

**Moderating role of top management support in electronic procurement usage of Jordanian firms****Ahmad Marei<sup>a\*</sup>, Luay Daoud<sup>b</sup>, Marhaiza Ibrahim<sup>c</sup> and Sameer M. Al-Jabaly<sup>a</sup>**<sup>a</sup>Middle East University, Amman, Jordan<sup>b</sup>Institute of Public Administration. Riyadh, Saudi Arabia<sup>c</sup>Tunku Puteri Intan Safinaz School of Accountancy (TISSA), Universiti Utara Malaysia, Kedah, Malaysia**CHRONICLE****ABSTRACT***Article history:*

Received: August 14, 2020

Received in revised format:

November 14 2020

Accepted: November 14, 2020

Available online:

November 23, 2020

*Keywords:**Electronic procurement**DOI theory**TOE framework**Top management support**Jordan*

The use of e-procurement aids organisations in reducing business costs, broadening their market access and simplifying purchasing processes. However, in Jordan, only 27.6% of firms utilise e-procurement systems. Hence, the usage of e-procurement systems by Jordanian firms is still in its infancy. In this work, the technology, organisation and environment (TOE) factors affecting the use of e-procurement systems by large firms in Jordan were investigated. Previous studies have reported inconsistent findings with regard to the antecedent factors that may affect e-procurement usage. Therefore, this work aimed to determine the factors related to e-procurement usage and whether or not top management support moderates the relationship between TOE factors and e-procurement usage. Results revealed that all TOE factors used in this study influenced the e-procurement usage of the firms. Moreover, the moderating role of top management support was found to be positively related to relative advantages and organisational readiness and negatively related to complexity.

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**1. Introduction**

E-procurement is described as the process in which organisations utilise information technology (IT) to acquire goods or services at the business-to-business (B2B) level (Amman Stock Exchange Report, 2016). Through e-procurement, organisations can reduce business costs, cut consumption time, access wide markets and simplify purchasing processes (Almajali *et al.*, 2016). E-procurement thus opens up avenues for management to increase profitability and competitiveness through effective purchase order, expanded supplier bases, streamlined purchase payment and mitigated costs (Daoud & Ibrahim, 2017). Given their potential advantages, e-procurement systems are purchased by numerous firms around the globe for their survival in a dynamic and competitive market. As suggested by David, Phillip and Edith (2003), e-commerce comprises an intra-organisational relationship either in a business-to-consumer or a B2B context. Teo, Lin and Lai (2009) explained that e-procurement systems are generally B2B. De Boer Harink and Heijboer (2002) enumerated several functions of such systems, including e-sourcing, e-tendering, e-information, e-auction, e-collaboration, e-MRO and web-based enterprise resource planning (ERP). Hassan, Tretiakov, Whiddett and Adon (2014) divided e-procurement usage functionalities into the information and transaction perspectives. The information perspective includes e-information, e-source and e-collaboration. The transaction perspective includes e-tendering, e-auction, e-catalogue, e-MRO and ERP. The use of e-procurement around the world has increased in the last decade. Based on the United Nations Conference on Trade and Development, the e-procurement volume around the globe in 2013 exceeded \$15 trillion. Over three-quarters of that volume was produced by the U.S., China, Japan, and the UK (Information economic report, 2015). These events indicate the more accelerated growth of e-procurement in developed countries than in developing ones.

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In the context of Jordan, e-procurement usage has grown in the last few years (Daoud & Ibrahim, 2017). Jordan may be a developing country, but its readiness to use e-procurement is greater than that of other developing countries. This quality is reflected by the country's technology infrastructure. Nevertheless, the use of e-procurement in the country remains limited, and its overall progress is slower than that of other developing and developed countries (Alsaad, Mohamad, & Ismail, 2014). In other words, despite the growth of e-procurement in the country, its use remains challenging (Yaseen, Dingley, & Adams, 2016). The Ministry of Information and Communications Technology (2016) of Jordan recently reported that only 27.6% of businesses in the country have adopted and are using e-procurement systems. In addition, relevant research in the context of the Middle East, particularly Jordan, is limited. Therefore, the current study attempts to bridge the gap in the literature by investigating the determinants of e-procurement use in Jordan. Specifically, we examine the effects of the technology, organisation and environment (TOE) factors on the use of e-procurement on the basis of diffusion of innovation (DOI) theory. Apart from offering a solid foundation for B2B IT research, the TOE framework is capable of integrating moderating variables into theoretical models (Mohtaramzadeh, Ramayah & Jun-Hwa, 2017; Eneizan, et al., 2020). Previous studies have used TOE factors as key determinants of the usage of IT, such as e-procurement, but their results regarding the influence of these factors are conflicting (Alsaad, Mohamad, & Ismail, 2017; Hassan, Tretiakov, & Whiddett, 2017). This drawback is attributed to the incorrect incorporation of the TOE factors into general IT models (Hong, Chan, Thong, Chasalow, & Dhillon, 2013). Therefore, research has suggested that relationship factors moderate usage behaviour rather than directly influence it (Abu-Elsamen *et al.*, 2010; Hameed & Counsell, 2012). According to the previous studies the inconsistent results about the relationship between independent variables and dependent variables are attributable to the presence of the indirect effects of moderator variables. Hence, to explain the inconsistencies in prior research, the present study focuses on the moderating role of Top Management Support (TMS) between TOE factors and use of e-procurement.

