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Quality Requirements of Electronic Procurement System for Enhancing its User Experiences (UX)

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***Abstract*—Presently, electronic (e-) procurement system is crucial for buying and selling supplies, and services between the government and individuals over the online environment. E-procurement is one of the Business to Consumer (B2C) applications that has the benefits of reducing transaction costs and supplier's payment with increased information quality and accuracy of system. Nonetheless, users are still facing difficulties in using the e-procurement system thus causing them to feel dissatisfied. Moreover, studies related to user experience (UX) and e-procurement systems are also lacking in terms of UX interaction with this system. Users also face the problems such as lack of transparency and efficiency, corruption, and complicated procedures. There are other barriers faced by them such as prejudice, resource constraints and lack of experience. Therefore, this study aims to identify quality requirements of the e-procurement system which enhance their user experiences. This study uses a qualitative method (open-ended interviews) for data collection. The selection of the participants was done through purposive sampling and analyzed using a qualitative data analysis tool. The results revealed from interviews, that there are seven quality requirements that are important namely, effectiveness, efficiency, satisfaction, security, user interface aesthetics, ease of use and learnability. This study will be useful for system developers, and designers to put emphasis on these quality requirements for better user experience in enhancements of e-procurement in the future.**

***Keywords*— User experience; UX; quality requirement; e-procurement.**

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I. INTRODUCTION

An electronic procurement (e-procurement) system is a Business to Consumer (B2C) application that relates to the process of transacting products and services directly between the government and individuals by which business processes are linked with internet protocol and information technology (IT) [1]. E-procurement system allows government agencies and suppliers to conduct business transactions, such as acquiring products and services through an online environment [2]. The term e-procurement relates to the utilization of business processes between electronic communications of buyers and sellers. E-procurement has been designated as a priority and a major function of electronic governance, but users tend to regard the current system of dealing with complex procurement activities as unsatisfactory [3]. The use of e-procurement system is very important nowadays because of its beneficial impact on the productivity of organizations and individuals [4]. There are many benefits for the organizations involved, such as increased accuracy and quality of information, reduced transaction errors, payment of suppliers, and cost for purchasing [5]. However, despite all these advantages, there are still some problems faced by the users; the most common one is that suppliers believe using the e-procurement system is ineffective in promoting their products or services. Due to this reason, suppliers are not keen to use the system, and this scenario has hindered the achievement of the government's procurement objective while achieving value for money [6].

The government has invested a lot of time and energy in reform efforts to increase efficiency and increase people's satisfaction with the services provided by government agencies [7]. However, the adoption rate of users using the e-procurement system, which includes large companies and Small and Medium Enterprises (SMEs), is quite disappointing, and the system implementation is also considered unsuccessful because of certain risks [8]. This is due to users' dissatisfaction because of the difficulty in understanding the information contained, decreases in the use [9], and the users felt compelled to use the system as it is a mandated environment by the government [4]. Thus, the user experience

(UX) of the e-procurement system needs to be investigated. This will include the user's quality requirements to improve their experiences when interacting with the system in the future. The quality requirement is defined as the conditions or specifications of the quality of products, services, or processes [10]. Some research has been conducted on UX for government systems [5], [11]. However, there is still a lack of studies regarding user experience when interacting with e-procurement systems [12].

User experience (UX) can be defined as all forms of users' engagement with the services and products of the organization. Parts of the word "user experience" have now been codified by the International Organization for Standardization (ISO) which relate to "the use" and "the anticipated use" of a system [13]. The term UX is the result of a user's internal state (expectations, needs, motivation, mood, and so on), the designed system's characteristics, and the context (or environment) in which the interaction takes place [13]. In addition, UX is dynamic and relates with a user's emotional condition and how the user interacts with the product, system or services. While Biduski et al. [14] define UX as all aspects that are related to end-user interaction with a product or service. Thus, UX refers to the process of reviewing one's experience before, during and after using a product, system, or service [13] and is related to positive or negative emotions users feel in a specific context [15].

