption. The mediation results verify that *satisfaction* has a full mediating effect on *system quality* and *eBidding adoption*, partial mediating effect on *information quality* and *eBidding adoption*, and partial mediating effect on *service quality* and *eBidding adoption*.

DISCUSSION

The findings of this study provide several implications for the success of e-government implementation, such as the Malaysian government's online auction system. This study is one of the few studies that applied a combined research framework in exploring adoption behaviour and system factors from the government side of the system adoption, especially one that focuses on online reverse option system.

With regard to theoretical contribution, the study introduced and subsequently validated four variables from the UTAUT model (*performance expectancy*, *effort expectancy*, *social influence*, and *facilitating conditions*); one variable (*information quality*) from the updated DeLone and McLean (2003) and another (*satisfaction*) from the ISSM model. Some previous studies have examined the links between them and the adoption behaviour of users, and the findings of this study reveal similar results to theirs (Venkatesh *et al*., 2003; Lu *et al*., 2009; Carlsson *et al*., 2006; Wolin & Korgaonker, 2003; Wu *et al*., 2007; Wixom & Todd, 2005; Reichheld & Schefter, 2000).

Practically, the results of the study provide beneficial information to the public sector stakeholders, particularly e-government planners and administrators, for future improvement of online reverse auction system. The findings indicate performance expectancy, effort expectancy, facilitating conditions and information quality have significant influences on eBidding adoption. This information can be utilised by the e-government planners and administrators in improving the usage level by these officials.

Some of the strategies that can be implemented include increasing efforts to improve the officials' perception on the system's capability in supporting their work-related productivity and reducing barriers on how to use the system. For this purpose, training and communication programmes by The Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) or the Ministry of Finance can be positioned to assist the users, especially newly appointed officials, to gain familiarity with the information provided by, types of supports provided for, and various system features of the eBidding system.

Another approach that can be utilised by the e-government system administrators is to improve the facilitating conditions for the eBidding system. One suggestion for improvement is to have a designated 24-hour technical support group or help desk that can assist the procuring officials in time of need. Another recommendation is to enhance eBidding system's ability to provide quality information that is timely, accurate, complete, and in the right format (Nelson *et al*., 2005). These changes can support the officials in adopting the system.

The study confirms the argument by Venkatesh *et al*. (2003) that social influence significantly affects system usage. Thus, programme managers and the early adopters of the eBidding system who support its

utilization need to be encouraged to inform their peers about the benefits of using the system, which will likely influence others to adopt it, too. In addition, the outcome of this study can be used to evaluate the positional influence of head departments on their staff in using technologies. The outcome of this evaluation will aid in the design, evaluation and implementation of future procurement auction system.

The results have shown satisfaction to have a positive mediating impact on the use of eBidding system. Therefore, Malaysian e-government system administrators can devise improvements to the online auction system by taking into consideration several approaches to improve satisfaction level of the procuring officials when using the technology. In this case, providing easy-to-use web design (system quality), timely and accurate system output (information quality), and reliable technical support (service quality) will likely help to intensify the officials' satisfaction toward using the system.

The findings also have some policy implications. The results indirectly assert that a majority of the procuring officials consider eBidding as a reliable and productive system. However, the study found that the manual system, i.e., quotation system, is more preferable due to the attributes of product specifications, competitiveness, price transaction value and human interactions with the suppliers. This finding can be utilised by policy makers in devising relevant e-government procurement IT policy that is in line with the national-level accountancy and transparency policies.

CONCLUSION

The study began with the objectives of determining the factors that affect system utilisation by the Malaysian public sector procuring officials. The study's research framework comprises eight variables: performance expectancy, effort expectancy, social influence, facilitating conditions, information quality, system quality and service quality as the independent variables, satisfaction as the mediating variable, and eBidding adoption as the dependent variable. The results also confirm the findings of the earlier research, and validate the model fit. This finding, which contributes to further understanding of the procuring officials' behaviour in adopting the eBidding system, enriches the literature on technology acceptance in organisations. This understanding supports improvement efforts in technology implementation within the government sector.

REFERENCES

Anthony, P., & Law, E. (2012). Reverse Price Strategy for Seller Agent in Multiple Simultaneous Auctions. *International Journal of Knowledge-based and Intelligent Engineering Systems*, *16*(3), 163-175.

Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, *19*(1), 43-50.

Beall, S., Carter, C., Carter, P. L., Germer, T., & Jap, S., (2003). *The role of Reverse Auctions in Strategic Sourcing. CAPS Research*. Retrieved April 12, 2010, from http://www.capsresearch.org/ publications/pdfs-protected/beall2003.pdf.

Cai, S., & Jun, M. (2003). Internet Users' Perception of Online Service Quality: A Comparison of Online Buyers and Information Searchers. *Managing Service Quality*, *13*(6), 504-519.

Carlsson, C., Hyvonen, K., Puhakainen , J., & Walden, P. (2006). *Adoption of Mobile Devices/Services-Searching for Answers with the UTAUT*. Proceedings of the 39th Hawaii International Conference on System Science. Retrieved November 29, 2011, from http://ieeexplore.ieee.org/ stamp/stamp.jsp?arnumber=01579556.

Carter, C. R., Kaufmann, L., Beall, S., Carter, P. L., Hendrick, T. E., & Peterson, K. J. (2004). Reverse auctions-grounded theory from the buyer and supplier perspective. *Transportation Research, Part E*, *40*(3), 229-254.

Chiu, C. M., Chiu, C. S., & Chang H. C. (2007). Examining the Integrated Influence of Fairness and Quality on Learners' Satisfaction and Web-based Learning Continuance Intention. *Information Systems Journal*, *17*(3), 271-287.

