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E-PROCUREMENT FRAUD DETERRENT IN THE MINISTRY OF HIGHER EDUCATION IN MALAYSIA

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ABSTRACT

The adoption of e-procurement in the government procurement process is assumed to provide accountability and transparency. It could mitigate fraud and corruption by decreasing the chances at every level of the procurement system by using information communication technology. Hence, this study aims to examine the relationship between information quality, system quality, service quality and transparency, and e-procurement fraud deterrent in the Malaysian public sector. Primary data was collected through the distribution of the questionnaire. A total of 300 samples were selected from the Ministry of Higher Education. Two hundred and twenty-seven (227) respondents responded to the questionnaire, which then was used for the analysis. Statistical tests such as descriptive analysis, correlation and regression analyses were conducted to answer the study's research questions. The findings from the study show that system quality, service quality and transparency have a significant positive relationship with e-procurement fraud deterrent. However, there is no significant relationship between information quality and e-procurement fraud deterrent. This study gives a holistic picture of the impact of information quality, system quality, service quality, transparency, and e-procurement fraud deterrent as well as the important insight of e-procurement to deter fraud in the public sector.

Keywords: *E-procurement, fraud deterrent, government procurement, procurement system*

INTRODUCTION

Public procurement has been identified as one of the government's activities most vulnerable to collusion, corruption, manipulation and fraud. During the Combating Procurement Fraud in the Public and Private Sectors Forum 2017, Tan Sri Ambrin Buang (Former Chief Auditor General) stated that procurement fraud has been committed by those inside and outside the organisation starting from bid ringing during the pre-contract award phase to false invoicing in the post-contract award phase. The Malaysian Anti-Corruption Commission (MACC) report states that public sector procurement topped the significant financial loss list through corruption and fraud between 2013 and 2018, at 43 per cent due to unlawful manipulations of the procurement process (NST, 18 July 2020). Based on Caulfield's (2014) findings, fraud in public procurement has become a burden to the government because of massive public spending and ineffective management among various public organisations. Moreover, PWC's Global Economic Crime Survey (2018) listed common types of fraud that occurred in the public sector that include identity fraud, the forgery or falsification of records, the unauthorised access and release of information, unauthorised or inappropriate use of information technology, fraudulent expenditure claims, payroll fraud, procurement fraud and also theft (cash, consumables and intangible asset).

As Nuepane et al. (2014) mentioned, many developed countries have concentrated on implementing the e-procurement system as a key tool to combat fraud by opening the competition to the public in government

procurement processes. The implementation of an e-procurement system is a tool to improve the effectiveness and efficiency of the traditional procurement process (Neupane et al. 2014). As stated by Kim (2015), implementing this system can reduce the opportunity of fraudulent activities in the government sector. They suggested that governments promote and implement the e-procurement system to deter several fraud issues like monopoly power of government and information asymmetry. The e-procurement method with the e-catalogue mechanism is an effort to prevent corruption because it can directly limit corrupt behaviour in public sorganisations (Dodi et al., 2021).

Even though e-procurement has brought many positive effects, practices of fraud still occur in the implementation of e-procurement. Huda et al. (2017) stated that the risks of fraud arise in the e-procurement due to lack of transparency, limited access to information, and the lack of accountability and control at each phase. Aditya et al. (2017) explained that lack of transparency and accountability opened more opportunities to the users, including public officials and vendors, to ignore the rule for corruption purposes. The function of the e-procurement system is designed for users to understand the process, manage the procurement process and be free from fraud. Femilia et al., (2021) suggested that the procurement process's efficiency willminimise fraud in government procurement. Public procurement is one of the key areas where the public and private sectors interact financially, leading to fraudulent activity, cronyism, favouritism, and outright bribery. In the context of public procurement, some of the fraud activities in Malaysia are associated with the entrenched power of political and economic institutions in distributing public resources. Such a policy of distribution of public funds opens opportunities for fraud and corruption rent-seeking activities, political patronage, cronyism and favouritism (Gomez et al., 2013; Sundram and Hui, 2010).