The attention to user experience determines the success of products, services, websites, and software, but the empirical research on user experience is still too little. When it comes to consumer loyalty and perceptions of digital products, a great user experience approach is very vital for organizations or businesses [13]. It has been reported in the literature that some users have difficulty using e-procurement because they are dissatisfied with the system [4], [16], and they have issues such as system availability and system complexity [3], [4]. This is most likely due to the fact that the public sector's e-procurement implementation is still in its infancy. The procurement system is difficult to work with since it is important to transition from paper-based to electronic systems. Organizations that have overcome these obstacles can gain control over and facilitate the indirect procurement of products and services. However, being a new trend, e-procurement continues to face a variety of linked issues, such as a lack of interoperability, privacy, information source, and transparency [1], [12].

Despite the fact that e-procurement technology is now compulsory in many organizations or industries, individual acceptance is sometimes difficult to force, and disgruntled users will find ways to avoid using the system. Although there is a lack of published articles on users' experience with e-procurement that the authors have identified, it can be concluded from the existing studies that users' experience with e-procurement from various perspectives by companies is still insufficient [17]. In the work by Deraman et al. [18], it is mentioned that e-procurement is one of the initiatives by the government to meet enterprise objectives, but they fail to generate quantifiable benefits. The reported failure percentage of e-procurement (75–85%) has led researchers to investigate the quality requirements of e-procurement to enhance positive user experience. From the start of utilizing the e-procurement system until they are adept, the user experience may be difficult.

Past studies on e-procurement have investigated various aspects, including issues on public procurement. Various studies have highlighted e-procurement problems such as lack of transparency and efficiency, corruption, and complicated procedures that lead to the waste of resources of government [19]. Other pertinent issues include transparency of the procurement process [20], accountability, corruption, and integrity in e-procurement [20], [21]. Besides, Deraman et al. [18] stated that one of the major problems among e-procurement users is the lack of understanding of the system's success factors, which causes the failure of e-procurement implementation. On the other hand, there are also barriers faced by e-procurement users, especially SME users, such as prejudice, resource constraints, and lack of experience [21]. Therefore, according to Mélon and Spruk [5], if e-procurement is not implemented well, then the level of quality of an organization will be poor. Despite several studies that have been carried out on public procurement issues, there are still gaps that need to be explored in terms of important quality requirements of an e-procurement system. Based on the previous studies on e-procurement issues, it is undeniable that the quality requirements for e-procurement systems need to be studied and refined as they play an important role in reducing the impact of problems in public procurement activities.

Therefore, this study aims to identify the quality requirements of the system that system developers and designers need to improve user experience when interacting with the system. These quality requirements also will be helpful for researchers in the UX and e-procurement field within the discipline of business and experiences by identifying the system's specifications or services [10]. The findings will help them (system developers and designers) identify quality requirements that are needed for an e-procurement system to enhance the positive user experience. This paper is organized as follows, the materials and method, results and discussion, and conclusion.

II. Materials and Method

A qualitative method was used to understand user experiences using the e-procurement system. The qualitative approach was adopted because it allows a flexible exploration of informants' experiences and attitudes, which allows richness of data because the researchers can gain a deeper understanding of the phenomena. In this section, the design and implementation of the interviews are described, including the characteristics of the participants. Firstly, the purpose of the interview study was to understand the users' experience when interacting with the e-procurement system (*ePerolehan*). The study collected data through open-ended interview questions with the e-procurement users. The study looked for e-procurement users with years of experience, current role(s) in their companies, and related experiences as suppliers for the government sector to create a level of heterogeneity [22]. Four participants were recruited and interviewed, and the resulting data were analyzed to identify the quality requirements of the e-procurement system, which represent the dimension of UX. The instrument used was eight open-ended questions. The questions were as follows:

- What is the main purpose of you using the e-procurement system?
- What are the modules that you use in the e-procurement system?
- What are the difficulties that you face while using the system? Which processes are the most complex?
- If you have a problem in using the system, who can you contact or refer to?
- Do you refer to any user manual or website in assisting you to learn or use the system?
- Have you ever felt frustrated when using the system?
- Do the e-procurement system interface and functionalities of the system satisfy your needs?
- What dimensions or criteria should the e-procurement system have for the user to be satisfied?

The participants were selected through purposive sampling to gather information on the participants' experience [23]. The ideal number for qualitative participants is in the range of three to ten people, depending on the depth of the study [24]. Thus, several participants recruited in this study were both novice and experienced users who have been using e-procurement systems to investigate their experiences openly about the system and its requirements.