TMS exerts positive effects by emphasising the need for firms to use state-of-the-art IT tools and financial resources to use e-procurement (Liang & Saraf, 2007). It also increases the degree of usage and weakens organisational resistance by promoting cultural values that are supportive of innovation usage (Adebayo & Evans, 2015). Organisational factors have been found to moderate institutional pressure (Yigitbasioglu, 2015). Mat, Jantan, Mat and Romli (2012) described TMS as a moderator and reported its positive influence on the development of new products and product innovation performance. When managers realise the advantages of IT, they tend to exert a strong influence on the IT acceptance of firm members. Conversely, when managers are unsupportive of IT usage, IT acceptance fails to produce positive outcomes (Teo *et al.*, 2009). Hence, top management is a change factor in the usage of IT innovation. However, the role of TMS as a moderator between TOE context and the use of e-procurement in the e-procurement process has largely been disregarded.

The current work makes valuable contributions to researchers and practitioners. On the one hand, researchers may benefit from this study because of the use of DOI theory and the TOE framework in investigating the major factors facilitating e-procurement use in Jordanian large firms. In addition, this study enriches the understanding of e-procurement usage amongst Jordanian firms. Furthermore, the research model herein presents e-procurement usage from the perspectives of information and transaction. These perspectives reflect the range of e-procurement functionalities that have never been examined collectively in the context of Jordanian organisations. Moreover, the scale used in this work is more elaborate than a simple binary metric because a binary metric does not adequately distinguish differences in organisational behaviours with respect to IT (Hassan, 2013). This study also contributes to the ongoing debate about how TMS influences organisational behaviour. On the other hand, practitioners may benefit from this work through its testing of the strength of TOE factors in encouraging e-procurement use and through its suggestions regarding the extensive diffusion of e-procurement technologies.

## 2. Factors Affecting B2B E-Procurement Usage

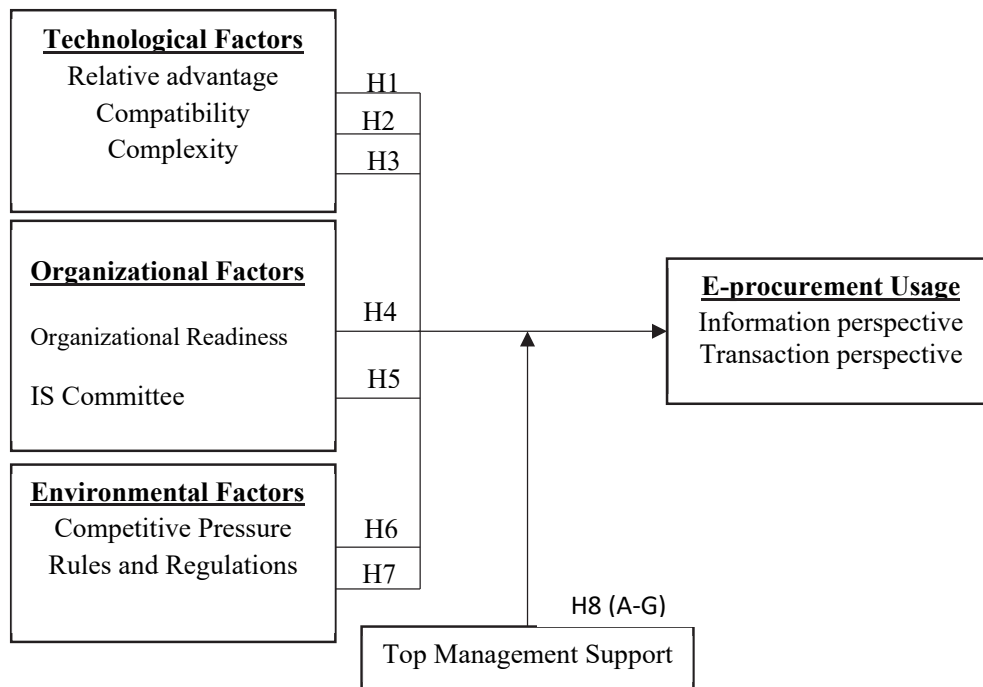
This work attempts to examine e-procurement use (post-adoption stages) amongst large Jordanian firms. Most of the influencing determinants are based on two specific perspectives: one that encompasses intra-organisational determinants and another that covers the institutional perspective influencing the application of system decisions (Alsaad *et al.*, 2014). The existing research on intra-organisational aspects focuses on the determinants influencing organisational capability evaluation and the potential for innovation through innovation features (Alsaad *et al.*, 2014). By contrast, studies based on the institutional perspective contend that the social context of an organisational operation influences organisational behaviour. Extensive research has explored the influence of environmental factors on the decisions towards the use of innovation. As for the TOE framework, it posits that three contextual determinants, namely, technological, organisational and environmental factors, could influence the decision of management to use innovation in the e-procurement process. The TOE framework serves as the basis for explaining the determinants of e-procurement usage. Rogers (1995) proposed DOI theory to evaluate innovation on the basis of the following five characteristics which are referred to as innovation attributes: relative advantage, compatibility, complexity, observability and triability. Amongst these attributes, the first three are most closely related to technology usage (Tornatzky & Klein, 1982). Hence, they were adopted in the current work. Alsaad *et al.* (2014) explained that organisational characteristics are indicative of innovation efficiency determinants and help assess the ability of organisations to use a type of innovation successfully (Khalifa & Davison, 2006). Previous studies have also indicated that organisational readiness is the most important organisational factor that facilitate innovation use amongst firms (Eneizan et al., 2019). Organisational