With reference to the NACP 2019-2023 report, the corruption trend in Malaysia over the last five years (2013-2018) showed that the public sector had been the most vulnerable to corruption. It was based on comparing the vulnerability rate between the private sector and the public sector, which rate for the private sector was only 17.06% as compared to 63.30% for the public sector. This result showed a more alarming rate for the public sector and indicates weak governance in its procurement practices, legal enforcement agencies and administration. Additionally, based on a report published by the Public Service Department (2020), 184 public officials of several ministries from 2012-2018 were found guilty and spenalised accordingly concerning 564 punitive issues found in Auditor-General's Reports. The Malaysian Anti-Corruption Commission (MACC) (2021) revealed that 467 (46.8 per cent) were public officials arrested in 2020 due to corruption cases in comparison to 572 (50.4 per cent) in 2019 and 416 (46.0 per cent) in 2018. In the same report, MACC revealed that half of the corruption cases in the country involved civil servants over the past six years. Furthermore, MACC added that based on the arrest statistics from 2015 to 2020, a total of 5,652 arrests were made, and of that number, 2,683 or 47.5 per cent were civil servants.

Although the implementation of e-procurement improved the transparency of the procurement process, fraudsters could still exploit the system's limitations, which in turn still allowed for corrupt practices to occur. Hence, the costs of fraud are passed on to society in the form of increased customer inconvenience, opportunity costs, unnecessarily high prices for goods and services, and criminal activities funded by fraudulent gains. Therefore, based on the issues highlighted above it is essential for this research to be carried out to examine the relationship between information quality, system quality, service quality and transparency, concerning e-procurement fraud deterrent in the Malaysian public sector.

This paper is divided into five sections. Section one provided an overview of this paper that included an explanation of the issues related to the research. This is followed by section two, which presented on literature review and hypotheses development. The theory applied in this study was political economy theory and the review of the literature on e-procurement in Malaysia, e-procurement fraud, information quality, system quality, service quality, and transparency. Section three briefly explained the research method and data collection and constructed the e-procurement fraud model for further discussion. Then, Section four provided the result and discussion on critical findings

concerning e-procurement to deter fraud. Section five concluded the study and provided suggestions for future action of stakeholders.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The political economy theory is used in this study. According to the World Bank (2012), the political economy theory can add value to the public sector to improve project design, promote better risk management, and reduce misdirection and misallocation of funds. Definition of political economy theory referred to the combination of politics with economics to examine the underlying dynamic of the relationship between markets and society and explain outcomes. The term 'political economy' had become an increasingly popular part in the government sector as well as in the private sector. Similarly, interest in the political economy aspects of development had also seen an emerging trend in academia, within economics and political science departments and the leading business industry. Sargiacomo et al. (2015), in particular, revealed that corruption in Italian government procurement is due to prevailing political and economic theories. Another study by Neupane et al. (2015) showed that political interference with the processes of government procurement is because of the key role that senior politicians, business elites, and bureaucrats play. Therefore, in this paper, political and economic theories were used to discuss the effect of the public procurement fraud in the Malaysian public sector. The nature of procurement and the use of public funds in government procurement involved decision-making. Such decision-taking would naturally be influenced by discretion. And discretion in turn may be influenced by biases. Such would then open the door to the risk of corruption. All levels of government departments are engaged in procurement. The nature of public procurement is interfered with by the political system, and any decision-taking will affect the country's economy.

Information quality refers to an individual's belief in the output quality generated by the system (Wixom and Todd, 2005). They claim that output quality produced by the system plays an important function in the user's satisfaction. The higher the user perceives the quality of output produced by the system, the higher the possibility they will be satisfied with the information provided. It briefly concludes a user who is satisfied with the quality of data produced from the system will have a higher possibility that they will perceive it will enhance work performance. Wixom and Todd (2005) posit that if the information generated by the system is satisfactory to the individual (user of the system) the satisfaction will likely influence their belief of the usefulness and actual use. In addition, Wang (2008) argued that information quality significantly impacts the user's perception of value, which increases users' intention to use the information system. Lee et al. (2007) found that information quality is important in increasing customers' intentions to use online services. As supported by Lin (2006), information quality significantly affected users' participation in a virtual community and confirmed the significant influence of information quality in actual use. Saeed et al. (2003) also suggested that information quality greatly influences the user's online behaviour. Information quality has proven to be strongly associated with system use in recent empirical studies (Rai, Lang and Welker, 2002) and especially in the context of e-commerce systems (Molla and Licker, 2001). According to Al-Mamary, Shamsuddin and Aziati (2014), completeness is the extent to which information is available and sufficient in-depth and breadth for the task at hand, which is one of the information quality dimensions. Then, Huang and Benyoucef (2013) explained that information quality is being easy to understand which refers to that any information delivered by the system is clear without ambiguity and easily comprehend. In line with Morgan (2014) any information about a system that is easy to understand assists people to make better decisions. The quality of information provided by an information system, is a very important factor in leading people to believe in the usefulness of that information system (Lin and Lu, 2000).

