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# Exploring the impact of electronic procurement on buyer-supplier relationship in the Jordanian pharmaceutical industry: an empirical study

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**Abstract:** This research paper investigates the impact of electronic procurement on the buyer-supplier relationship in the pharmaceutical industry sector of Jordan. The study adopts a quantitative approach and utilises an online questionnaire to collect data from 171 managers working in different managerial levels in various pharmaceutical companies and factories in Jordan. The electronic procurement system is implemented with six applications: e-tendering, e-ordering, e-invoicing, e-auction, e-sourcing and e-informing. Structural equation modelling is used to test the hypotheses, and the analysis reveals that most hypotheses were accepted, except for e-informing, which was rejected. The study suggests that pharmaceutical companies and factories in Jordan should adopt electronic procurement systems to improve procurement processes and enhance their relationship with suppliers. Electronic procurement can increase efficiency, reduce costs, and improve communication with suppliers, resulting in a more productive and collaborative buyer-supplier relationship.

**Keywords:** e-procurement; electronic procurement; building buyer-supplier relationship; pharmaceutical industry; Jordan.

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**Biographical notes:** Noor Al-Ma'aitah is an Associate Professor at the Mutah University, Jordan. She has obtained her PhD from the University of Kent, UK. She specialises in the cultural aspects of supply chain and quality management, particularly supply chain relationships in the Middle East region and its ramifications for quality performance. Her research interests include the relationship between culture and leadership effectiveness, and the implications of supplier-buyer relationship for quality performance. She has extensive work experience in shipping industry and manufacturing sector as purchasing officer. She published her research in international journals and presented her research in number of international conferences. She won runner up position in her PhD study time at the Kent Business School in 2012, as well as the Harrington Best PhD Thesis Award in 2015. Also, she is certified as supply chain expert (CSCE) in 2023.

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## 1 Introduction

The current global business environment is rapidly changing, and companies encounter various barriers and challenges (Bhullar, 2018). Among these challenges, building an effective supply chain is critical. Such effectiveness is revealed through the coordination, collaboration, and synchronisation of all activities across the entire supply chain network, encompassing end-buyers to begin-suppliers (Al-Shboul and Alsmairat, 2023; Oteki, 2019). Therefore, the significance of supply chain relationships (SCRs) lies in their ability to help supply chain parties anticipate and appreciate changes in external and internal operating environments. This ability, in turn, helps companies confront new challenges and reap the benefits resulting from these relationships (Al-Ma'aitah, 2014).

The global economic environment has compelled companies to adopt new strategies in handling their relationships with other companies regarding buying and selling to achieve their mutual goals (Amukanga and Nurwin, 2021). Building relationships between buyers and suppliers through a well-established supply chain network can speed up the response to fluctuations in buyers' demands, enhance a company's profitability, and improve its ability to achieve stable growth (Alsmairat and Aldakhil, 2022; Kembi, 2021). Moreover, building buyer-supplier relationships can provide companies with more opportunities to progress and achieve a competitive advantage than they could individually (Wegdam, 2021).

With the advent of information and communication technology (ICT), companies have been compelled to modify their operations and transactions from the traditional manner to the electronic manner to improve their business processes (Waithaka and Kimani, 2021). Electronic procurement (e-procurement) systems, with their various applications, support business to business (B2B) transactions from the buying information stage to the supplier evaluation stage. When the procurement process is automated, buyers and suppliers can exchange information more efficiently, making the transaction process more effective, which has a positive impact on their relationship (Awadallah and Saad, 2018; Waithaka and Kimani, 2021).

Globally, with the increase in technology development, e-procurement has gained more popularity (Oteki, 2019). However, e-procurement is an increasingly important system for companies and the process of using the system in Jordanian companies has grown significantly in the past few years (Daoud and Ibrahim, 2017). Still, there are many limitations of the use of e-procurement applications in Jordanian companies (Yaseen et al., 2016). Further, the research about the use and implementation of e-procurement in the Middle East region is limited, especially for Jordan (Daoud and Ibrahim, 2017).

SCRs have been identified as one of the key research areas, but there is a scarcity of studies that have focused on this concept (Alsmairat, 2021; Grant, 2005; Soni and Kodali, 2012). The fragmented understanding of the literature on this topic and the difficulties in data collection and analysis make it a challenging process to understand how to develop buyer-supplier relationships (Shamsollahi et al., 2020). This study aims to fill the gap by evaluating the impact of e-procurement systems on building buyer-supplier relationships, especially in the pharmaceutical industry, which has received less attention compared to other industries (Masheti, 2016). By automating the procurement process, e-procurement systems may enhance communication and collaboration between buyers and suppliers, leading to more effective SCRs.

