"E-procurement adoption in Indonesian government: A study of TOE model"

AUTHORS	Stefanus Ardy Susantya Khoirul Aswar (b) Mahendro Sumardjo (b) Ingrid Panjaitan Andreas (b)		
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Stefanus Ardy Susantya, Graduated Student, Faculty of Economics and Business, Department of Accountancy, Universitas Pembangunan Nasional Veteran Jakarta. Indonesia.

Khoirul Aswar, Ph.D., Lecturer, Faculty of Economics and Business, Department of Accountancy, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia. (Corresponding author)

Mahendro Sumardjo, Dr., Lecturer, Faculty of Economics and Business, Department of Accountancy, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia.

Ingrid Panjaitan, M.Sc., Lecturer, Universitas Catur Insan Cendekia, Indonesia.

Andreas, Dr., Lecturer, Universitas Riau, Indonesia.



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Stefanus Ardy Susantya (Indonesia), Khoirul Aswar (Indonesia), Mahendro Sumardjo (Indonesia), Ingrid Panjaitan (Indonesia), Andreas (Indonesia)

E-PROCUREMENT ADOPTION IN INDONESIAN GOVERNMENT: A STUDY OF TOE MODEL

Abstract

Due to innovations, the Industrial Revolution 4.0 has become a popular trend among the public. The Indonesian government is eager to implement e-procurement in accordance with Presidential Regulation No. 16 of 2018 on government procurement. The purpose of this study is to assess the impact of each TOE model factor on Indonesian eprocurement adopters, as well as to investigate how the diffusion of innovation theory categorizes them. This study employed a quantitative method and SmartPLS version 3.0 to examine the model, based on Teo et al. (2009), which set the major structure. In this study, state-owned firms and their subsidiaries, as well as other private enterprises that operate in the infrastructure and construction sectors and participate in Îndonesia's e-procurement system, were used as samples. The result show that top management support ($\beta = 0.279$; p < 0.05) and information sharing culture ($\beta = 0.783$; p < 0.05) have positive and significant effects on e-procurement adoption. On the other hand, perceived cost (β = 0.097; p > 0.05), firm size (β = -0.080; p > 0.05), and business partner influence ($\beta = -0.057$; p > 0.05) did not contribute any effect significantly. This study expects that the organizing committee for government goods and services procurement, as well as participants in government goods and services procurement, would pay attention to and consider significant components in the implementation of e-procurement outside of the applicable legislation.

Keywords perceived cost, diffusion of innovation theory,

organizational factors, e-procurement, environmental

factors

JEL Classification G32, H83, L20

INTRODUCTION

E-procurement is a market that connects providers and participants through an integrated information connection, allowing the government to stay afloat by using a database to acquire goods (Croom & Brandon-Jones, 2006; Vaidya et al., 2006). According to the World Trade Organization (2021), procurement accounts for between 10% and 15% of each country's gross domestic product. The internet's development has aided the advancement of procurement activities in recent years. According to Gunasekaran and Ngai (2008) and Murathi (2016), integrated information systems will save time and cost. This benefit would be a powerful incentive to improve the current system, which is riddled with flaws such as collusion, restricted access, corruption, price mark-up, and winning the trust of their partner companies (Lewis-Faupel et al., 2016; Udoyono, 2012).

Since 2004, several corruption cases have been found and investigated by Komisi Pemberantasan Korupsi (KPK). This has led Indonesia into the digitalization era, which utilizes e-government and e-procurement systems to minimize corruption (KPK, 2020). Therefore, e-procurement is predicted to help Indonesia's economy grow and develop in a more balanced manner as a developed country in the

future (Afolabi et al., 2019; Etse et al., 2021). The procurement norms and regulations are outlined in Presidential Regulation No. 12 of 2021, which is a revision of Presidential Regulation No. 16 of 2018. The value for money principles is clearly stated in the regulation, and the business is done following the law and ethical standards.