In this study, information quality refers to the perception that the output generated by e-procurement generates information based on the dimension highlighted by Nelson et al. (2005), which is the accurate, complete, up-to-date and right format. When people feel that an information system is useful to them, the chances that they will sutilise that system will be higher. Based on Zhou (2013b), poor information content quality may decrease users' satisfaction as they anticipate getting

quality information from using e-procurement systems. Hence, if the information system is vague, erroneous or incomplete, it will arouse doubts in the user's mind about the reliability of that particular information system and possible harmful opportunistic behaviours, thus, reducing the intention to use. On the contrary, an information system that provides high content quality increases the sense of users to engage in the services provided. Thus, this study focused on using the system that predicted the success of the e-procurement system when it could improve the accuracy, completeness and consistency of information which leads to the deterrent of fraud via e-procurement. Hence, it is posited that:

H1: There is a positive relationship between information quality and e-procurement fraud deterrent in the Malaysian public sector.

System quality refers to the performance quality of the system. According to Wixom and Todd (2005) system quality is associated with system satisfaction. Added to Delone and Mclean (2016) in terms of perceptions of usefulness and actual use are more influenced by user satisfaction. The electronic procurement system streamlines government operations to improve the quality of services provided (Mohd Nawi et al., 2017). However, based on the analyses were done by Floropoulus et al. (2010), it is found that system quality and satisfaction are insignificant. It is because they argued that system quality might not be a prominent factor in measuring satisfaction given the nature of the sample being sufficiently computer and internet literate. On the other hand, Chiu et al. (2007) explained that system quality significantly affected the respondents' use of online e-learning via user satisfaction. In the e-procurement system, Kusuma and Pramunita (2011) state that users tend to refuse to use the system because of its risk and untrustworthiness. Based on Mahmod et al. (2004), trust is a critical aspect that plays a significant role in predicting user behaviour in the information system context. As reported by Nicolaou and McKnight (2006), few studies show that trust can be enhanced by improving system quality and fulfilling users' expectations.

In the e-procurement system, Kusuma and Pramunita (2011) stated that users tend to refuse to use the system because of its risk and untrustworthiness. In the context of the user-developed application, there is proof that system performance is influenced by system quality (McGill et al., 2003). Guimaraes et al. (2009) ssed that system quality elements rely on the characteristics necessary to the system and the stakeholder's view. According to Warren et al. (2015), the increasing number of data sources bears the risk of exceeding current corporate capabilities. The system risk has a negative influence on behaviour certainty and trust. Kassim et al. (2012) found a significant positive relationship between system quality and trust. A study on information technology artefacts by Vance et al. (2008) revealed that the perception of system quality significantly positively influences the user's trust. Belkhamza and Wafa (2009) argued that in an online environment, perceived system risk has a negative impact on behaviour certainty and confidence. In this study, if the procurement officer smelled that the system is flexible, reliable, fast and accessible and increases user satisfaction, it would give the result of transparency of the outcome from the e-procurement system to the public. It would give a positive perception from the public that the procurement officer does their work properly and portrays a good image to the government as the e-procurement system can deter fraud. Hence, based on the above arguments, it is posited that:

H2: There is a positive relationship between system quality and e-procurement fraud deterrent in the Malaysian public sector.