A. Characteristics of Participants

Four participants, two males and two females, designated as P1, P2, P3, and P4, were recruited by the researchers via personal invitation, and their participation was voluntary. Three of them were suppliers, while the other one was a government staff who used the system on a daily basis. The participants have experiences from 2 to 13 years. The demographic of the participants is shown in Table I.

TABLE I
DEMOGRAPHIC OF THE PARTICIPANTS

Participant No	Gender	Role (User Type)	Years of Experience
P1	Male	Supplier	8
P2	Male	Supplier	2
P3	Female	Supplier	2
P4	Female	Government sector	13

B. The Procedure of Data Collection and Analysis

The interviews were conducted individually by the researchers in Malay to avoid misunderstandings of the questions and translation later. The interview session was conducted personally by the researchers face-to-face. All interviews were conducted at venues conducive for the participants, i.e., at their companies or organizations. The interview session focused on knowledge and experiences of using the e-procurement system and the requirements for the system. All the interviews were audio recorded and transcribed subsequently. The researchers also took notes while interviewing to confirm with the audio recording. The researchers analyzed all the transcripts for relevant contents and themes using qualitative data analysis software. The findings from the interview session were analyzed with thematic analysis. Thematic analysis is one of the powerful and appropriate analysis methods suitable for understanding experiences, thoughts, or behaviors across a data set [25]. Themes are actively built patterns (or meanings) derived from a data set that address research questions rather than only summaries or categorization of the codes [25]. From the interviews' analyses, data saturation was obtained after four interviews, with no new theme arising in the last interview.

III. RESULTS AND DISCUSSION

The study applied thematic analysis to develop coding schemes for participants' interview questions. Thematic analysis of the interviews identified seven themes: namely effectiveness, efficiency, satisfaction, security, user interface aesthetics, ease of use, and learnability, as shown in Fig. 1. These themes are the quality requirements for the e-procurement system, and it has also represented the dimensions of UX.

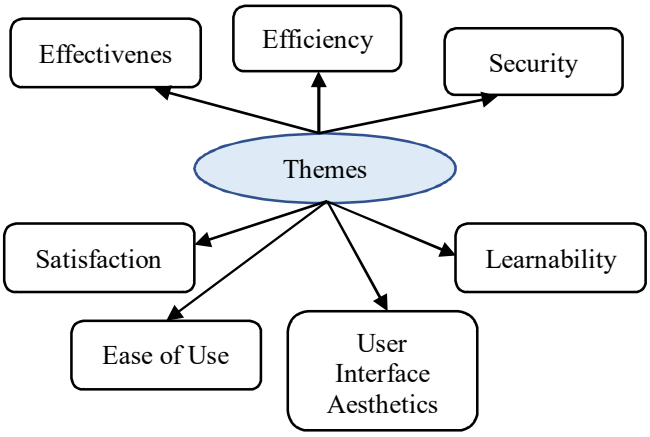

Fig. 1 Seven Themes Related to E-procurement System from Interview

The first theme is efficiency, according to the standards for efficiency, which can be defined as "*resources expended in relation to the results achieved*" [26]. According to Sagirani et al. [27], efficiency is how quickly users' can complete tasks in the product, system, or services. The findings revealed that e-procurement users experienced a low efficiency of the system. For example, the process of uploading procurement files and the payment process took a long time. The issues of the system taking a long time to upload procurement files and completing the payment process render the system inefficient can cause the users dissatisfaction. Among such statements are:

"The process of uploading files takes time" (P2)

"Inconsistent payment received process (sometimes takes time)" (P3)

This result is similar to a study by Yıldırım and Bostancı [28], which stated that users are not satisfied when the efficiency of a government portal or system is lacking. If the users take a long time to complete tasks, this makes them feel uneasy and distracted while using the system. The result shows that the system's efficiency is crucial because it will influence the users' job productivity since it relates to the time spent by the users in overtime hours. In addition, efficiency is one of the indicators that impact the adoption of e-procurement by the user in terms of cost [1]. Therefore, the efficiency of the system is how long the time is taken until task completion or achieved and whether users feel pleasant using the system during overtime hours. This finding shows

that the system's efficiency is an important concern in any development phase because users need to achieve their objectives over time and be satisfied when interacting with the system.