Several countries have already achieved transparency and accountability as primary goals using e-procurement (Daoud & Ibrahim, 2018; Gunasekaran & Ngai, 2008; Teo et al., 2009). In other words, e-procurement is a market that anyone can access through a website interface. This adoption study was empirically discovered in several research studies using diffusion of innovation theory and the TOE model. Because of its significance to the social context, Chau and Jim (2002), Teo et al. (2009), and Tushman and Nadler (1986) employed these combination theories to investigate adoption situations. However, these combination theories were not discovered to investigate this problem in the Indonesian empirical study. This paper makes a complete discussion using Indonesia as an object by including the preceding studies.

1. LITERATURE REVIEW

Gabriel Tarde invented the hypothesis in 1903, which was later re-explained in 1965 by Everett M. Rogers (Kaminski, 2011; Mustonen-Ollila & Lyytinen, 2003). According to the hypothesis, produced goods go through a cycle of becoming the most popular and then being replaced. As a result, when businesses decide to dominate the market, communication is a priority. According to Rogers (2003), the first are innovators, who are the first to adopt innovation in their organization or industry with almost no risk aversion and are hence referred to as risk-takers. The second are early adopters; these individuals are known as trendsetters and major spenders in the field of innovation since they may provide feedback to potential users. The third group, the pragmatic majority, calculates every conceivable risk that businesses may face. The fourth is the late majority; in this segment, they are skeptical entities since they desire to use innovation due to partner influence. Finally, the fifth are laggards who are distrustful of advances and distance themselves from them, making it difficult for the outside world to affect them.

This model provides a valuable framework for examining technology uptake and other inventions (Dwivedi et al., 2012). When the idea is applied, technological elements describe how entities will accurately calculate the risks, benefits, and operational flow. Some measurements are used in empirical studies, such as advantage, cost-paid (Chau & Jim, 2002; Chau & Tam, 1997; Teo et al.,

2009; Tornatzky & Klein, 1982), security (Skafi et al., 2020), technological complexity, and the user's competence (Chau & Jim, 2002; Chau & Tam, 1997; Teo et al., 2009; Tornatzky & Klein, 1982; Daoud & Ibrahim, 2018; Zhu et al., 2003). In addition, because the entities are the operators, organizational aspects should be considered. The previous study's metrics included size, internal communication (Chau & Tam, 1997; McKinnon et al., 2003; Teo et al., 2009; Teo & Ranganathan, 2004), and top management support (Chau & Tam, 1997; McKinnon et al., 2003; Teo et al., 2009; Teo & Ranganathan, 2004; Grover, 1993; Teo et al., 1997; Thong, 1999).

The external environment of things that can be affected directly or indirectly is usually defined by environmental variables. The following measurements were taken from the previous study for business partner and market competition (AlZoubi, 2018; Daoud & Ibrahim, 2018; Teo et al., 2009), regulatory and industry pressure (Hoti, 2015; Kuan & Chau, 2001), and market scope (AlZoubi, 2018; Daoud & Ibrahim, 2018; Teo et al., 2009; Skafi et al., 2020).

The government chose procurement to help all of Indonesia's provinces achieve economic parity. The government invites private and state-owned firms to participate in the program, where the government gives opportunities. E-procurement is defined by Croom and Brandon-Jones (2006) and Vaidya et al. (2006) as a market tied to an integrated information system such that the database is collected legally.

E-procurement provided efficiency in the purchasing system and time and cost savings for businesses looking to expand. According to Daoud and Ibrahim (2018), when a company participates in e-procurement, it gains benefits. The power of each sample was assessed using "power" as a moderating variable in this study. Oyediran and Akintola (2011) used e-tendering to rename e-procurement in Nigeria, then claimed that cost and time efficiency were not reached when e-tendering was implemented. Batenburg (2007) discusses e-procurement in a few European countries, claiming that each country and its enterprises have their own criteria for implementing e-procurement, such as size and industry scope. For example, Teo et al. (2009) used size to define organizational factors in e-procurement adoption in Singapore. Aboelmaged (2010) used the theory of planned behavior and the technology acceptance model to examine e-procurement adoption in the United Arab Emirates, with the results indicating the motives of businesses to adapt as well as the impact of e-procurement adoption on the social environment.