Service quality refers to the quality support provided by the system provider (Delone and McLean, 2003). Gorla et al. (2010) shypothesised that information technology quality represented by system, service, and information has a positive impact on organisations. The results revealed that service quality had the highest impact on sorganisational performance followed by information quality, then system quality. In the research on enterprise applications' effectiveness, Lai (2006) concluded that improving service quality positively influenced user satisfaction. According to Jang (2010), service quality significantly affected individual performance through usage and user satisfaction with the e-procurement system. Ogoe (2016) mentioned that procurement and quality service are positive and directly related due to the

fact that quality service is dependent on procurement operation. In this study, service quality is described as the level of responsiveness and assurance provided by the service providers to the officials in helping to make their tasks free from fraud activities when using e-procurement. The availability of support for government users will determine the transparency of the e-procurement system. The officers will adequately use the system and give the output without any interference from the ambiguity and vagueness that give negative perception from the public. Hence, it is suggested that:

H3: There is a positive relationship between service quality and e-procurement fraud deterrent in the Malaysian public sector.

E-procurement is one of the emerging technologies needed to be fully transparent to flow information from society to government. It is also used to supervise citizen feedback on public officials' performance through public procurement (Kossow & Dykes, 2018). Talero (2001) emphasised the transparency benefits as e-procurement can be a major contributor to the anti-corruption campaigns of the government. He also suggested that effective transparency in public procurement depends on the timeliness, quality, and accessibility of procurement information. Hasan (2000) argued that to prevent acts of fraud is by improving sorganisational culture, particularly in the field of transparency. Dwiyanto (2012) stated that transparency becomes an important dimension of change as it facilitates the users of services and civil society to monitor the implementation of public service. In line with Dwiyanto's (2012) reiteration, it shows that transparency in the bureaucracy may have implications for the decline in the level of corruption within the bureaucracy. Beth (2007) believed that lack of transparency and accountability is recognised as a major threat to integrity in public procurement. Even though not all information is equally useful to citizens, government public procurement transparency can be operationalised using situational characteristics, in particular, paying attention to the public (Bauhar and Grimes, 2017). The good governance approach should apply elements of good governance, particularly transparency and accountability. In terms of public procurement, it is to prevent corruption and review the whole procurement cycle. This includes needs assessment to contract management and focus on policy and practice rather than regulations when possible. The use of online technology for government procurement (e-procurement) aims to reduce face-to-face interactions, thus, increasing market transparency, building trust, and limiting fraud and corruption (Neupane et al., 2014; Vaidya et al., 2006). Transparency and openness are core principles of public procurement, and transparency is widely recognised as a foundation of good governance (Parigi et al., 2004). Lack of transparency creates opportunities for public officials such as government officers and politicians to abuse their positions of authority for private gain. This indicates a weak accountability mechanism that tends to facilitate corruption. Efforts to curb fraud through increased levels of transparency often confront high implementation costs. If transparency is costly, sorganisations tend to stop short of implementing the level of transparency in procurement that would dissolve fraud. Hence, based on the discussion, the following hypothesis is offered:

H4: There is a positive relationship between transparency and e-procurement fraud deterrent in the Malaysian public sector.

RESEARCH METHOD

Data Collection

The study used a questionnaire survey for data collection. The Ministry of Higher Education, which consists of three departments, namely, the Department of Higher Education, Department of Polytechnic Education and Department of Community College Education, were chosen as a sample for this study. The main reason the Ministry of Higher Education was chosen is that according to the Auditor-General Report (2017), it is one of the ministries which is lacking in terms of transparency in e-procurement leads to the issue of corruption, falsification of documents and values of the good procures that has impaired the image of the ministry itself. The involvement of all categories of officers will contribute to a different understanding of the e-procurement system and lead to different outcomes on how they handle and use the system. The questionnaires were distributed to 300 public servants under the Ministry of Higher

Education. However, 227 were returned and usable. The respondents comprised top-level management, middle-level management and support staff. The middle-level direction and support staff respondents were selected since they are directly involved in the operation of the e-procurement system. Meanwhile, selecting top-level management as respondents seemed to be appropriate since they possess the overall knowledge of the organisation's operation and make strategic decisions. A simple random sampling was conducted as it is deemed appropriate since there was an adequate sampling frame and the population was geographically concentrated (Hair *et al*., 2006). According to Sekaran and Bougie (2016), to meet the rule of thumb by Roscoe (1975), the appropriate sample size for most research should be larger than thirty (30) and less than five hundred (500). The sample was selected by using the probability sampling method. It was employed where every unit in the sampling frame has a chance (greater than zero) of being selected. The questionnaire survey was divided into six sections. All the questions in Part A required the respondents to answer regarding the demographic profile themselves without disclosing any personal or private information. The questions in Section B to Section E (information quality, system quality, service quality and transparency) and Section F (e-procurement fraud deterrent) required the respondents to rate based on a five-point Likert scale of 0 to 5: "1" indicates strongly disagree while "5" indicates strongly disagree.