The second theme from the findings is effectiveness. The standards for effectiveness can be defined as "*the accuracy and completeness with which users achieve specified goals*" [26]. The effectiveness of a system is crucial because it's one indicator that influences the user to adopt the e-procurement system and use it successfully. The finding of the interview revealed that the e-procurement users experienced troublesome item codes when searching for products or services in the system because there were too many item codes that they needed to search for one by one. Moreover, the search process was also difficult and complicated. The users mentioned that they need a simpler system for them to use. For example, is in this quote:

"Item code searching is a bit troublesome because there are too many item codes" (P1)

"Need to search one by one (the item codes)" (P1)

"There are various codes that are hard to search" (P2)

"Complicated to find. Simplify if possible" (P4)

The participants also experienced situations whereby the system froze when too many users were using the system simultaneously. Due to these scenarios, users failed to complete their tasks, and the objective of using the system was not achieved, thus making the system ineffective. The statements are:

"Sometimes system is stuck (frozen)" (P1)

"The system will get stuck when many people use the system at one time" (P2)

"System should not have stuck (frozen)" (P4)

Thus, the findings found that the e-procurement users experienced difficulty with the system in terms of item code searching for products or services, and the system froze when a number of users simultaneously used the system. These situations show that the system is ineffective to the user because the system is complex, and they cannot complete their tasks effectively. This view is supported by Yıldırım and Bostancı [28] study, which claimed that easy searching options are important to identify the service categorizations and classification as its critical for the system. Therefore, the effectiveness relates to the well-functioning of the system, and the success of task completion, and is useful to the users. In addition, the system's effectiveness could help the users in terms of better resource utilization, organized information, and visibility of customer demands [1].

The third theme from the findings is satisfaction. Satisfaction is the level of fulfillment of one's needs, wants, and desires, and users can accomplish specific tasks with pleasantness, attractiveness, likeability, and trustworthiness [29]. Satisfaction can also relate to users' effect with (feelings about) prior to e-procurement use [4], including the users' needs in terms of usefulness and ease of use. The findings revealed that the participants were satisfied with the e-procurement system because they could view all the incoming tenders. The system also displays all bidders who successfully win a contract from the government. However, several participants feel dissatisfied because they did not know how to use the system at the initial stage of use because there were a lot of modules in the system. This situation shows that the users were not satisfied at the early usage and the system gave them an unpleasant experience. Among such statements are:

"Satisfied because I can see all the incoming tenders and the history is quite clear" (P2)

"Dissatisfaction because I don't know how to use the system at the early usage" (P4)

The finding also shows that e-procurement users feel satisfied and dissatisfied rather than frustrated when interacting with the e-procurement system. This view is supported by Sunmola and Shehu [30], who wrote that users are satisfied if they can achieve their goals and feel dissatisfied User satisfaction is the sum of the user's experiences with technology over time. Thus, it will pique the user's interest in using a system [31]. The result is similar to Atmaja and Sfenrianto [9] study, where the users are satisfied when the system meets their needs in completing the tasks. In mandatory use systems, user satisfaction is considered an indicator or success metric. Areas of the system that influence overall user satisfaction include architecture, navigation, and system's ability to meet user expectations. Therefore, satisfaction with the system is when the users feel pleasant and satisfied with the service that is offered. In this study, user satisfaction is demonstrated if the users can see all the incoming tenders and can easily use the system early in usage. Moreover, they can feel pleasant and satisfied when interacting with the system when their objectives are fulfilled.

The fourth theme is security, which refers to how the system can protect the information and data so that users can access the system appropriately using the types and authorization levels [32]. The participants experienced a secure e-procurement system where passwords are required for the login and during the submission of contract applications such as quotations or tenders, and the system can only be accessed by an authorized person who is registered with the system. In this study, the elements for security was password-protected logins, secure transaction during contract solicitation and submission, and protection from unauthorized users. The results of this study indicate that the security characteristic of the system is significant because the e-procurement system is safe from unauthorized users to ensure confidentiality of the system and could build users' trust while using the system for business transactions between customers and buyers. Among such statements are:

"System has privacy and security with password protection" (P1)

"It is important to have security with password protection" (P4)

"Security control on the contract module is for one person only" (P4)

A similar result was found in the study by Belisari, Binci, and Appolloni [33], which declared that trust and transparency enable the sharing of needs between the customer and provider sides. Moreover, transparency and accountability of the system can assist in procuring better quality products and services as mentioned by Ahmad, Aljafari, and Venkatesh [11]. This finding also supports the

study by Palaco et al [34], whereby security in the system is essential to ensure the reliability and robustness of technical systems. Therefore, users will trust the e-procurement system if it has security characteristics, which include confidentiality, privacy, transparency, and accountability. The most important element in the e-procurement system is that it should focus on security as an alternative secured option [28].