Therefore, the current study aims to explore the impact of e-procurement that includes six applications which are (e-tendering, e-ordering, e-invoicing, e-auction, e-sourcing and e-informing) on building buyer-supplier relationship in pharmaceutical industry sector of Jordan, to answer the following research question: what is the impact of e-procurement on building buyer-supplier relationship in Jordanian pharmaceutical industry?

## 2 Theoretical background

This section provides a theoretical background for both dependent variable (i.e., SCR) and independent variable (e-procurement) in order to develop the research hypotheses.

### *2.1 Buyer-supplier relationship*

SCRs have been defined in different ways in the literature. Some scholars define it as a mutual understanding and coordination between exchange parties (Anderson and Narus, 1990), while others see it as a mutual trust, communication, shared reward, and risk that achieves a competitive advantage (Lambert et al., 1996; Mpinganjira et al., 2013;

Nguyen et al., 2017). The strength of relationships between organisations referred to as relationship magnitude, is classified into three main levels: cooperation, coordination and collaboration (C3) (Al-Ma'aitah, 2014; Humphries and Wilding, 2004). In establishing and maintaining relationships, some researchers suggest that depends on three key success factors: commitment, trust and satisfaction (Hashim and Tan, 2015; Palmatier et al., 2007).

Besides, the major dimensions of relationships include trust, commitment, adaptability, communication, dependence, power, performance, coordination, collaboration, information sharing and flexibility (Kamau, 2013; Ambrose et al., 2010). Companies pay more attention to building business relationships to improve their position in the market, enhance their competitive advantage, reduce product costs, reduce marketing time, improve product/service quality, keep up with advanced technology, and improve or speed up the delivery process (Nyaga et al., 2010; Athanasopoulou, 2009; Matopoulos et al., 2007; Rinehart et al., 2004). Moreover, building good relationships can help reduce uncertainty, enhance the flow of materials, lower stocks, and lead to more flexibility to react to changing circumstances (Waters, 2019). Moreover, Alsmairat and Aldakhil (2022) point out that when top management within the organisation understands, develops, and maintains the relationship with suppliers, they will have a great strategic value. This will further allow them to plan and work accordingly.

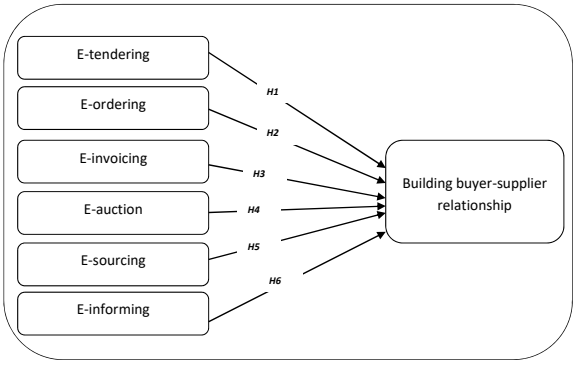
### *2.2 Electronic procurement*

According to Awadallah and Saad (2018) and Tatsis et al. (2006), e-procurement is an end-to-end automation process that streamlines, improves, and develops the procurement process within the organisation using electronic tools and technology. It supports information transaction exchange and B2B communication through web access. E-procurement assists businesses in lowering their tendering costs, which results in less paperwork being used (Rankin et al., 2006); less time wasted increases the competitive advantage (Davila et al., 2003; Egbu et al., 2004); improves supply chain partner communications by streamlining electronic paperwork, and boost market intelligence by enabling better decision-making (Eadie et al., 2007). It improves operational efficiency, increases openness, decreases errors, raises standards of integrity, shortens order turnaround times, decreases inventory, and gives small and medium-sized businesses better access to government contracts (Oteki, 2019). E-procurement also made it easier for suppliers and customers to develop long-term connections (Ronchi et al., 2010). E-procurement uses a number of ICT tools, including e-tendering, e-sourcing, e-auction and e-awarding (Phillips and Piotrowicz, 2006; Kajewski and Weippert, 2004).

### *2.3 Conceptual framework and hypotheses development*

As we exhibit in Figure 1, our conceptual framework suggests that e-procurement practices affect buyer-supplier relationships.

**Figure 1** Conceptual framework




### *2.3.1 E-tendering and SCRs*

E-tendering is a technology that allows for fast online transaction execution between buyers and suppliers by sending purchase and invoice requests to providers on a secure platform (Tiwari et al., 2019; Kamarulzaman and Mohamed, 2013).