According to this criterion, the prior study provided a plethora of characteristics to assess the enterprise's adoption. Lin (2014), Skafi et al. (2020), and Teo et al. (2009) have all exploited the variable of perceived costs and benefits. The directors examine the cost of adopting the technology in detail. However, Skafi et al. (2020) and Teo et al. (2009) argue that the cost has little bearing because the technology is difficult to adapt directly, and businesses should be well-prepared to reduce risk. On the other hand, Chau and Tam (1997), Tornatzky and Klein (1982), Chau and Jim (2002), Skafi et al. (2020), and Teo et al. (2009) perceived cost as a barrier for some businesses. Perceived cost is always defined as a barrier; therefore, Teo et al. (2009) used perceived benefits to explain the advantage of adopting technology. However, when talking about benefits, it is entirely basic information.

To identify organizational characteristics in the TOE model, Aulia et al. (2016), Chau and Jim (2002), and Lin (2014) employed relevant variables such as business size, top management support, and information sharing culture. Firm size is a worry for businesses that are willing to adapt to change. Lin (2014) and Teo et al. (2009) found that

when adopters had amassed wealth and employed workers proportionally, they were at the lowest risk. Teo and Tan (1998) agreed that large-scale firm size has sustainability and stability when adopting the innovation, while Skafi et al. (2020) disagreed, claiming that small businesses can adopt the innovations. As a result, Skafi et al. (2020) suggested that small businesses can implement the technology by prioritizing goal congruence.

Decision-makers are critical for businesses since decisions are based on data, particularly financial reports. The second independent variable, top management support, had previously been investigated (Aulia et al., 2016; Grover, 1993; Lin, 2014; Skafi et al., 2020; Teo et al., 2009). It was discovered that senior management support was a significant predictor of adoption based on commitment, decisions, and policies. Users benefit significantly from the information-sharing culture. Because of these benefits, the culture of information sharing has become a priority. According to Kelle and Akbulut (2005), the relevance of information exchange through ERP is improving the operational flow of businesses. Because of its advantages in preventing asymmetric information, Kim and Umanath (2005) utilize "cure" as a phrase for information sharing. The first component that is impacted by implementing information sharing is transaction cost, according to Lin et al. (2002). As a result, transaction costs can be reduced at every step by establishing this essential concept of information exchange and top management support.

DOI has an impact on social climate changes (Roger, 2003). Thus, it is critical to investigate the factor in depth using a variety of variables. The previous study used variables such as competitiveness, industry types, partner recommendations, and significant forces such as legislation, industry pressure, and political dynamics in order to establish environmental influences (Aulia et al., 2016; Lee et al., 2005; Lin, 2014; Skafi et al., 2020; Teo et al., 2009). Lee et al. (2015), Lin (2014), and Teo et al. (2009) employed other factors such as business partner influence and trading partner or trading partner influence. Mutual relationships are developed among them as a result of referrals to other partners, and they develop chemistry with each other.

2. AIMS AND HYPOTHESES

This study aims to examine technological, organizational, and environmental factors in the adoption of e-procurement in the Indonesian government. Therefore, the hypotheses are:

- *H*₁: Perceived cost has a negative and significant effect on e-procurement adoption.
- *H*₂: Firm size has a positive and significant effect on e-procurement adoption.
- H_3 : Top management support has a positive and significant effect on e-procurement adoption.
- H_4 : Information sharing culture has a positive and significant effect on e-procurement adoption.
- H₅: Business partner influence has a positive and significant effect on e-procurement adoption.