E-Procurement Fraud Model

The dependent variable in this study is e-procurement fraud deterrence. The main experimental variables are information quality (IQ), system quality (SQ), service quality (SVQ) and transparency (TRANS). Besides, control variables, gender (GEN) and position of officer (POST) are used to enhance the relationship between this study's independent and dependent variables. The following is the model on e-procurement fraud intention deterrence to test the hypotheses in this study.

Model:

$$\mathbf{E_{PFD}} = \alpha + \beta_1(\mathbf{IQ}) + \beta_2(\mathbf{SQ}) + \beta_3(\mathbf{SVQ}) + \beta_4(\mathbf{TRANS}) + \beta_5(\mathbf{GEN}) + \beta_6(\mathbf{POST}) + \varepsilon$$

Where,

E_{PFD} = E-procurement Fraud Deterrence
IQ = Information Quality
SQ = System Quality
SVQ = Service Quality
TRANS = Transparency
POST = Position Of Officer

RESULTS AND DISCUSSION

Demographic Analysis

This section provides descriptive analyses of the demographic characteristics of the respondents. The total number of respondents for this study was 227. About 31.3% or 71 respondents were aged between 21 to 31 years, followed by 46.3% or 105 respondents aged between 31 and 40 years. Then, 41 to 50 years old respondents at about 20.3% or 46 and the rest of the total respondents were between 51 to 60 years old which was 5 or 2.2% of the respondents. Out of 227 respondents, 102 or 44.9% were male, while 125 or 55.1% were female. The positions of respondents in the procurement department were about 45.4%, from the support group whilst 50.7% were from middle management, and 4.0% were from top management. Based on the frequency of the length of respondents' services, about 63 or 27.8% of respondents worked

Table 1 Demographic analyses

	Frequency	Per cent
21 to 30 years old	71	31.3
31 to 40 years old	105	46.3
41 to 50 years old	46	20.3
51 to 60 years old	5	2.2
Male	102	44.9
Female	125	55.1
Support Staff	103	45.4
Middle–level Management	115	50.7
Top-level management	9	4.0
Less than 1 year	63	27.8
1 to 10 years	105	46.3
10 to 20 years	52	22.9
More than 2 years	7	3.1

less than one year followed by 105 or 46.3% of respondents who had worked between one and ten years. Then, about 22.9 % or 52 of respondents have work experience of at least 10 to 20 years and 3.1% or 7 of the respondents have worked for more than 20 years.

Descriptive Analysis

Table 2 shows the descriptive statistics of the dependent variable, namely e-procurement fraud deterrent, based on the results of the questionnaire. The highest mean score goes to Question 9, '*Complexity of e-procurement system at all three levels (the pre-contract, contract and post-contract phase)*' where the mean score is 3.09, mainly slightly greater than 3.00. This finding implies that on average, the respondents agreed that the e-procurement fraud deterrent is reducing the complexity of the e-procurement system at all three levels. The lowest mean score goes to Question 3, *'Proper guidelines and policies regarding the e-procurement system process are properly distributed to the public'* where the mean score is 1.90, mainly lower than 3.00. This finding implies that on average, the respondents agreed that the e-procurement fraud deterrent is reduced when proper guidelines and policies regarding the e-procurement system process are properly distributed to the public.

Table 3 shows the descriptive statistics of the independent variable information quality. The

Table 2 E-procurement fraud deterrent

No.	Questions	Means	Std. Deviation
1.	There is still lacking effective prevention tools for e-procurement systems that involve officers and suppliers/contractors	2.28	1.137
2.	The e-procurement system decision-making process involved or influenced by management and supplier relationship	2.43	1.064
3.	Proper guidelines and policies regarding the e-procurement system process are properly distributed to the public	1.90	0.687
4.	The Output information of the e-procurement system can be easily manipulated by the e-procurement officer.	2.00	0.836
5.	The price and items posted in the e-procurement system catalogue are not the same as those offered to the user	1.99	0.890
6.	Revealing information to contractors during the bidding/contracts process	1.98	0.846
7.	Additional technical requirement on e-procurement tends to cause difficulties to the user	2.52	1.110
8.	No specific officer in charge to monitor the e-procurement system in terms of information system	2.05	0.855
9.	The complexity of the e-procurement system at all three-level (the pre-contract, contract and post-contract phase)	3.09	1.228