The topic of e-tendering systems and buyer-supplier relationships through performance and information sharing has been extensively discussed in research. Oteki (2019) and Masheti (2016) both highlighted the significant correlation between e-tendering practices and supply chain performance. This is achieved through a range of benefits such as reduced processing time, lower printing costs, better storage, decreased operation costs, enhanced order processing, reduced lead time, decreased delivery costs, improved flexibility, and better product/service quality between the buyer and the supplier. Furthermore, e-tendering systems enhance the supplier's ability to access tenders and requests from anywhere, regardless of their geographic location, while also improving audit trails to a substantial degree.

In addition, e-tendering has a positive influence on performance and effectiveness of supply chain integration process (Ngeno and Kinoti, 2017). Mwangi and Kagiri (2016) and Wagner and Sweeney (2011) found that the online tendering process enables firms to be more efficient, more accurate, reliable information and facilitating for a more rapid exchange of information through supply chain process. Adebanjo et al. (2019) illustrated the positive relationship between the performance and SCR in the manufacturing sector that revealed in the development of innovative capabilities.

According to Rajagopal et al. (2009) and Chin et al. (2004), effective supply chain performance is essential in building better long-term partnerships. This includes effective procurement, cost reduction, inventory reduction and lead time reduction. Such improvements positively affect the flow of information, resource sharing, organisational linkage and supply chain infrastructure. Li and Lin (2006) suggested that responding to changing trends and needs of buyers and improving the efficiency and performance of supply chains leads to the maintenance of good relationships. Furthermore, offering superior benefits to buyers is critical for value-based business relationships (Ulaga and Eggert, 2006). Therefore, we can hypothesise that:

Hypothesis 1 There is a positive relationship between e-tendering and building buyer-supplier relationship in Jordanian pharmaceutical industry.

### 2.3.2 E-ordering and SCRs

E-ordering defined as an online system of making and approving buying requisitions, inserting purchase orders still as receiving merchandise and services ordered; by employing a software supported internet technology (Oteki, 2019; Chepkwony and Chepkwony, 2017).

Many researchers discussed the subject of e-ordering system and buyer-supplier relationship through the satisfaction concept. Ganapathi and Abu-Shanab (2020) and MacKenzie-Shalders et al. (2020) revealed that online ordering system have a direct effect on customers satisfaction, as well as, increase the interaction between the two parties, in turn, revealed a successful nature of the industry operations. Moreover, Thirumalai and Sinha (2005) revealed that customers and suppliers have a tendency to have superior satisfaction levels with the electronic order fulfilment process via four variables that enhance satisfaction levels between customers and suppliers: on-time delivery, order tracking or status information, product or services met the expectations of customers and providing support yields to customers.

Mbango et al. (2019) found that customer satisfaction has an important resultant of commitment, trust, loyalty, and word-of-mouth, that all of these considered to be very important components for building long-term relationships between the customers and the suppliers. Mbango and Phiri (2015) indicated that satisfaction plays a major role in building customer loyalty; enhance the communication between partners, better reputation of the firms via word-of-mouth; that leads to long-term relationships, commitment, and decreased propensity to terminate relationships. In addition, satisfaction influences three important outcomes in business relationships: cooperation, coordination and continuity (Mpinganjira et al., 2013). Moreover, Mysen et al. (2011) showed the satisfaction which is generated from trust and commitment positively associated with the business relationships among partners via reduces the possibility of occurrence opportunism, formalisation and specific investments.

In the same vein, Mpinganjira et al. (2017) stated that both economic and non-economic satisfaction impact buyer-supplier relationship. While the economic satisfaction is related with tangible benefits of the economic exchange, the non-economic satisfaction component is related with emotional social elements relating to relationships. Consequently, we can develop the second hypothesis of our study as follows:

Hypothesis 2 There is a positive relationship between e-ordering and building buyer-supplier relationship in Jordanian pharmaceutical industry.

### 2.3.3 E-invoicing and SCRs

E-invoicing defined as the sending, receiving and storage of invoices in electronic arrangement without any use of paper, the term is used for the B2B and business to government (B2G) segments (Koch, 2015).

In Cory (2020), e-invoicing affects the buyers' relationships with the suppliers through. In one hand, it makes easier for buyers to pay all invoices online resolve disputed invoices efficiently and the end buyers can recover and storage all their invoices in a web portal w. On the other hand, electronic invoices allowing suppliers to track the approval of their invoices and the disputes resolved effectively and quickly. Moreover, both parties can be connected in live conversations without the struggle of several calls as well as emails exchanged back and forward. Giang (2018) and Ali (2016) stated that

e-invoicing system improves the buyers' relationships with suppliers through reducing errors, superior security, no printing cost, ease use interface, in turn, enhance the level of satisfaction that led for better cooperation and commitment between the that affects business relationships.