3. METHODS

This study examines a direct association between perceived cost, firm size, top management support, information sharing culture, business partner impact, and e-procurement usage as a dependent variable. The study used a quantitative research strategy since the objective of the framework is to determine the direction and relationship among the variables. This method led to the collection and quantitative analysis of data. This theory is effectively examined using a quantitative approach with causality methodologies (Sekaran & Bougie, 2016). The government held this event on e-procurement, which is the major stage of this investigation. Participants with prior experience in Indonesian e-procurement are asked to participate in this study. Nonetheless, the Indonesian e-procurement participants were limited to any state-owned contracting firms with subsidiaries and private contracting enterprises participating in infrastructure and construction e-procurement using the purposive sample technique (Table 1).

Table 1. Research samples

Criteria	Quantity	Percentage
Listed as samples	96	-
Distributed questionnaire	60	100%
Uncollected questionnaire	24	40%
Used/analyzed questionnaire	36	60%

Table 1 shows the 36 questionnaires that have been collected and are ready to be studied. When the questionnaires were distributed, some of the samples agreed to fill out and respond to a maximum of three surveys. However, this action was chosen because some refused to fill out the surveys and did not respond to the proposition. Due to this impediment, the study's sample size must be increased in order to be properly studied. To obtain perceptive and measurable replies, a questionnaire with a Likert-scale format was used according to the quantitative method. The accuracy of perspectives ranges from 1 to 5, with 1 indicating strongly disagree, 2 indicating disagree, 3 indicating relative agreement, 4 indicating agreement, and 5 indicating strong agreement (Sekaran & Bougie, 2016). After that, respondents were asked to complete three sections of a bundled questionnaire. The first section begins with a brief company profile, position, and an ideal opinion of the company perspective on the TOE model; the second section discusses e-procurement adoption as a dependent variable, which was adopted and adjusted from Batenburg (2007). Finally, the third section discusses independent variables from the TOE model factors. The indicators used in this study are listed in Table 2.

Valid data would be checked using descriptive statistics to see the frequency of distribution data, and the normality of the data would be tested using standard deviation and mean (Ahsanullah et al., 2014; Sekaran & Bougie, 2016). The Structural Equation Model (SEM) is a statistical regression method that visualizes the path between the independent and dependent variables to make the effect easier to understand. The statistical program SmartPLS version 3.0 was utilized to support the Structural Equation Model. Validity, reliability, path coefficient, and hypothesis testing are all part of the evaluation.

Purposive sampling was used in conjunction with some of the criteria mentioned in the preceding paragraph (Table 3).

Table 2. Indicators of variables

Component	Indicators	Scale	Questions	Source
	Dependent Variable			
	Online or offline procurement			
	Doing procurement from the supplier's website		9	Batenburg (2007)
E-procurement	Doing e-procurement for special order	Likert		
Adoption	Information systems to connect with the supplier	Likert		
	Estimated e-procurement price value			
	First time participating in e-procurement			
	Independent Variable	es		
	Technological Factor	s		
	It takes a relatively long time to install e-procurement			
	It takes a relatively long time for training		9	Chau and Hui (2001), Chau and Jim (2002), Teo et al. (2009)
Perceived Cost	High cost for installing e- procurement	Likert		
	High cost for operating e-procurement			
	High training costs while operating e-procurement			
	Organizational Facto	rs		
	Annual Revenue		3	Ein-Dor and Segev (1978), Teo et al. (2009)
Firm Size	Total Employee	Likert		
	Total Employed IT			
Гор	Interest		6	Teo et al. (1997, 2009), Teo and Ranganathan (2004)
Management	Enthusiasm	Likert		
Support	Supportive act			
	Information sharing culture came from an organization		9	Teo et al. (2009), Thong et al. (1996)
nformation-	Organizations applying information-sharing culture			
Sharing Culture	Information sharing is an organization's value	Likert		
8	Employers share information			
	Employers used to share information with other department			
	Environment Factor	s		
	Requested by all partners		4	Lee et al. (2005), Teo et al. (2009)
Business Partner	Requested by some of partners' department	Likert		
Influence	Recommended by all partners	LINCIL		
	Recommended by some of the partners			