readiness represents technological capabilities and financial capabilities. In this study, organisational readiness is discussed from the aspect of technological capabilities, which include the IT knowledge and expertise of the adopting organisation. Previous studies have suggested that firms with adequate financial resources tend to use e-procurement (Hassan, 2013; Khalifa & Davison, 2006; Rawwash et al., 2020). However, financial resources are excluded in the current work because the focus lies on Jordanian organisations with large registered capital. Thus, financial capabilities should not hinder the use of e-procurement systems. Another factor that has been known to contribute to innovation use is the information system committee. The IS committee is vital in the use of e-procurement in reviewing and overseeing not only the management strategies for developing and implementing new technologies but also the post-implementation outcomes of major technology initiatives (Bank Queensland Report, 2016).

The literature related to the environmental factors influencing IT use emphasises several factors, including competitive pressure and government support (Sutanonpaiboon & Pearson, 2006). Al-Qirim (2010) stressed that the lack of technical or financial support from the Jordanian government restricts the motivation to adopt IT. Hence, the current study examines the role of the government in establishing rules and regulations that encourage e-procurement usage amongst firms.

### 3. Hypotheses Development

The conceptual framework of this study combines DOI theory and the TOE framework. The research focuses on the factors affecting the utilisation of e-procurement amongst large Jordanian firms. These factors are analysed from the TOE contexts and the moderating role of TMS. The hypotheses derived herein contribute to the completion of the research model. The research framework is presented in Fig. 1.



**Fig. 1.** Research framework

#### 3.1 Technological Factors

The literature highlights several factors of technology that affect the use of e-procurement. These factors are examined accordingly in this work.

##### 3.1.1 Relative Advantage

According to Rogers (2003), relative advantage refers to the extent to which an innovation is recognised to be more sophisticated than its successor. Previous research has shown that relative advantage is positively associated with adoption/usage behaviours. In this argument, system implementation is rendered useless when the firm does not regard the adoption of e-procurement as beneficial. Hence, this study proposes the following hypothesis for testing:

H<sub>1</sub>: Relative advantage has a positive influence on the e-procurement usage.

### 3.1.2 Compatibility

As defined by Moore and Benbasat (1991), compatibility is “the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters” (p. 195). E-procurement usage also requires obtaining new skills and methods for its effective use (Ihlsoon, 2002). Therefore, the perceived compatibility of e-procurement use could contribute to its extensive application. The following hypothesis is proposed accordingly:

*H<sub>2</sub>: Compatibility positively influences e-procurement usage.*

### 3.1.3 Complexity

As described by Rogers (2003), complexity is “the degree to which an innovation is perceived as difficult to understand and to use” (p. 257). According to Al-Hudhaif and Alkubeyyer (2011), the rate of IT usage declines when the complexity of the innovation increases. Thus, this study makes the following hypothesis:

*H<sub>3</sub>: Complexity negatively influences e-procurement usage.*

## 3.2 Organisational Factors

Organisational factors reflect various mechanisms, structures and characteristics that affect the inclination to adopt and assimilate innovation (Tornatzky, Fleischer, & Chakrabarti, 1990). The organisational factors examined in this study are as follows.