Pereira (2017) and Barngetuny and Kimutai (2015) stated that there is a positive relationship between e-invoicing and supply chain performance; e-invoicing affect the cost of procurement transactions, eliminate errors, reduce cost, speed transactions, and enhance the interaction among supply chain members. Also, the literature (e.g., Penttinen et al., 2010; Maunola, 2009), showed there is strong impact of e-invoicing on the buyer-seller relationships via the information switch and the operational connection, in addition, it was also showed that the commitment improved and the switching costs increased between the seller and its consumers, as well as, the investments in e-invoicing decrease costs for the buyers, also the sellers advantage from the implementation of e-invoicing improved in creating long-term relationships and even dependence between the two parties. Consequently, we can develop the third hypothesis of our study as follows:

Hypothesis 3 There is a positive relationship between e-invoicing and building buyer-supplier relationship in Jordanian pharmaceutical industry.

### *2.3.4 E-auction and SCRs*

Carter et al. (2004, p.2) described e-auctions as "an online, real-time auction between a buying organization and two or more invited suppliers, where suppliers can submit multiple bids during the time period of the auction, and where some degree of visibility exists among suppliers regarding the actions of their competitors." In addition, other scholars (e.g., Coey et al., 2020; Delina et al., 2019) defined it as a selling system in online markets that provide secure and higher objectiveness of prices.

Many researchers discussed the subject of e-auctions system and buyer-supplier relationship through the trust concept. While the literature stated that e-auction influence trust level negatively due to biased in understanding information, submission of abnormally low bids; delivery of lower quality products/services, rumours and technical problems (Tunca et al., 2014; Wolf and Muhanna, 2011; Charki and Josserand, 2008), Other scholars stated that e-auction improves institutional and personal trust and communication between exchange parties via quality of software that enhance objectivity, transparency of procedure and financial performance (Ow et al., 2018; Gregg and Walczak, 2010; Carter et al., 2004). In turn, trust maintains a fruitful SCR via enhance commitment and communication, and decrease the uncertainty and opportunistic behaviour (Arum et al., 2020; Sarathchandra et al., 2018; He et al., 2017). Consequently, we can develop the fourth hypothesis of our study as follows:

Hypothesis 4 There is a positive relationship between e-auction and building buyer-supplier relationship in Jordanian pharmaceutical industry.

### *2.3.5 E-sourcing and SCRs*

E-sourcing defined as a process of finding new and more potential suppliers using ICT that intend for decreasing searching costs, identifying new sources of suppliers and

increase/enhance the competition during the offering process (Oteki, 2019; Awadallah and Saad, 2018).

Many researchers discussed the subject of e-sourcing process and buyer-supplier relationship. While Bartezzaghi and Ronchi (2005) stated there is negative impact between e-sourcing and B2B relationship that revealed in the risk of reduction in quality and the excessive reduction in margins which influence in the termination of consolidated B2B relationships.

In Tiwari et al. (2019) and Faheem and Siddiqui (2019), e-sourcing is positively connected with the supply chain process for the firms; it helps organisations to identify, evaluate and select new suppliers online, in turn, improve supply chain performance via reduce costs, improve responsiveness to buyers demand, avoid mistakes in the supply chain procurement process and added value in supply chain management, enabling development of new product/services. Therefore, e-sourcing increases supply chain efficiency and better information management; that enhance the relationships between the buyers and suppliers (Kimutai and Ismael, 2016; Kingori, 2013). Consequently, we can develop the fifth hypothesis of our study as follows:

Hypothesis 5 There is a positive relationship between e-sourcing and building buyer-supplier relationship in Jordanian pharmaceutical industry.

### *2.3.6 E-informing and SCRs*

E-informing defined as "an approach to collecting information regarding purchases to buyers as well suppliers using web-based technology" [Tiwari et al., (2019), p.2]. Other scholars see it as a type of enterprise resource planning (ERP) for gathering and distributing buying information both from two parties, using the internet technology (Oteki, 2019).

Many researchers discussed the subject of e-informing system and buyer-supplier relationship, Smith et al. (2020) and Kochan et al. (2018) revealed that exchange and share information electronically between buyer and supplier have an impact on SCRs by better matching supply with demand and supplier capacity, therefore, affect the supply chain contracts. In addition, exchange information related to demand, forecast, new product electronically, enhance the benefit such as supply chain integration, flow, and speed information, however, lead to improve long-term relationship (Lotfi et al., 2013; Hsu et al., 2008). Consequently, we can develop the sixth hypothesis of our study as follows:

Hypothesis 6 There is a positive relationship between e-informing and building buyer-supplier relationship in Jordanian pharmaceutical industry.