Table 3. Purposive sampling

Characteristics	Descriptions	Frequency	Percentage	
Entermaine	State-owned	2	5.56%	
Enterprises	Private	34	94.44%	
	Holding	16	44.44%	
Enterprises Status by Capital Stocks	Subsidiaries	20	55.56%	
	President Director	0	0%	
D 31	Finance Director	1	2.78%	
Position	Operating Director	0	0%	
	Others	35	97.22%	

In this study, 2 state-owned firms (or 5.56 percent) of 36 samples returned the questionnaire, while 34 private enterprises (or 94.44 percent) of 36 samples returned the questionnaire. Furthermore, when looking at companies by capital stock, 16 are classified as holding companies, accounting for 44.44 percent of the total, and the rest are subsidiaries. A total of 55.56

percent of 100 percent samples were collected, resulting in 20. One person works as a Finance Director, accounting for 2.78 percent of all respondents, while 35 others work as employees or managers, accounting for 97.22 percent of all respondents. Table 3 shows that private firms that are subsidiaries dominate the data, whereas personnel and managers dominate the respondents.

4. RESULTS

The data was collected, validated, and notated in order to be analyzed with SmartPLS 3.0; it is displayed in Table 4.

Table 4. Descriptive statistics

Variables	Acronyms	Questions	Mean	Standard Deviation
E-procurement Adoption	EP	9	2.71	0.841
Perceived Cost	PC	9	3.90	0.205
Firm Size	FS	3	3.09	1.127
Top Management Support	TMS	6	4.00	0.120
Information- Sharing Culture	ISC	8	3.79	0.596
Business Partner Influence	BPI	4	4.01	0.091

According to Table 4, there are 5 independent variables, such as perceived cost, firm size, top management support, information sharing culture, business partner influence, and e-procurement adoption as a dependent variable, thereby 6 variables summarized. Sequentially, the mean and standard deviation for e-procurement adoption stated 2.71, perceived cost stated 3.90, firm size stated 3.09, top management support stated 4.00, information sharing culture stated 3.79, and business partner influence stated 4.01. Thus, business partner influence achieved the highest score among the others. Furthermore, the standard deviation value from e-procurement adoption is 0.841, perceived cost is 0.205, firm size is 1.127, top management support is 0.120, information sharing culture is 0.596, and business partner influence is 0.091. In the end, Table 4 concludes that the data is normal, according to Ahsanullah et al. (2014) and Sekaran and Bougie (2016). Furthermore, the validity and reliability tests purposed for judging the data could be examined using SmartPLS version 3.0 (Table 5).

Table 6. Discriminant validity

Variables	E-procurement Adoption	Perceived Cost	Firm Size	Top Management Support	Information-Sharing Culture	Business Partner Influence
EP	0.949					
PC	0.559	0.716				
FS	-0.054	0.076	0.802			
TMS	0.537	0.234	0.255	0.830		
ISC	0.921	0.533	-0.061	0.368	0.713	
BPI	0.426	0.252	0.097	0.576	0.389	0.952

Table 5. Convergent validity and reliability

Variables	Composite Reliability	Cronbach's Alpha	Average Variance Extracted (AVE)
EP	0.947	0.889	0.900
PC	0.805	0.704	0.513
FS	0.769	0.639	0.644
TMS	0.867	0.763	0.689
ISC	0.755	0.531	0.508
BPI	0.975	0.967	0.906

Table 5 shows that the data is sufficient to test the hypotheses. Fornell and Larcker (1981) and Garson (2016) utilize composite reliability of 0.7 and an AVE of 0.5 to suggest that the feasibility data is valid and dependable. Teo et al. (2009) utilize 0.7 as Cronbach's Alpha standard to demonstrate that a variable is valid and trustworthy; therefore, variables with coefficients greater than 0.7 are done, but company size and information-sharing culture are not. In a more advanced investigation, coefficients less than the standard can be used to test hypotheses (Schmitt, 1996) if the variables indicate > 0.49. Sijtsma (2009) also claimed that the coefficient is a lower bound of reliability value. Firm size and information-sharing culture can be investigated using Schmitt (1996) and Sijtsma (2009). Table 6 shows the results of a discriminant validity test using a standard from Fornell and Larcker (1981) with a standard of 0.7.