The fifth theme is user interface aesthetics. Aesthetics refers to the sensory experience that a product or system provides and how well that experience aligns with particular visuals, such as simple, clean, and orderly design [35]. While user interface aesthetics can be defined as the degree to which the user interface allows for pleasant and satisfying interaction with the user [32]. The findings showed that the e-procurement system has unpleasant interfaces where the search item code that displayed products or services did not have page divisions to make it easy for users to view. Issues related to information position, such as announcements and the position of the previous and back buttons, were difficult to find. Sometimes, the participants did not know how to click the search button in the e-procurement modules due to the complex interfaces. Thus, the findings revealed that the user interface of the e-procurement system needs additional improvements, such as page divisions for information search and easy position of buttons that are not difficult to find. Thus, the system should enable the users as learners to navigate from one page to another with easy [36]. Among such statements are:

"Need a sub or division for item code searching in e-catalogue" (P1)

"The positioning of the offer announcement button in the system" (P1)

"Sometimes cannot find the previous and back button" (P2)

"Don't know the search button for audit" (P4)

This finding also indicates that the e-procurement interface is difficult to navigate and has a complicated structure, especially for novice users, thus causing certain tasks to take longer to be completed. This view is supported by Mauri et al. [37], who mentioned that system navigation is important to complete a task in the time provided. The study's findings also align with Al-Hunaiyyan et al. [38], whereby consistency in interface design keeps the system's menus and commands orderly and easy to use; inconsistencies can cause systems to become confused. However, user interface aesthetics in terms of navigation have not ceased to be an important characteristic of user experience, especially in complex and regulated environments such as e-procurement systems [39]. Therefore, in this study, the elements regarding interfaces and navigation are easy-to-identify positions of buttons, and ease of navigation can be considered for future improvement in order to make the system friendlier for users to use the system.

The sixth theme from the findings is the ease of use. Ease of use can be defined as easy to use a function or easy-to-obtain information [40]. There are many sub-modules in the e-procurement system, such as quotation, tender, and payment management. The participants mentioned that the modules and sub-modules must be simple. However, some modules in the system may be important and cannot be removed or reduced because every procurement procedure needs to be known by the user to submit their application online. Thus, the system's complexity cannot be reduced but only transformed in another way [41]. Moreover, the interview findings revealed that e-procurement users need an easy-to-use system and an easy submission process that is not complex and can give them a pleasant experience. Among such statements are:

"Need an easier system" (P1)

"Require an easy submission process in the system" (P2)

Based on the findings, it can be concluded that the participants felt that there were too many modules and sub-modules in the e-procurement system. They required a simpler system that is easy to use. [3] argues that the complexity of a product or a system should be reduced to avoid users spending much time using it. However, the system's complexity cannot be reduced because each system is developed with its functions and purposes due to the technology [42]. For example, is in this quote:

"Many sub-modules in quotation and tender" (P1)

"Simplify the modules" (P2)

"Many sub-modules for payment management" (P4)

These findings align with the study by Biduski et al. [14] where the user demands a product or service which is easy to use to avoid them from feeling frustrated and stop using it. User satisfaction is important to determine the success of an e-procurement system [9]. Similarly, Ibem et al. [17] mentioned that users' experience with e-procurement is influenced by the ease of use of the technology. [3] reiterates that when procurements become increasingly complex, local governments are less likely to rely on the technology support associated with e-procurement. Therefore, when the system's complexity cannot be reduced, the users need to struggle and deal with the system on their own to achieve their goals [41]. In this study, the important quality requirements for the system's ease of use are when the users can submit their applications with much ease, and it is easy to see the modules displayed in the system interface thoroughly and consistently. Ease of system use can be considered an important dimension for future system development. Other than that, the ease-of-use dimension should be of concern in any system or web application development to attract users.