### 3.2.1 Organisational Readiness

The adoption and use of e-procurement systems is generally hindered by several factors, including the failure to obtain the required skills and talents in innovation and the lack of adequate training (Chircu & Kauffman, 2000). Therefore, the organisation is likely to use e-procurement if its readiness level is high. The following hypothesis is derived accordingly:

*H<sub>4</sub>: Organisational readiness positively influences e-procurement usage.*

### 3.2.2 IS Committee

The IS committee comprises IT specialists who understand and are dedicated to the vision, mission and strategic plan of the organisation (Daoud & Ibrahim, 2017). The IS committee examines the effects of several dimensions, including employee knowledge, skills and culture of IS alignment and considers the value of IT use in the firm. Hence, organisations that make IS decisions on the basis of the opinion of the IS committee are likely to succeed in the use of e-procurement. This study thus makes the following hypothesis:

*H<sub>5</sub>: The IS committee positively influences e-procurement usage.*

## 3.3 Environmental Factors

According to Jeyaraj, Rottman and Lacity (2006), environmental factors are exterior elements which are beyond the control of the top management. Research has shown that environmental factors affect firms' adoption and usage of innovation and reflect organisations' external landscape (Tornatzky, Fleischer, & Chakrabarti, 1990). Sutanonpaiboon and Pearson (2006) identified competition rules and government regulations as the two major external pressures faced by organisations.

### 3.3.1 Competitive Pressure

Competitive pressure urges organisations to react quickly to the needs of their customers, cut lead times and provide superior customisation (Zhu & Kraemer, 2005). According to the extant literature, the effect of competitive pressure on the adoption and use of technology is statistically significant. Previous studies have also contended that competitive pressure is a key determinant of information system. Thus, this study derives the following hypothesis:

*H<sub>6</sub>: Competitive pressure positively influences e-procurement usage.*

### 3.3.2 Rules and Regulations

According to Daoud and Ibrahim (2017), rules and regulations refer to “the acts and laws imposed by the government for the management of e-procurement usage”. Existing research has indicated that the application of innovations is facilitated by the

government's rules, regulations, support and incentives (Zhu & Kraemer, 2005; Enaizan et al., 2020). Hence, rules and regulations strongly support e-procurement usage. The following hypothesis is derived accordingly:

*H<sub>7</sub>: Rules and regulations positively influence e-procurement usage.*

### 3.4 TMS

As a strong force in business, top management may either support or oppose the usage of e-procurement. When top management promotes the usage of an innovation, they can create supporting corporate cultural values to reduce any resistance in the organisation (Hameed & Counsell, 2012). Regardless of the presence of external factors, top management ultimately decides whether to use IS (Elbashir, Collier, & Sutton, 2011). Organisational factors have been found to moderate institutional pressures (Yigitbasioglu, 2015). In addition, top management helps create an environment that stimulates and encourages the use of IS. According to Mat et al. (2012), TMS as a moderator positively affects the development of new products and product innovation performance. When managers recognise the advantages of IT, they tend to exert a strong influence on the IT acceptance of firm members (Daoud et al., 2020; Marei & Iskandar, 2019). Conversely, where managers are unsupportive of IT usage, IT acceptance fails to produce positive outcomes Ifinedo (2011). Hence, top management is a change factor in the usage of IT innovation. In the current study, TMS is assumed to affect the decision making related to e-procurement usage. Its influence stems from the sufficient allocation of financial and technological resources for state-of-the-art IT, creation of a stimulating environment and urging of employees to use e-procurement systems. Hence, the moderating role of TMS between DOI, TOE factors and e-procurement usage is examined herein. The following hypotheses are formulated accordingly:

*H<sub>8A</sub>: TMS positively moderates the relationship between relative advantage and the use of e-procurement.*

*H<sub>8B</sub>: TMS positively moderates the relationship between compatibility and the use of e-procurement.*

*H<sub>8C</sub>: TMS negatively moderates the relationship between complexity and the use of e-procurement.*

*H<sub>8D</sub>: TMS positively moderates the relationship between organisational readiness and the use of e-procurement.*

*H<sub>8E</sub>: TMS positively moderates the relationship between the IS committee and the use of e-procurement.*

*H<sub>8F</sub>: TMS positively moderates the relationship between competitive pressure and the use of e-procurement.*

*H<sub>8G</sub>: TMS positively moderates the relationship between rules and the use of e-procurement.*

## 4. Research Method

In this study, the population comprised listed firms in the Jordanian Control Companies Department with large amounts of capital. This selection was based on the fact that e-procurement systems are relatively sophisticated and that their adoption requires significant technical and financial resources (Hassan et al., 2014; Venkatesh & Bala, 2012). E-procurement system usage and high transaction volumes have been found to be correlated (Grover & Saeed, 2007). These parameters are common amongst firms with sufficient resources, and such firms are likely to have huge registered capital (Alsaad et al., 2017; USAID, 2007). The sample was limited to major companies with registered capital amounting to JD5,000,000 or more (Alsaad et al., 2017). Based on this criterion, the final sample consisted of 566 companies. The entire population was used as the research sample. That is, the sample size and population size were equal. This approach was adopted because of the relatively small population size (566 companies) and generally low response rate of Jordanian firms (response rate of 25%–44%). Following the e-procurement literature, this study evaluated the purchasing managers of the selected firms. In terms of B2B usage, purchasing managers are deemed as the most appropriate respondents in the literature (Alsaad et al., 2017).