From the dependent variable, e-procurement adoption was 0.949 > 0.7, and perceived cost was 0.716, which was above the margin of error of 0.7. Firm size was 0.802, which was also over 0.7, and top management support was 0.830, which was also over 0.7. Information-sharing culture was 0.713, which was above the margin of error of 0.70, and business partner influence was 0.952, which was higher than 0.7. Table 6 shows that all of the variables are via-

Table 7. PLS path algorithm and bootstrapping

Variables	Path Coefficient (Original Sample)	T-Statistics	P-Values	Adjusted R-Square
EP				0.890
$PC \rightarrow EP$	0.097	1.235	0.217	
$FS \rightarrow EP$	-0.080	1.215	0.225	
TMS \rightarrow EP	0.279	2.687	0.007	
ISC → EP	0.783	10.012	0.000	
BPI → EP	-0.057	0.740	0.459	

ble. Because the feasibility data was authorized, Table 7 shows the PLS algorithm and bootstrapping in SmartPLS version 3.0.

Table 7 shows the statistical results of determining the significance level and path coefficient. If the t-statistics are greater than the t-count and the p-value is less than 0.05, the predicate is considered significant in this investigation. On the other hand, the study considers path coefficient value when deciding on hypotheses. Table 7 also included the R-square value of 0.890, which was calculated using the corrected R-square.

5. DISCUSSION

Table 7 shows that the adjusted R-square value of 0.89 indicates that 89 percent of outstanding factors were used to determine e-procurement adoption in Indonesia. In comparison, 11 percent of 100 percent indicated that certain variables were not employed. This 11% includes the DeLone and McLean model used by Mathenge and Wausi (2018) and the theory of planned behavior and technology acceptance model for e-procurement adoption (Murathi, 2016). In addition, Teo et al. (2009) divided advantages into direct and indirect benefits, and Vaidya et al. (2006) used technical standards as critical success factors relevant to Indonesian procurement.

The first hypothesis holds that there is no link between perceived cost and adoption of e-procurement. The significance of the t-statistics t-count (1.235 > 2.040) is 0.217 higher than the significance level of 0.05, according to this conclusion. Therefore, it is claimed that apparent cost is unimportant and that businesses interested in participating in Indonesian procurement can do so easily. According to Chau and Hui (2001), businesses are divided into two categories when they wish to adopt the technology. First, there are financial in-

vestments, which implies that the businesses are less likely to face risk than the others, and simply these samples are included in this group. Second, some businesses have classified administrative costs because of this classification, and they should carefully assess each component and risk. Teo et al. (2009) and Tornatzky and Klein (1982) support these findings, while Chau and Tam (1997) and Lin (2013) indicate that perceived cost has a negative and significant effect on Edi and E-SCM adoption.

The t-statistics t-count (1.215 < 2.040) revealed the second hypothesis, with a significance level of 0.225 higher than the significance level of 0.05. According to these data, Indonesian e-procurement ignores the size of the companies participating in the event. The prior study, on the other hand, claimed that business size has a favorable and substantial effect in each trial (Doll & Torkzadeh, 1987; Teo et al., 2009; Teo & Tan, 1998). According to the study, the larger the company, the easier it is to implement the innovation. On the other hand, Skafi et al. (2020) and Teo and Ranganathan (2004) found that small firms can implement technology provided their aligned vision and goal. Moreover, Teo and Ranganathan (2004) concurred that major firms have sustainability and stability in the finance industry.