Table 3 Information Quality

No.	Questions	Means	Std. Deviation
1.	Information on the e-procurement system is accurate.	4.50	0.889
2.	Information on the e-procurement system is complete.	4.42	0.774
3.	Information on the e-procurement system is easy to understand.	4.51	0.879
4.	Information on the e-procurement system is relevant to my task.	4.43	0.825
5.	Information on the e-procurement system is secure.	4.41	0.834
6.	E-procurement system has a relevant number of suppliers registered.	4.36	0.782
7.	The E-procurement system has the relevant number of catalogues uploaded for users.	4.31	1.031
8.	An E-procurement system allows easy searching for suppliers or items.	4.24	0.989

highest mean score is for Question 3, '*Information of e-procurement system is easy to understand*' where the mean score is 4.51, mainly greater than 3.00. This finding implies that on average, the respondents agreed that information quality ensures the information provided in e-procurement is easy to understand. The lowest mean score goes to Question 8, *'E-procurement system allows easy searching for suppliers or items'* where the mean score is 4.24, mainly greater than 3.00. This finding implies that on average, the respondents agreed that information quality benefits the procurement officer and the supplier when the e-procurement system allows easy searching for any related information.

Table 4 shows system quality with the highest mean score goes to Question 3, *'E-procurement system is adaptable with the latest information technology'* where the mean score response of the question is 4.53, mainly greater than 3.00. This finding implies that on average, the respondents agreed that the e-procurement system is advanced from another system by adapting to the latest information technology. The lowest mean score goes to Question 4, *'The commands used to interact with the e-procurement system is not user-friendly'* where the mean score is 4.00, mainly slightly greater than 3.00. On average, the respondents agreed to the system quality provided that the command used to interact with the e-procurement system is user-friendly.

Table 5 shows the descriptive statistics of the independent variable service quality based on the results of the questionnaire. The highest mean score is for Question 1, '*The software of e-procurement system in use is always up-to-date*' where the mean score is 4.52, mainly greater than 3.00. This finding implies that on average, the respondents agreed that service quality provides always up-to-date information for the e-procurement system. The lowest mean score is for Question 6, *'E-procurement system allows easy navigation through the process'* where the mean score is 4.27, mainly greater than 3.00. This finding implies that on average, the respondents agreed that service quality benefited the e-procurement system when it allows easy navigation through the process.

Table 6 shows the descriptive statistics of the independent variable transparency. The highest mean score goes to Question 1, '*Adequate prevention tools are in place to prevent procurement fraud in e-procurement system by the procurement officers and suppliers/ contractors'* where the mean score is 4.61, mainly greater than 3.00. This finding implies that on average, the respondents agreed that transparency is vital in e-procurement by providing adequate prevention tools to avoid fraud from the users. The lowest mean score is for Question 6, *'Clear and comprehensive documents of e-procurement system are disclosed in standard form and made available to the public'* where the mean is 4.34, mainly greater than 3.00. This finding implies that on average, transparency of e-procurement is practised when all documents are clearly and comprehensively following standard disclosure and available to the public.

Pearson's Correlation Analysis

The findings of correlation analysis are presented in Table 7, indicating that multicollinearity is within the acceptable range. A multicollinearity test is performed to test whether there is the existence of a strong

Table 4 System Quality

No	Questions	Means	Std. Deviation
1.	It is convenient to use an e-procurement system.	4.43	0.901
2.	The operation of the e-procurement system is reliable.	4.38	0.861
3.	The E-procurement system is adaptable to the latest information technology.	4.53	0.766
4	The commands used to interact with the e-procurement system are not user-friendly.	4.00	0.823
5.	The response and feedback of the e-procurement system are fast.	4.45	0.922
6.	The E-procurement system is capable of processing complex orders.	4.30	0.935
7.	An E-procurement system can ensure the right goods and services are delivered accordingly.	4.40	0.888
8.	An E-procurement system can ensure that orders arrive on time.	4.33	0.800