**Table 1**  
Measurement Items.

Constructs	Sub constructs	Source	No./Items
E-Procurement usage	Information perspective (IP)	Hassan et al. (2017)	13
	Transaction perspective (TP)		13
Relative advantage (RA)		Hassan et al. (2017)	6
Compatibility (COMP)		Alsaad et al. (2017)	5
Complexity (COX)		Grandon and Pearson (2004)	5
Organisational readiness (OR)		Ifinedo (2011)	4
IS Committee (ISC)		Ibrahim (2012)	3
Competitive pressure (CPR)		Hassan et al. (2017)	5
Rules and regulations (RR)		Zhu and Kraemer (2005)	4
Top management support (TMS)		Hassan et al. (2017)	6

The instrument was pretested by academicians in the domain of e-business and by purchasing managers in large Jordanian firms. For the pilot testing, the instrument was distributed to 50 selected firms in June 2017. A total of 33 questionnaires were returned. Of the 566 firms in the sample, 50 firms were excluded for the purpose of the pilot study, and 7 firms were unreachable due to unclear addresses. For the remaining 509 firms, their purchasing managers were each provided with one questionnaire. In a span of 12 weeks, 238 responses were obtained; of this number, 5 responses were incomplete whilst 12 had outliers, thereby reducing the usable sample to 221 and indicating a 43% response rate. According to Hair et al. (2014), the total response received should meet the required least sample to test a model on the basis of partial least square–structural equation

modelling (PLS-SEM). Table 2 presents the profiles of the sampled companies and the demographic characteristics of the respondents.

**Table 2**  
Profiles of Sampled Companies and Respondents' Demographic Information.

Variable	Label	Frequency	Percent
Gender	Male	193	87.3
	Female	28	12.7
Age	20–30 years	19	8.6
	31–40 years	43	19.5
	41–50 years	127	57.5
	51 and above	32	14.5
Position	Managing Director	36	16.3
	Purchasing Manager	185	83.7
Sector	Service Sector	116	52.5
	Industrial Sector	77	34.8
	Financial Sector	28	12.7
Length of Business Operation	5–10 years	54	24.4
	11–15 years	48	21.7
	More than 15 years	119	53.8
Sales	Less than 5 JOD million	37	16.7
	5–10 JOD million	35	15.8
	11–15 JOD million	25	11.3
	More than 15 JOD million	124	56.1

## 5. Data analysis

### 5.1 Measurement Model

PLS was used for data analysis, specifically for the estimation of the proposed model. The PLS method simultaneously tests the measurement and structural models (Gefen, Rigdon, & Straub, 2011; Becker et al., 2012). PLS is suitable for complex models with a hierarchical structure and several indicators, constructs and relationships. In addition, PLS steers clear of issues caused by small sample sizes, and it puts forward lenient assumptions with regard to normal distribution and error terms (Sarstedt, Ringle, Smith, Reams, & Hair, 2014). Hence, PLS may be invaluable in situations that render other methods useless. The approach was thus deemed suitable for use in this paper. The primary step in PLS is to confirm the reliability and validity of the measurement model. Hence, the constructs of reliability and validity were first estimated in this work by using composite reliability (CR) and average variance extracted (AVE) with respective cut-off values of 0.70 and 0.50 (Hair et al., 2014; Sarstedt et al., 2014). As shown in Table 3, all CR and AVE values exceeded the cut-off values. Hence, the measurement model was deemed to have acceptable convergent validity. Table 4 presents the square root values of the AVEs on the diagonal line. These values were greater than the correlation coefficients between the constructs. This outcome established construct discriminant validity. Thus, the study proceeded with the examination of the structural model.