The third hypothesis is the one that has been accepted. T-statistics were found to be greater than the t-count (2.687 > 2.040), and the p-value was less than the level of significance (0.007 < 0.05). These findings agreed with Premkumar et al. (1997), Teo et al. (2009), Teo and Ranganathan (2004), and Teo and Tan (1998). Thus, top management support is a critical component because top managers have the authority to make decisions and solve problems, particularly external ones. The hypothesis has been accepted. This conclusion is based on t-statistics > t-count (10.012 > 2.040) and a significant level more than p-value (0.000 < 0.05). This

variable may be considered sufficient to affect the dynamics of the enterprise, such as difficulties and the like. Chong et al. (2009) and Li et al. (2015) supported this study. However, Teo et al. (2009) argued the contra with this and previous studies.

No substantial effect is indicated in the last hypothesis. T-statistics less than t-count (0.740 < 2.040) and p-value more than the significant level (0.459 > 0.05) backed up the findings. According to Teo et al. (2009), the partners' rec-

ommendations helped the businesses grow to acquire advantages, but this requires trust (Kim & Lee, 2008; Lee et al., 2005). Because Singaporean e-procurement requires enterprises to utilize e-procurement, this condition is comparable to Indonesian e-procurement, which requires enterprises or ministries to use e-procurement to purchase any products or services. Because of the contrary argument, the findings of Kim and Lee (2008), Lee et al. (2005), and Abed (2020) differed.

CONCLUSION

The purpose of this study was to determine the effect of perceived costs, firm size, top management support, information sharing culture, and the influence of business partners on e-procurement adoption in state-owned enterprises with subsidiaries and private companies participating in Indonesian e-procurement. According to the findings, perceived cost has no substantial impact on e-procurement adoption. These findings revealed that the samples evaluate the costs paid for Electronic Procurement Services (LPSE). However, they could not issue a discussion to move on to the other topics. As a result, firm size has no significant effect on e-procurement adoption, implying that using the TOE model to determine how big firms may engage in Indonesian e-procurement. The data indicate that firm size still has no impact on Indonesian e-procurement.

The final factor is business partner influence, which has no bearing on e-procurement adoption. According to the results of the variable, the indication about the firms' partners in this study has no significant impact or significance in making the samples adopt Indonesian e-procurement.

The constraints of the data collection technique were also addressed in this study. First, the study tolerates the pandemic. Thus, the samples required their workers to work from home for approximately 80 percent to 100 percent of the time during the study. Additionally, due to the restricted data and the person in charge of the information, the study took a long time to complete. The second point is that the study's implicit recommendations to practitioners were ineffective, yet the use of variables previously covered the entire empirical investigation. The empirical study approved the contribution and provided a full explanation based on the theory, framework, and variables used. The variables to measure Indonesian firms that specialize in infrastructure and construction, in particular, have yet to contribute to the current study. As a result of the findings, it was discovered that the government is neglecting various costs associated with participating in Indonesian e-procurement. Furthermore, the examples are organized according to the hierarchy of systems in their organization, which the top managers ruled with. Neutral data backed up the ruled judgment, therefore, hopefully, it was made correctly. The analyses of the variables revealed that the theory and the model are implicitly related.

AUTHOR CONTRIBUTIONS

Conceptualization: Khoirul Aswar, Stefanus Ardy Susantya.

Data curation: Khoirul Aswar, Stefanus Ardy Susantya, Andreas.

Formal analysis: Khoirul Aswar, Stefanus Ardy Susantya, Mahendro Sumardjo, Ingrid Panjaitan.

Methodology: Khoirul Aswar, Stefanus Ardy Susantya, Mahendro Sumardjo, Andreas.

Project administration: Ingrid Panjaitan. Resources: Khoirul Aswar, Andreas. Software: Khoirul Aswar, Stefanus Ardy Susantya, Andreas.

Supervision: Stefanus Ardy Susantya, Mahendro Sumardjo, Ingrid Panjaitan.

Validation: Stefanus Ardy Susantya, Mahendro Sumardjo, Ingrid Panjaitan.

Writing - original draft: Khoirul Aswar, Stefanus Ardy Susantya.

Writing – review & editing: Khoirul Aswar.

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109