Table 5 Service Quality

No.	Questions	Means	Std. Deviation
1.	The software of the e-procurement system in use is always up-to-date.	4.52	0.838
2.	The system provider of the e-procurement system responds quickly to any requests.	4.31	0.997
3.	There is little possibility for the user to have difficulties using an e-procurement system.	4.45	0.983
4	E-procurement system provides scustomised operation.	4.37	0.859
5.	The E-procurement system has an online supporting service that answers frequently asked questions.	4.45	0.868
6.	An E-procurement system allows easy navigation through the process.	4.27	0.909
7.	An E-procurement system is available at all times.	4.44	0.887

Table 6 Transparency

No.	Questions	Means	Std. Deviation
1.	Adequate prevention tools are in place to prevent e-procurement fraud in the e-procurement system by the procurement officers and suppliers/contractors.	4.61	0.765
2.	The E-procurement system decision-making process is independent of any influence and transparent.	4.44	0.836
3.	Policy and guidelines regarding e-procurement systems are easily accessible by the public.	4.57	0.881
4.	All written records of the e-procurement system are made available to the general public.	4.47	0.832
5.	Summaries of information about e-procurement systems are usually disclosed.	4.58	0.791
6.	Clear and comprehensive documents of the e-procurement system are disclosed in standard form and made available to the public.	4.34	0.875
7.	Complete and adequate records of e-procurement system activities are kept by the department.	4.41	0.790
8.	Adequate review of e-procurement officers' conduct by the superior/top management.	4.37	0.869
9.	Officers involved in the e-procurement process adhere to professional conduct and ethical principles.	4.4	0.847

Table 7 Pearson's Correlation Analysis

Correlation is significant at the 0.01 level (1-tailed).
Note: IQ (Information Quality), SQ (System Quality), SVQ (Service Quality), TRANS (Transparency), E_PFD (e-procurement fraud deterrent)

Variables	E-pro	IQ	SQ	SVQ	Trans
E-pro	1				
IQ	0.699**	1			
SQ	0.753**	0.878**	1		
SVQ	0.747**	0.889**	0.802**	1	
Trans	0.739**	0.848**	0.808**	0.890**	1

correlation between two or more predictors (Field, 2013). In this study, correlation analysis was conducted to examine the strength of association among all independent variables namely information quality, system quality, service quality and transparency, and dependent variables namely e-procurement fraud deterrent. When the independent variables are highly correlated (r=0.9), multicollinearity exists (Pallant,

2005). From the table below, the two variables that have the highest correlations are service quality (SVQ) and transparency (Trans), with a correlation of 0.89. It indicates a significant and positive relationship exists between the two variables. However, the tolerance and variance inflation factor (VIF) of the Collinearity Statistic (refer to Table 8) for the individual independent variables shows no multicollinearity issues when it has a VIF of less than 10 (Pallant, 2016). Hence, the result is within the acceptable range, and multicollinearity does not exist.

Multiple Regression Analysis

The results in Table 8 show the coefficients of the multiple regression analysis. The beta value represents the strength of the relationship between e-procurement fraud deterrent and information quality, system quality, service quality and transparency. The independent variable with a level of significance (*p*-value) value of less than 5% can significantly contribute to the dependent variable's predicted value. Additionally, the results also indicate the tolerance and variance inflation factor (VIF) of the Collinearity Statistic for the individual independent variables. As explained by Pallant (2016) a VIF shows no multicollinearity issues when it has a VIF of less than 10. Thus, there are no multicollinearity issues as all individual VIFs of all the independent variables are below 10 for this study.

System quality has a *p*-value of 0.041 and is significant at a p<0.05 significance level. Hence, it indicates a positive significant relationship between system quality and e-procurement fraud deterrent, supporting hypothesis H2. The result of this study is consistent with Lin (2006), which explained system quality as one of the effects of users' involvement in the virtual community and significantly influences users while dealing with the online system. Meanwhile, Chiu et al. (2007) highlighted that system quality greatly affected the respondents' use of online e-learning via user satisfaction. However, the procurement officer perceived that the system is flexible, reliable, fast and accessible and increased user satisfaction, which would lead to positive perception and eventually deter e-procurement fraud.