**Table 3**  
Reliability and Validity

Variables	CR	AVE
E-Procurement usage - Information perspective	0.970	0.712
E-Procurement usage - Transaction perspective	0.973	0.737
Relative advantage	0.958	0.793
Compatibility	0.944	0.773
Complexity	0.976	0.891
Organisational readiness	0.967	0.881
IS Committee	0.962	0.894
Competition pressure	0.959	0.886
Rules and regulations	0.947	0.819
TMS	0.972	0.853

**Table 4**  
Correlations and Square roots of AVEs for constructs

	CPR	COMP	COX	IP	ISC	OR	RA	RR	TMS	TP
Competition Pressure	<b>0.941</b>									
Compatibility	0.714	<b>0.879</b>								
Complexity	-0.271	-0.345	<b>0.944</b>							
Information perspective	0.722	0.799	-0.353	<b>0.844</b>						
IS Committee	0.634	0.570	-0.346	0.630	<b>0.946</b>					
Organisational Readiness	0.617	0.709	-0.289	0.696	0.567	<b>0.938</b>				
Relative Advantage	0.468	0.499	-0.323	0.589	0.518	0.524	<b>0.890</b>			
Rules and Regulations	0.632	0.701	-0.383	0.688	0.631	0.750	0.584	<b>0.905</b>		
TMS	-0.120	-0.045	0.090	-0.069	-0.210	-0.149	-0.164	-0.121	<b>0.924</b>	
Transaction perspective	0.559	0.610	-0.458	0.695	0.629	0.637	0.604	0.731	-0.188	<b>0.859</b>

## 5.2 Structural model: Hypothesis testing

In the literature, structural models are generally assessed through the PLS algorithm. To assess the proposed hypotheses and structural model, this study examined the main effect model without the moderator. The moderation effect was subsequently tested in an interaction model (Hair et al., 2014; Wilson, 2010). In this testing, the significance of the path coefficients was calculated using the bootstrapping method. The calculating yielded 500 resamples. The standardised coefficients ( $\beta$ -values) along with the critical ratios (t-values) and p-values of the hypothesised relationships are presented in Table 5. The values showed that all the direct hypotheses were supported.

**Table 5**  
Results of Direct Hypotheses

Relationships	Beta	Std. Err	t-value	p-value	Decision
Relative Advantage → E-Procurement	0.183	0.039	4.685	0.000	Supported**
Compatibility → E-Procurement	0.254	0.055	4.622	0.000	Supported**
Complexity → E-Procurement	-0.104	0.036	2.904	0.002	Supported**
Organisational Readiness → E-Procurement	0.124	0.062	1.983	0.024	Supported*
IS Committee → E-Procurement	0.149	0.050	2.985	0.001	Supported**
Competition Pressure → E-Procurement	0.108	0.056	1.926	0.027	Supported*
Rules and Regulations → E-Procurement	0.191	0.064	2.975	0.002	Supported**

Notes: Significant level at \*\* =  $p < 0.01$ ; \*  $p < 0.05$  (one-tail)

For the technological factors, relative advantage was found to have a significant and positive relationship with e-procurement usage ( $\beta = 0.183$ ,  $t = 4.685$ ,  $p < 0.01$ ). This result indicated that H1 was supported. Meanwhile, compatibility demonstrated a significant and positive relationship with e-procurement usage ( $\beta = 0.254$ ,  $t = 4.622$ ,  $p < 0.01$ ). Hence, H2 was supported. As for complexity, it presented a significant and negative relationship with e-procurement usage ( $\beta = -0.104$ ,  $t = 2.904$ ,  $p < 0.01$ ). Thus, H3 was supported. Amongst the organisational factors, organisational readiness revealed a significant and positive relationship with e-procurement usage ( $\beta = 0.124$ ,  $t = 1.983$ ,  $p = 0.024$ ). Hence, H4 was supported. The IS committee indicated a significant and positive relationship with e-procurement usage ( $\beta = 0.149$ ,  $t = 2.585$ ,  $p < 0.01$ ). H5 was thus supported. In terms of environmental factors, competitive pressure was reported to be significantly and positively related to e-procurement usage ( $\beta = 0.108$ ,  $t = 1.926$ ,  $p = 0.027$ ). Therefore, H6 was supported. Similarly, rules and regulations were reported to be significantly and positively related to e-procurement usage ( $\beta = 0.191$ ,  $t = 2.975$ ,  $p < 0.01$ ). H7 was thus supported. As for the PLS regression result, the model was found to explain 77.4% of the variance. The interaction model, that is, the moderating role of TMS between TOE factors e-procurement usage. Table 6 presents the results of the bootstrapping resampling procedures.

**Table 6**  
Results of Interaction Model.

Relationships	Beta	Std. Err	t-value	p-value	Decision
(TMS×RA→E-Procurement Usage)	0.140	0.060	2.328	0.010	Supported*
(TMS×COMP→E-Procurement Usage)	0.074	0.068	1.087	0.139	Not Supported
(TMS×COX→E-Procurement Usage)	-0.074	0.045	1.658	0.049	Supported*
(TMS×OR→E-Procurement Usage)	0.190	0.070	2.716	0.003	Supported**
(TMS×ISC→E-Procurement Usage)	-0.078	0.062	1.252	0.106	Not Supported
(TMS×CPR→E-Procurement Usage)	-0.033	0.061	0.531	0.298	Not Supported
(TMS×RR→E-Procurement Usage)	-0.103	0.077	1.344	0.090	Not Supported