## 3 Methodology

The adopted deductive methodology in this study involved steps of the research design process. These included sample and procedure, research instrument, measurements, and results of statistical analysis. All these steps are discussed in turn in the following sections.

### *3.1 Population and sample*

According to Jordanian Association of Pharmaceutical Manufacturers (JAPM, 2020), the total numbers of registered and active companies are 305 companies. Convenience sampling technique is considered in the current research in which companies are sampled simply because they are convenient (Etikan et al., 2016), resulted in collected data from 171 companies.

### *3.2 Data collection procedure*

Questionnaire (see Appendix) method is adopted to collect the required data. Questionnaire considered as best way to collect standard answers with low cost comparing to interviews (phone calls, face-to-face) (Saris and Gallhofer, 2014). Questionnaire was distributed online to the study sample, and it contained 39 relevant questions that could lead to the collection of adequate and relevant data.

### *3.3 Instrument development and measures*

The questionnaire is composed three parts: the demographic profile for research sample (see Table 1), e-procurement dimensions including e-tendering, e-ordering, e-invoicing, e-auction, e-sourcing and e-informing, and buyer-supplier relationship as dependent variable.

**Table 1** Demographic characteristics

| *Demographic characteristic* | *Category* | *Frequency* | *Percentage* |
|---|---|---|---|
| Gender | Male | 107 | 62.6% |
| | Female | 64 | 37.4% |
| Experiences in current job | 1–5 years | 37 | 21.6% |
| | 6–10 years | 49 | 28.7% |
| | 11–15 years | 61 | 35.7% |
| | 16–20 years | 16 | 9.4% |
| | 21 years or more | 8 | 4.7% |
| Job Area | Supply chain | 32 | 18.7% |
| | Purchasing | 41 | 24% |
| | Logistics | 24 | 14% |
| | Operations | 18 | 10.5% |
| | Sales | 56 | 32.7% |
| Job title | CEO | 3 | 1.8% |
| | Manager | 7 | 4.1% |
| | Manger assistant | 13 | 7.6% |
| | Head of department | 22 | 12.9% |
| | Supervisor | 46 | 26.9% |
| | Employee | 80 | 46.8% |
| Total | | 171 | 10% |

As shown in Figure 1, the constructs in our conceptual framework were derived and adapted from previously verified measuring instruments. For questionnaire development, we first adopted survey measurement items validated by previous studies. Questionnaire was translated into Arabic and reviewed by four academics from Jordanian universities to ensure that the items of the questionnaire are related to the topic of the research and obvious for the respondent, and has a reasonable translation (Al-Ma'aitah, 2018).

The final version of the questionnaire contained 39 items representing and measuring the seven main constructs of the study, five items and four items were adopted from Oteki (2019), to measure e-tendering and e-ordering, respectively. Five items were adopted from Hong et al. (2018) to measure e-invoicing, four items were adopted from Tiwari et al. (2019) to measure e-auction, five items were measured e-sourcing (Masheti, 2016), six items were used to measure e-informing (Nancy, 2017), and ten items were adopted to measure the dependent variable buyer-supplier relationship (Mpinganjira et al., 2013; Nyaga et al., 2010).

A five-point Likert scale (where 1 indicates 'strongly disagree' and a score of 5 'strongly agree') was used to measure the relationship between e-procurement dimensions and buyer-supplier relationship. The hypothesised model (Figure 1) was tested using Smart PLS 3 software (Hair et al., 2017). The completed questionnaires were used to test the construct's reliability and validity as well as the research hypotheses.

## 4 Data analysis and results

Validity and reliability analysis for research instrument were measured. In line with Hair et al. (2017), these were conducted by applying Cronbach's alpha, composite reliability (CR) and average variance extracted (AVE). Accordingly, all indices reveal the good reliability and validity of the constructs and exceed the cut-off values (CR > 0.60, alpha > 0.60, AVE > 0.50). Table 2 summarises these findings.