Subsequently, service quality has a *p*-value of 0.033 and is significant at a p<0.05 significance level. Hence, it indicates a positive significant relationship between services quality and e-procurement fraud deterrent, hence Hypothesis H3 is supported. The result of this study is consistent with Gorla et al. (2010) that service quality had the highest impact on sorganisational performance followed by information quality, then system quality. As stated by Chung et al., (2008), in information system success, service quality is incorporated as a dimension by giving the importance of information system support, especially in the e-commerce environment where customer service is crucial. Government officials' level of responsiveness and assurance when using the e-procurement system has managed directly to deter e-procurement fraud.

Moreover, transparency has a *p*-value of 0.048 and is significant at a p<0.05 significance level. Thus, it indicates a positive and significant relationship between transparency and e-procurement fraud deterrent, supporting Hypothesis H4. The result of this study is consistent with Beth (2007), that is a lack of transparency will be srecognised as a major

Table 8 E-Procurement Fraud Regression Model

		Standardized Coefficients		Sig. (*P*-Value)	Collinearity Statistic	
					Tolerence	VIF
Model 1	Variables	Beta	t			
	(Constant)		30.390	0.000		
	IQ	-0.029	-0.29	0.772	0.184	5.423
	SQ	-0.276	-2.054	0.041**	0.102	9.839
	SVQ	-0.268	-2.142	0.033**	0.117	8.571
	TRANS	-0.223	-1.989	0.048**	0.147	6.847
	GENDER	-0.023	-0.518	0.605	0.944	1.060
	POSITION	-0.025	-0.554	0.580	0.922	1.085

*p<0.10; **p<0.05; ***p<0.01

Note: IQ (Information Quality), SQ (System Quality), SVQ (Service Quality), Trans (Transparency), E_PFD (e-procurement fraud deterrent), GEN (Gender), POST (Position of Officer)

threat to integrity in public procurement. Meanwhile, Hui et al. (2011) critiqued that if the procurement officer has the chance for abuse and manipulation of the procurement process, it would also be reduced whenever the transparency of the process is increased. As a result, many countries had adapted the level of transparency of the procurement procedure to protect the sensitivity of the information and the specificity and value of the public procurement. In contrast, information quality has a *p*-value of 0.772 which indicates no significant relationship between information quality and e-procurement fraud deterrent, hence Hypothesis H1 is not supported. The result of this study is consistent with a previous study by Jakli, Popovi and Coelho (2011). Their finding in the study is that quality information will deliver little impact if the information is not used in the e-procurement directly and helps in the decision-making process, which is not related to deterring the fraud. Also mentioned by Howsons (2007) and Al-Hakim (2007) information quality does not affect the e-procurement process when the information is not being used. They stated that maintaining quality information is not enough to have better performance. According to Davenport and Beers (1995), if the information acquired is not sutilised in making decisions, then it will deliver little impact on firms' performance. In other words, if the sorganisation want the available quality information to ensure the objective of the implementation of the e-procurement system, such information must be used wisely to make sure the objective is achieved such as a fraud deterrent. Concerning the control variables, there is no significant relationship between gender, officer position, and e-procurement fraud deterrent in the Malaysian public sector.

CONCLUSION

E-procurement has provided a platform to improve public service delivery and offered the quality of interactions among the general community and business key players by implementing an interactive online environment. Moreover, it aims to transform the traditional manual procurement system by using the internet-based practice procurement to procure goods and services from various suppliers via electronic. With the support and full commitment from the government to implement an e-procurement system, the issues of fraud in public procurement could be deterred. Ensuring e-procurement is "free" from fraud requires further investment in terms of infrastructure of the system, competency of the procurement officer, stability of the system and also effectiveness mechanisms like governance and internal control from the government. Based on this matter, the government's responsibility in providing public knowledge and understanding of the general procurement process to improve government decision-making processes and accountability is vital to achieving good governance through e-procurement.

The main reason for implementing an e-procurement system is to create openness, availability and accessibility of procurement information to the public that increases the flow of public information, trust and satisfaction, and accountability. It boosts involvement among the users in government procurement which leads to reducing the chances of risk of corruption. Thus, using e-procurement to deter fraud in public procurement is one of the anti-corruption tools that governments established as their strategic management. The ability of e-procurement to eradicate fraud is due to the function of the inter-sorganisational system, which automates the entire part of the procurement process to improve efficiency, quality and transparency in government procurement.

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