TMS positively moderated the relationship between relative advantages and e-procurement usage ( $\beta = 0.140$ ,  $t = 2.328$ ,  $p = 0.01$ ), thereby indicating that H8A was supported. The relationship between relative advantages and e-procurement usage under high and low levels of TMS. Meanwhile, TMS also positively moderated the relationship between organisational readiness and e-procurement usage ( $\beta = 0.190$ ,  $t = 2.716$ ,  $p < 0.01$ ). H8D was thus supported. TMS negatively moderated the relationship between complexity and e-procurement usage ( $\beta = -0.104$ ,  $t = 2.904$ ,  $p < 0.01$ ). Hence, H3 was supported. The relationship between complexity and e-procurement usage given high and low levels of TMS. No significant moderating effects were observed for the other hypotheses; hence, hypotheses H8B, H8E, H8F and H8G were not supported by the data. The results of this work indicated the improvement of model productivity through the inclusion of the interaction terms, with R-square increasing from 0.774 to 0.805.

## 6. Conclusions and Discussion

The primary objective of this work was to evaluate the effects of TOE variables on e-procurement usage. TMS was assigned the moderator between TOE variables and e-procurement usage. The study proposed an integrated model on the basis of DOI theory and the TOE framework to explain e-procurement usage. All technological factors indicated significant relationships. Relative advantage exerted a positive and significant impact on e-procurement use. This result is aligned with that reported by Roger (2003), who contended that relative advantage is an innovation characteristic that affects the decision to use innovation. The result also coincides with the assumptions of DOI theory and the TOE framework, as well as with the existing

literature on technology adoption and use. In sum, the result indicates that when an organisation harbours positive perceptions towards the benefits of e-procurement, it is likely to consider the use of the technology.

Compatibility also presented a positive and significant influence on e-procurement usage. This result is aligned with DOI theory and the prediction of the TOE framework. Hence, a firm's perception towards e-procurement as a technological innovation in the presence of sufficient manpower and computer competency can lead to the timely and extensive use and positive impact of the technology (Panda & Sahu, 2011). This result is supported by prior findings on IT adoption and use (Alsaad *et al.*, 2017; Lutfi, Idris, & Mohamad, 2017). Compatibility describes the alignment of present processes with the required processes for e-procurement use across organisations. The effective use of e-procurement requires new skills and methods. As for complexity, it demonstrated a negative and significant relationship with e-procurement. This result is aligned with DOI theory and the TOE framework and is similar to those of prior studies (Alsaad *et al.*, 2017), thereby indicating that an increase in IT usage complexity hampers IT use (Rogers, 2003). Firms should be aware of the ease of use and operation of e-procurement systems to ensure their effective implementation and usage (Kendall, Tung, Chua, Hong, & Tan, 2001). Nevertheless, e-procurement usage requires superior managerial skills, particularly in the face of innovation technology. With regard to organisational factors, organisational readiness and IS committee exerted a positive and significant effect on e-procurement usage. The result supports the prediction of the TOE framework, which states that organisational readiness, as reflected through extensive IT use, facilitates quick extensive use. Conversely, the lack of readiness hinders e-procurement use. Meanwhile, the IS committee enlightening general managers during decision making related to e-procurement systems and ensures that strategic planning is streamlined with such usage. The results concerning the environmental factors showed that competitive pressure and rules and regulations positively and significantly affected e-procurement usage. The findings are supported by those of prior studies and by the TOE framework. The TOE framework posits that a competitor urges a firm to adopt and use new technology to compete in the local and global markets (Wei & Wang, 2010). In addition, a firm's competitive external environment boosts motivation and constructive motivation towards e-procurement usage aimed at exploring business avenues and tenders (Calipinar & Soysal, 2012). As for the government's rules and regulations, they are necessary in the development of IT and use of new innovation amongst business stakeholders. Meanwhile, the study partially proved the interaction model. The results implied that TMS had a significant relationship with relative advantage, complexity and organisational readiness as IV(s) and e-procurement usage. A high level of TMS positively affects the relationship between relative advantage and e-procurement usage for firms through their leadership role as change agents. Top management motivates employees and convinces them about the value of e-procurement in speeding up the purchasing process, enriching relationships with business partners, cutting the costs of procured goods and services, moderating operational costs and boosting competitive advantage (Yigitbasioglu, 2015). Moreover, strong management support generates a relative advantage by creating cultural values that will, in turn, create support for e-procurement usage (Lee, Park, & Baker, 2017).