**Table 2** Scale validity and reliability

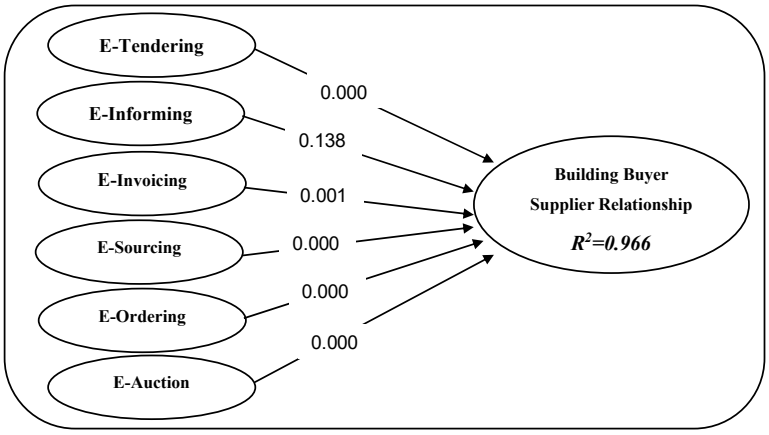
| *Constructs* | *Alpha Cronbach's* | *Composite reliability (CR)* | *AVE* |
|---|---|---|---|
| E-tendering | 0.850 | 0.898 | 0.689 |
| E-ordering | 0.571 | 0.772 | 0.592 |
| E-invoicing | 0.854 | 0.897 | 0.638 |
| E-auction | 0.921 | 0.944 | 0.809 |
| E-sourcing | 0.876 | 0.910 | 0.669 |
| E-informing | 0.885 | 0.913 | 0.637 |
| Building buyer-supplier relationship | 0.601 | 0.932 | 0.606 |

The SEM (see Figure 2) was assessed by checking path coefficients and the $R^2$ values. More so, both direct and indirect effects were evaluated to ensure that the mediation effect was checked following the Zhao et al. (2010) recommendations.

As represented in Figure 2, the values of $R^2$ of the research variable e-procurement practices and building buyer-supplier relationship was 0.96, which advocates that the model provides a proper explanation, and its predictive power is meaningful.

Furthermore, $H_1$ predicted that e-tendering is positively and directly associated with the building buyer-supplier relationship. This hypothesis is accepted as the path between these constructs is supported and significant at $p < 0.01$, and $\beta = 0.271$, $t = 3.833$. In addition, $H_2$, $H_3$, $H_4$ and $H_5$ predicted e-ordering, e-invoicing, e-auction and e-sourcing, respectively are positively and directly associated with the building buyer-supplier relationship, respectively. These hypotheses are accepted as the path between these constructs is supported and significant at $p < 0.01$. $H_6$ predicted that the relationship between e-informing and building buyer-supplier relationship was rejected as $p > 0.05$, and $\beta = 0081$, $t = 1.485$.

**Figure 2** Path model with P values




## 5 Discussion

The aim of this research is to examine how e-procurement affects the development of buyer-supplier relationships within the pharmaceutical industry in Jordan. Most of the research hypotheses were supported by the findings. The study found that e-tendering has a positive impact on building buyer-supplier relationships through performance and information sharing, which supports Hypothesis 1. Specifically, e-tendering enhances the effectiveness and performance of supply chain processes by reducing tender processing time and allowing buyers to make requests from anywhere, at any time, regardless of supplier location. These findings are consistent with previous research (Oteki, 2019; Ngeno and Kinoti, 2017; Masheti, 2016) and result in a positive impact on buyer-supplier relationships by promoting collaboration and improving teamwork between organisations, as well as responding more quickly to changing trends and buyer needs within the supply chain, which are also supported by previous literature (Adebanjo et al., 2019; Rajagopal et al., 2009; Li and Lin, 2006; Ulaga and Eggert, 2006).

Additionally, e-tendering improves information sharing by providing more accurate information and facilitating rapid exchange of information throughout the supply chain, consistent with previous research (Wagner and Sweeney, 2011; Amit and Zott, 2001). This leads to a positive impact on building buyer-supplier relationships by strengthening

the connections between supply chain members and reducing dysfunctional conflicts, which is also supported by previous literature (Cheng, 2011).

The results of this study support $H_2$, which states that e-ordering has a positive impact on building buyer-supplier relationships. Specifically, the findings indicate that e-ordering improves buyer satisfaction by reducing order processing time, ensuring that products or services meet buyer expectations, monitoring order due dates, and minimising human errors in the order process. These results are consistent with previous literature (Ganapathi and Abu-Shanab, 2020; MacKenzie-Shalders et al., 2020; Hu and Chen, 2018; Thirumalai and Sinha, 2005) and contribute to enhancing communication, coordination, and continuity between buyers and suppliers, as described in previous literature (Mbango and Phiri, 2015; Mpinganjira et al., 2013).

In respect of the third hypothesis, the results show a positive impact of e-invoicing on building buyer-supplier relationship which support $H_3$. The study results showed that e-invoicing positively affects building buyer-supplier relationship by improving the information exchange and the operational connection between them, smoothing the interaction process, providing faster invoice processing, supports contract negotiating, and offers better visibility into payment which are consistent with the literature (Cory, 2020; Penttinen and Rinta-Kahila, 2017; Pereira, 2017; Ali, 2016; Barngetuny and Kimutai, 2015; Penttinen et al., 2010).