The seventh theme from the findings is learnability. According to the standards for learnability, can be defined as "*the degree to which the system used by the users to achieve goals of learning and they are satisfied to use it*" [32]. Learnability is the level of ease with which users become proficient in order to interact with the system. E-procurement is a new business application, especially in new companies that are starting to know the functionality of this system for use in their organizations. Based on the findings, the participants who used the e-procurement system had difficulties at early usage because they possessed little knowledge about it. The participants would ask for assistance from others because they did not have the skills required to use the system. This result shows that the users have difficulty understanding the flow and interfaces of the system and using the system, especially novice users in the early usage of the system. For example, is in this quote:

"Asking for help from others because do not have the skills" (P3)

"For new users there will be problems using the system" (P4)

"Supplier don't know how to use the system" (P4)

"Call service provider because need to know about procedures and steps in the system" (P1)

"Try to understand the system if not attending a course" (P1)

"Explore the system to learn" (P2)

The interview findings show that the participants learned and understood how to use the system independently. They preferred to call the e-procurement service provider to ask about the flow, procedures, or steps in the system should they face any problems. They struggled to understand the system's procedures as they did not attend the course organized by the e-procurement service provider because the fees charged were quite expensive for them. Nevertheless, if they continue to use the e-procurement system for some time, users will become more familiar with the system and be satisfied. This view is supported by Biduski et al. [14], which mentioned that if the product or system offers good usability and satisfactory UX, users will continue to use it overtime. Therefore, the learnability of the system relates to being easy to learn and use, especially for new users, even though it is a new interface. This characteristic can be considered in any future system development as novice users face difficulties prior to system usage. The summary of the findings in terms of quality requirements and elements are presented in Table II.

TABLE II
QUALITY REQUIREMENTS AND ELEMENTS

Quality Requirements	**Elements**
Efficiency	Shorter time taken for task completion by the users.
Effectiveness	Easy item code searching for products or services and completing the task without assistance.
Satisfaction	Displays all bidders who successfully win a contract and easy to use the system at the initial stage.
Security	Password for the login, secure submission of contract solicitation, and Safety from unauthorized users to ensure confidentiality.
User Interface Aesthetics	Page divisions for searching, and Easier to find the position of the previous and back buttons.
Ease of Use	Easy submission of quotation or tender and Easy interaction with the system.
Learnability	Easy to understand the flow and achieve the goals of learning

IV. CONCLUSION

One of the goals of implementing an electronic government policy to use an e-procurement system is to provide citizens and businesses with efficient and high-quality online services. However, e-procurement adoption is difficult since it involves numerous impediments, and adoption expenses might impede overall organizational performance [33]. Improving service quality, reducing costs, increasing productivity, strengthening data security, protecting privacy, increasing citizen participation in governance, and creating transparency through effective communication are important.

The findings in this study investigate the users' experience of using the e-procurement system. This research reveals seven quality requirements (also represent the UX dimensions) from the interview study which are important for enhancing the user experience of the e-procurement system, namely effectiveness, efficiency, satisfaction, user interface aesthetics, ease of use, and learnability. Effectiveness, efficiency, and satisfaction are among the important dimensions for any development related to a product, system, or service [43].

A user experience is considered a key quality determinant of product, system or service intended for human use, which can be considered success or failure indicators. This study found that the users of the e-procurement system are satisfied when they can view all the successful bidders who get a contract from the government and use a secure online environment, and they are not satisfied if the system gives them an unpleasant experience. The important thing is that the e-procurement system should be available at any time in order to avoid users' frustration. On the other hand, the study findings support Tesler's theory, where the complexity of the system cannot be further reduced but only transferred from one place to another [41]. Thus, they need to deal with the system by their initiative, which might cause the long time taken to complete their tasks.

The UX influences how a user perceives their interactions with systems. Some e-procurement users may be hesitant to use public online government services because of their lack of trust in the security of government web services when it comes to the use of personal or company information given electronically [2]. Besides that, users are regularly exposed to privacy and security issues, and as technology becomes more widely used, the security dangers linked with it are increasing. This indicates that users have different needs, experiences, and expectations when interacting with the government system because user satisfaction is subjective. Therefore, the quality requirements stated in this study were identified as determinants of whether users are satisfied or dissatisfied with the system used. This study is also expected to provide dimensional evidence required by system developers and designers to improve the positive user experience in using e-procurement systems for future improvement. The researchers can also refer to the study's quality requirements (or dimensions) for their future research.

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REFERENCES

[1] N. Kumar and K. K. Ganguly, "External diffusion of B2B e-procurement and firm financial performance: role of information transparency and supply chain coordination," *J. Enterp. Inf. Manag.*, vol. 34, no. 4, pp. 1037–1060, 2020.