Cronin, J. J. Jr., & Taylor, S. A. (1992). Measuring Service Quality: Re-examination and Extension. *Journal of Marketing*, *56*(3), 55-68.

Davis, F. D. (1992). Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology*, *22*(14), 1111-1132.

Delone, W. H., & McLean, E. R. (2003). The Delone and McLean Model of Information Systems Success: A Ten Year Update. *Management Information Systems*, *19*(4), 9-30.

eBidding Transactions Perolehan Malaysia. (n.d.). Retrieved October 1, 2012, from http://home.eperolehan.com/ my/v2/index.php/bm/mengenai-ep/statistik-sistem-ep.

ePerolehan PTJ. (n.d.). Retrieved October 9, 2012, from http://home.eperolehan.com.my/v2/ index.php/bm/senarai-ptj-ep-enabled.

Eu-Gene, S. (2010). Malaysian C2C Auction e-Commerce Sites: A Case Study on eBay and Lelong.com.my. In R. Ramasamy (Ed.), *e-Commerce for Global Reach* (pp. 135-144). Petaling Jaya: PIKOM.

Gan, K. S., Patricia, A., Jason, T., & Kim, O. (2009). *Comparing the Performance of Deterministic Dynamic Adaptation GA and Self Adaptive GA in Online Auctions Environment.* Proceedings of the 2009 IEEE International Conference on systems, Man and Cybernetics, San Antonio, TX, USA, October.

Gefen, D., & Straub, D. (2000). The Relative Importance of Perceived Ease of Use in IS Adoption: A study of e-Commerce Adoption. *Journal of the Association for Information Systems*, *1*(8), 1-28.

Geyskens, I., Gielens, K., & Dekimpe, M. G. (2002). The Market Valuation of Internet Channel Additions. *Journal of Marketing, 66*(2), 102-119.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate Data Analysis* (6th Edition). Englewood Cliffs, N.J.: Prentice-Hall.

Kamarulzaman, N., & Rahman, A. (2009). E-auctions: A Potential Tool for the Malaysian Agriculture Sector. *Public Sector ICT Management Review*, *3*(2), 19-24.

Khairul Akmaliah, A. (2007). Online Marketplace Service Innovation: The Case of Lelong.com.my. *International Journal of Technoentrepreneurship*, *1*(2), 220-254.

Laporan Ketua Audit Negara (2010). *Aktiviti Kementerian/Jabatan dan Pengurusan Syarikat Kerajaan Persekutuan*. Retrieved May 20, 2012, from http://www.audit.gov.my/indek.php?option=com_content&view=article&id=458%3Alkan2010&catid=6%3Aberita-pengumuman&lang=ms#

Lin, H. F. (2006). Understanding Behavioural Intention to Participate in Virtual Communities. *Cyber Psychology and Behaviour*, *9*(5), 540-547.

Lu, J., Yu, C. S., & Liu, C. (2009). Mobile Data Service Demographics in Urban China. *The Journal of Computer Information Systems*, *50*(2), 117-126.

Nelson, R., Todd, P., & Wixom, B. (2005). Antecedents of Information and System Quality: An Empirical Examination within the Context of Data Warehousing. *Journal of Management Information Systems*, *21*(4), 199-235.

Pekeliling Perbendendaharaan Bil.3/2009 (2009). *Tatacara Pengurusan Perolehan Kerajaan Secara eBidding Melalui Sistem Perolehan*. Unit ePerolehan, Kementerian Kewangan.

Reichheld, F., & Schefter, P. (2000). E-Loyalty. *Harvard Business Review*, *78*(4), 105-113.

Sekaran, U. (2003). *Research Methods for Business: A Skill Building Approach*. USA: John Wiley and Sons.

Sambasivan, M., Patrick Wemyss, G., & Che Rose, R. (2010). User acceptance of a G2B system: A case of electronic procurement system in Malaysia. *Internet Research*, *20*(2), 169-187.

Settoon, R., & Wyld, D. C. (2003). The Ski Slope to Prosperity: An Analysis of the Potential Impact of Reverse Auctions in Government Procurement in Five Southeast Asian Nations. *Asia Pacific Journal of Marketing and Logistics*, *15*(3), 3-19.

Sun, H., & Zhang, P. (2005). The Role of Moderating Factors in User Technology Acceptance. *International Journal of Human-Computer Studies*, *64*(2), 53-78.

Tong, D. Y. K. (2007). *An Empirical Study of e-Recruitment Technology Adoption in Malaysia: Assessment of Modified Technology Acceptance Model*. PhD Thesis, Multimedia University, Malaysia.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis F. D. (2003). User Acceptance of Information Technology: Toward a Unified Views. *MIS Quarterly*, *27*(3), 425-478.

Wang, Y. S. (2008). Assessing e-Commerce Systems Success: A Respecification and Validation of the Delone and McLean Model of IS Success. *Information Systems Journal*, *18*(5), 529-557.

Wixom, B. H., & Todd, P. A. (2005).A Theoretical Integration of User Satisfaction and Technology Acceptance. *Information Systems Research*, *16*(1), 85-102.

Wolin, L. D., & Korgaonkar, P. (2003). Web Advertising: Gender Differences in Beliefs, Attitudes, and Behaviour. *Internet Research: Electronic Networking Applications and Policy*, *13*(5), 375-385.

Wu, Y., Tao, Y., & Yang, P. (2007). *Using UTAUT to Explore Behaviour of 3G Mobile Communications Users*. Proceedings of the 2007 IEEE International Conference on Industrial Engineering and Engineering Management, Singapore

Wyld, D. (2012). Reverse Auctioning Saving Money and Increasing Transparency. Retrieved October 10, 2012, from http://www.businessofgovernment.org/sites/default/files/Reverse%20Auctioning.pdf.