In respect of $H_4$, the results supported the positive impact of e-auction on building buyer-supplier relationship. The study results showed that e-auction positively affects the trust by creation more competitive environment, enhance the procedures and potentials to bring more financial advantages, and improve the price reductions, which are consistent with the literature (Hanák, 2018; Gregg and Walczak, 2010; Carter et al., 2004). That will lead to positive impact on building buyer-supplier relationship by providing collaboration, commitment and communication between the buyer and supplier, which are consistent with the literature (He et al., 2017; Lösch and Lambert, 2007). While the study results are not consistent with the literature (Tunca et al., 2014; Wolf and Muhanna, 2011; Charki and Josserand, 2008) that see e-auction negatively affect the buyer-supplier relationship when supplier understand feedback information in biased, delivery of lower quality products/services, rumours and technical problems.

While the study result of $H_5$ is not consistent with the literature (Bartezzaghi and Ronchi, 2005), that see e-sourcing negatively affects buyer-supplier relationship that revealed in the risk of reduction in quality and the excessive reduction in margins which influence in the termination of consolidated B2B relationships. The results of the analysis supported $H_5$, and showed that e-sourcing positively affects building buyer-supplier relationship by improving the procurement effectiveness, providing the ability to monitor and choose potential suppliers, better interaction between buyer and supplier, reduce procurement costs, improve responsiveness to buyers demand, reinforce the commitment and avoid mistakes in the supply chain procurement process, which is consistent with the literature (Tiwari et al., 2019; Faheem and Siddiqui, 2019; Kimutai and Ismael, 2016; Kamarulzaman and Eglese, 2015).

Finally, the analysis of quantitative data revealed that e-informing ($H_6$) was not supported as seen in Table 3. The common assumption was that e-informing has a positive impact on supplier-buyer relationship (Smith et al., 2020; Kochan et al., 2018) but that was not the case with the results of the current study which is consistent with Mafini et al. (2020) where many companies could exchange their information with the suppliers but not all of them, in particular, small and medium sized companies (SMEs).

In addition, sharing information is not easy to do in developing country context due to the way of building trust level between exchange partners, as cultural values play a significant role in it (Al-Ma'aitah, 2014). Also, this study was conducted in a period when pharmaceutical industries sectors around the world are witnessing an increase and pressure at work than the usual because of the COVID-19 pandemic including Jordan. Therefore, the study found that the companies which working in field of pharmaceutical industries tended to increase the uses and implements e-procurement applications to reduce the traditional transactions in buying and selling to accelerate product ordering with no choice to investigate social side of SCRs by sharing more information with exchange partners.

**Table 3** Hypotheses results

| *H* | *Path* | *β* | *SE* | *t-value* | *P-value* | *Decision* |
|---|---|---|---|---|---|---|
| $H_1$ | E-tendering-SCR | 0.271 | 0.071 | 3.833 | 0.000 | Accept |
| $H_2$ | E-ordering-SCR | 0.230 | 0.049 | 4.656 | 0.000 | Accept |
| $H_3$ | E-invoicing-SCR | 0.105 | 0.031 | 3.370 | 0.001 | Accept |
| $H_4$ | E-auction-SCR | 0.229 | 0.038 | 6.027 | 0.000 | Accept |
| $H_5$ | E-sourcing-SCR | 0.173 | 0.030 | 5.792 | 0.000 | Accept |
| $H_6$ | E-informing-SCR | 0.081 | 0.054 | 1.485 | 0.138 | Reject |

## 6 Conclusions

This study aimed to examine how e-procurement (including e-tendering, e-ordering, e-invoicing, e-auction, e-sourcing and e-informing) impacts buyer-supplier relationships in the pharmaceutical industry sector of Jordan. The results indicated that five out of six e-procurement applications had a positive impact on buyer-supplier relationships, resulting in numerous benefits such as increased company and supply chain effectiveness, reduced effort, cost, and time, and faster commercial and financial transactions. E-procurement also facilitated continuous updates about product or service information between companies, accelerated shipment and delivery processes, and reduced errors compared to traditional procurement methods. These advantages ultimately led to increased trust, collaboration, satisfaction, communication, and commitment, and better information sharing among supply chain parties, positively impacting buyer-supplier relationships.

### *6.1 Theoretical and practical implications*

This study develops the current knowledge and enriches the existing related literature about the impact of e-procurement on building buyer-supplier relationship in developing countries. In addition, insufficient Jordanian studies that handle the impact of any applications of e-procurement on building buyer-supplier relationship. Moreover, while the results of this study provide a clear picture for the companies that work in pharmaceutical industry in Jordan how e-procurement affects in building buyer-supplier relationship, it helps the decisions makers in the companies that work in pharmaceutical industry to decide the adoption of the application of e-procurement that can affect the

relationship of their company with other companies. In addition, this study helps the companies' leaders to improve the companies' competitiveness in general and supply chain effectiveness in particular with e-procurement system.