[2] K. K. Soong, E. M. Ahmed, and K. S. Tan, "Factors influencing Malaysian small and medium enterprises adoption of electronic government procurement," *J. Public Procure.*, vol. 20, no. 1, pp. 38–61, 2020.

[3] Y. Chen, S. Bretschneider, J. M. Stritch, N. Darnall, and L. Hsueh, "E-procurement system adoption in local governments: the role of procurement complexity and organizational structure," *Public Manag. Rev.*, pp. 1–23, 2021.

[4] M. Ramkumar, T. Schoenherr, S. M. Wagner, and M. Jenamani, "Q-TAM: A quality technology acceptance model for predicting organizational buyers' continuance intentions for e-procurement services," *Int. J. Prod. Econ.*, vol. 216, no. Oktober 2019, pp. 333–348, 2019.

[5] L. Mélon and R. Spruk, "The impact of e-procurement on institutional quality," *J. Public Procure.*, vol. 20, no. 4, pp. 333–375, 2020.

[6] S. H. Abul Hassan, S. Ismail, and H. Ahmad @ Abdul Mutalib, "Public procurement in Malaysia: objectives and procurement principles," *J. Econ. Adm. Sci.*, vol. 37, no. 4, pp. 694–710, 2020.

[7] J. Yoo, K. Kim, and J. Houng, "Government Reorganization in the ICT Sector : Analysis of Multi- Level Factors from the Case of South Korea," *Int. J. Adv. Sci. Eng. Inf. Technol.*, vol. 11, no. 3, pp. 1178–1185, 2021.

[8] M. Ibrahim, "Defining the Promise of e-Procurement Diffusion among Small Medium Enterprises (SMEs) in Malaysia," in *International Conference of E-Commerce (ICoEC2020)*, Malaysia, 2020, pp. 122–130.

[9] R. A. Atmaja and Sfenrianto, "An evaluation the implementation of e-procurement application at contractor company," *J. Theor. Appl. Inf. Technol.*, vol. 99, no. 8, pp. 1902–1914, 2021.

[10] R. C. Wibawa, S. Rochimah, and R. Anggoro, "A development of quality model for online games based on ISO/IEC 25010," *Proc. 2019 Int. Conf. Inf. Commun. Technol. Syst. ICTS 2019*, pp. 215–218, 2019.

[11] T. Ahmad, R. Aljafari, and V. Venkatesh, "The Government of Jamaica's electronic procurement system: experiences and lessons learned," *Internet Res.*, vol. 29, no. 6, pp. 1571–1588, Dec. 2019.

[12] N. Yusof, N. L. Hashim, and A. Hussain, "Prior User Experience (UX) on E-procurement System Usage," in *International Conference of E-Commerce (ICoEC2020)*, Malaysia, 2020, pp. 5–16.

[13] L. Luther, V. Tiberius, and A. Brem, "User experience (UX) in business, management, and psychology: A bibliometric mapping of the current state of research," *Multimodal Technol. Interact.*, vol. 4, no. 18, pp. 1–19, 2020.

[14] D. Biduski, E. A. Bellei, J. P. M. Rodriguez, L. A. M. Zaina, and A. C. B. De Marchi, "Assessing long-term user experience on a mobile health application through an in-app embedded conversation-based questionnaire," *Comput. Human Behav.*, vol. 104, pp. 1–15, 2020.

[15] N. Yusof, N. L. Hashim, and A. Hussain, "A Conceptual User Experience Evaluation Model on Online Systems," *Int. J. Adv. Comput. Sci. Appl.*, vol. 13, no. 1, pp. 428–438, 2022.

[16] S. Nandankar and A. Sachan, "Electronic procurement adoption, usage and performance: a literature review," *J. Sci. Technol. Policy Manag.*, vol. 11, no. 4, pp. 515–535, 2020.

[17] E. O. Ibem *et al.*, "Electronic (e-) Procurement Adoption and Users ' Experience in the Nigerian Construction Sector," *Int. J. Constr. Educ. Res.*, vol. 17, no. 3, pp. 258–276, 2020.

[18] R. Deraman, C. Wang, J. B. H. Yap, H. Li, and F. A. Mohd-Rahim, "Developing internet online procurement frameworks for construction firms," *Futur. Internet*, vol. 11, no. 136, pp. 1–22, 2019.