A high level of TMS also negatively influences the relationship between complexity and e-procurement usage in firms, thereby increasing e-procurement usage. TMS can decrease the impact of IT complexity through training programs for employees because e-procurement usage requires considerable investment in training (Kheng & Al-Hawamdeh, 2002). This training is critical when employees believe that an e-procurement system is complex. In this study, 57.5% of the respondents were aged 41–50 years, and 14.5% were aged over 51 years. Global market research and IPSOS (2016) indicated that only 11% of Internet users in Jordan are aged over 40 years. Hence, most of the respondents of the study were inclined to believe that e-procurement is a complex system. Furthermore, a high level of TMS positively influences the relationship between organisational readiness and e-procurement usage through their efficient allocation of the resources necessary for the smooth usage of e-procurement systems (Dai, Montabon, & Cantor, 2014). E-procurement usage calls for a large amount of resources, which translate into a considerable investment in resources and in changes in an organisation's processes and routines (Gilbert, 2005). Top management usually maintains control over most of the firm's technical, financial, and human resources. The role of TMS as a moderator did not support compatibility. A possible explanation could be derived to justify the argument that e-procurement usage requires considerable changes in a firm's structure, practices, routine and processes (Alsaad *et al.*, 2017) and that these changes call for the flexibility of employees in using an e-procurement system. Hence, purchasing managers and employees may perceive changes towards the use of e-procurement as possible causes of key disruptions in already successful routines, which are regarded as a source of success (Gilbert, 2005). Therefore, firms in such a context may not be able to absorb new technologies, such as e-procurement systems.

The hypothesised interaction relationship between TMS and IS committee did not support e-procurement usage. A possible reason is the functioning of an IS committee, which comprises IT expert members who understand and are dedicated to the firm's mission, vision and strategic plans related to IT. This committee should be devoted to the fulfilment of the required benefits and efficiency (Wu, Zsidisin, & Ross, 2007; Wei *et al.*, 2010). In addition, IS committees in large Jordanian firms are fully independent of the administration and should express their opinion about IT systems for the best interests of the company away from all internal and external pressures (Bank Queensland Report, 2016). Meanwhile, the hypothesised interaction relationship between TMS and environmental factors (competitive pressure and rules and regulations) presented an insignificant relationship with e-procurement usage. A possible reason is that the environmental factors affecting a firm's decision to use an e-procurement system are outside the management scope (Eze, 2008). As a prevailing force for firms, institutional pressures prompt firms seek to conform to the norms and practices of their counterparts (Wu *et al.*, 2007). Top management lacks any influence on the politics of other firms when these firms maintain high levels of autonomy. Competitive pressure is when competitors in the world market take the lead and enjoy the advantages brought by new technologies. Hence,



top management follows the lead of other firms in matching the requirements of the competitive environment to achieve performance improvements over competitors. Facing such environmental factors, firms primarily aim to gain a competitive advantage so as to establish strategic links between the ways businesses are conducted and IT (Hwang, Ku, Yen, & Cheng, 2004).

## 7. Research Implications

The present study provides several implications for theory and practice. Firstly, the study integrated DOI theory and the TOE model as underpinning theories upon which the research framework is based on. DOI theory and the TOE framework explain e-procurement usage and determine the factors affecting such use. Similar to the study of Hassan *et al.* (2014) about the level of e-procurement use amongst New Zealand small and medium-sized enterprises (SMEs), the current work measured e-procurement usage via its functionalities. Studies on e-procurement, particularly that in developing countries, are still scarce (Adebayo & Evans, 2015), the same is essentially true in the case of Jordan (Yaseen *et al.*, 2016). Secondly, the proposed validated model facilitates the identification of factors that boost the extensive use of e-procurement. With these factors known, great economic efficiency and productivity are guaranteed through the improvement of private businesses. These achievements are expected to heighten the competitiveness of Jordan in the global market and promote IT development in the country. This study also provides information about e-procurement usage activities from the information and transaction perspectives amongst businesses in the Jordanian environment. This perspective which reflects the range of e-procurement functionalities has never been covered in the context of Jordanian organisations. The scale adopted herein is more elaborate than a simple binary measure because a binary measure does not establish differences in organisational behaviours with respect to IT.

## 8. Limitations and Future Research

Notwithstanding the contributions to practice and theory, this study has limitations that need to be considered during the generalisation of the results. The sample employed in this work consisted of major Jordanian firms in the CCD database list and was limited to large firms with a capital of over 5 million JOD. These firms do not represent all companies in Jordan. Hence, future studies can examine the effects of e-procurement usage amongst SMEs and the factors affecting such usage. Another limitation refers to the cross-sectional approach adopted in the study. This approach does not allow the capture of changes that happen over time during e-procurement implementation. Therefore, for deep insights into the dynamics occurring during implementation, future studies can adopt a longitudinal approach to examine the level at which IT benefits are experienced by organisational users.

## Acknowledgement

The authors are grateful to the Middle East University, Amman, Jordan for the financial support granted to cover the publication fee of this article.

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