### *6.2 Limitations and future research*

Our research findings are limited by several factors, which suggest potential areas for future studies. Firstly, this study only examined the impact of six specific applications of e-procurement (e-tendering, e-ordering, e-invoicing, e-auction, e-sourcing and e-informing) on building buyer-supplier relationships. Therefore, future research should explore the impact of other applications, including e-catalogue, e-quotations, e-communication, and ERP on building buyer-supplier relationships to provide a more comprehensive understanding. Secondly, this study only focused on the direct relationship between e-procurement and buyer-supplier relationships. Future studies could consider adding mediating variables such as trust, commitment, performance, information sharing, and satisfaction, or moderator variables such as firm size and national culture to enhance the model. Thirdly, this study solely used a quantitative approach to investigate the impact of e-procurement on building buyer-supplier relationships. Future research could consider adopting a mixed methodology, combining numerical results with interviews to provide a better understanding of the findings. Fourthly, this study only surveyed companies within the pharmaceutical industry sector in Jordan, which may limit the generalisability of the results. Future studies could be conducted in other industries such as mining and metal industry, food industry and energy industry. Fifthly, the data collection in this study was limited to buyers only. Future studies could consider using paired data (buyer and supplier) to gain a more holistic understanding of the impact of e-procurement on building buyer-supplier relationships.

In summary, our study findings suggest potential directions for future research to expand upon our understanding of the impact of e-procurement on building buyer-supplier relationships, and to provide a more comprehensive view.

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## Appendix

| | |
|---|---|
| *E-tendering* | |
| 1 | Our suppliers are able to access e-tenders anytime and anywhere. |
| 2 | E-tendering provides fairness to all suppliers regardless of geographic location. |
| 3 | E-tendering improves our company relations with channel partners. |
| 4 | E-tendering improves effectiveness of supply chain processes in our company. |
| 5 | E-tendering provides quick information sharing between suppliers and our company. |
| *E-ordering* | |
| 6 | E-ordering reduces order processing time for our company. |
| 7 | E-ordering reduces human errors in our company. |
| 8 | E-ordering assists in monitoring order due dates. |
| 9 | E-ordering increases the satisfaction between our company and suppliers. |
| *E-invoicing* | |
| 10 | E-invoicing insures updated contact information between our company and suppliers. |
| 11 | E-invoicing offers effective monitoring into payment status. |
| 12 | E-invoicing supports contract negotiations between our company and supplier. |
| 13 | E-invoicing provides faster invoice processing and real time data analytics for suppliers. |
| 14 | E-invoicing helps our company to long-term supplier relationships |
| *E-auction* | |
| 15 | E-auction improves the transaction price |
| 16 | E-auction enables trust, flexible, fair and beneficial relationships for all parts. |
| 17 | E-auction has led to real-time trading online. |
| 18 | E-auction improves competitiveness of our company. |

## Appendix (continued)

| | |
|---|---|
| *E-sourcing* | |
| 19 | E-sourcing reduces costs and improves efficiency in procurement process in our company. |
| 20 | E-sourcing provides online unified platform to work together |
| 21 | E-sourcing distinguishes our relationship with supplier by commitment. |
| 22 | E-sourcing cooperates with supplier in terms of forecasting and delivery planning. |
| 23 | E-sourcing improves transparency between our company and suppliers. |
| *E-informing* | |
| 24 | Our company electronically shares information about pricing, and any other information. |
| 25 | Our company electronically consults references for product/service quality. |
| 26 | Our company negotiates the general procedures for purchasing with the supplier through the internet. |
| 27 | Our company selects the most appropriate supplier through the information system. |
| 28 | E-informing facilitates the ability to seek assistance. |
| 29 | Our company electronically gathers information for supplier's experiences. |
| *Building buyer-supplier relationship* | |
| 30 | Our company works jointly with supplier on issues that affect both companies. |
| 31 | The relationship between supplier and our company is satisfying. |
| 32 | Our company relationship with supplier is cooperative. |
| 33 | There is a level of trust between supplier and our company. |
| 34 | Our processes and/or procedures are coordinated with supplier. |
| 35 | We would like to continue our work with particular suppliers. |
| 36 | We expect to continue our relationship with supplier for a long time. |
| 37 | Information is mutually shared by supplier and our company. |
| 38 | There is a continuous an improvement in the relationship between supplier and our company. |
| 39 | Our company works jointly with supplier on issues that affect both firms. |