[19] B. Abdullahi, Y. M. Ibrahim, A. D. Ibrahim, and K. Bala, "Development of web-based e-Tendering system for Nigerian public procuring entities," *Int. J. Constr. Manag.*, vol. 22, no. 2, pp. 278–291, 2019.

[20] V. Mabillard and R. Zumofen, "Transparency and Accountability-The Case of Public Procurement Practices in Switzerland," *Public Work. Manag. Policy*, vol. 26, no. 2, pp. 95–114, 2020.

[21] T. O. Akenroye, J. D. Owens, J. Elbaz, and O. A. Durowoju, "Dynamic capabilities for SME participation in public procurement," *Bus. Process Manag. J.*, vol. 26, no. 4, pp. 1463–7154, 2020.

[22] S. S. Chivukula, C. R. Watkins, R. Manocha, J. Chen, and C. M. Gray, "Dimensions of UX Practice that Shape Ethical Awareness," in *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 2020, pp. 1–13.

[23] M. Serra, S. Psarra, and J. O'Brien, "Social and physical characterization of urban contexts: Techniques and methods for quantification, classification and purposive sampling," *Urban Plan.*, vol. 3, no. 1, pp. 1–7, 2018.

[24] J. W. Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Traditions.*, Second Edi. Thousand Oaks, California: SAGE Publications, Inc., 2007.

[25] M. E. Kiger and L. Varpio, "Thematic analysis of qualitative data: AMEE Guide No. 131," *Med. Teach.*, vol. 42, no. 8, pp. 846–854, 2020.

[26] International Organization for Standardization. (2018). *Ergonomics of human-system interaction - Part 11: Usability: Definitions and concepts* (ISO Standard No. 9241-11:2018).

[27] T. Sagirani, B. Hariadi, M. J. D. Sunarto, T. Amelia, and J. Lemantara, "Evaluation of User Experience on Using the " MoLearn " Application in Learning Activities of High School Students," *Int. J. Adv. Sci. Eng. Inf. Technol.*, vol. 11, no. 6, pp. 2422–2427, 2021.

[28] S. Yıldırım and S. H. Bostancı, "The efficiency of e-government portal management from a citizen perspective: evidences from Turkey," *World J. Sci. Technol. Sustain. Dev.*, vol. 18, no. 3, pp. 259–273, 2021.

[29] K. A. Dawood, K. Y. Sharif, A. A. Ghani, H. Zulzalil, A. A. Zaidan, and B. B. Zaidan, "Towards a unified criteria model for usability evaluation in the context of open source software based on a fuzzy Delphi method," *Inf. Softw. Technol.*, vol. 130, no. April 2020, p. 106453, 2021.

[30] F. T. Sunmola and Y. U. Shehu, "A Case Study on Performance Features of Electronic Tendering Systems," *Procedia Manuf.*, vol. 51, pp. 1586–1591, 2020.

[31] J. H. Kim, D. Nan, Y. Kim, and H. P. Min, "Computing the User Experience via Big Data Analysis: A Case of Uber Services," *Comput. Mater. Contin.*, vol. 67, no. 3, pp. 2819–2829, Mar. 2021.

[32] International Organization for Standardization. (2016). *Systems and software Quality Requirements and Evaluation (SQuaRE) - Measurement of system and software product quality* (ISO Standard No. 25023:2016).

[33] S. Belisari, D. Binci, and A. Appolloni, "E-procurement adoption: A case study about the role of two Italian advisory services," *Sustain.*, vol. 12, no. 18, pp. 1–18, 2020.

[34] A. I. Palaco *et al.*, "Public–Private Partnerships for e-government in Developing Countries: An Early Stage Assessment Framework," *Eval. Program Plann.*, vol. 72, no. September 2018, pp. 205–218, 2019.

[35] A. B. Kocaballi, L. Laranjo, and E. Coiera, "Understanding and Measuring User Experience in Conversational Interfaces," *Interact. Comput.*, vol. 31, no. 2, pp. 192–207, 2019.

[36] N. L. Hashim, M. S. B. Matraf, and A. Hussain, "Identifying the Requirements of Visually Impaired Users for Accessible Mobile E-book Applications," *Int. J. Informatics Vis.*, vol. 5, no. 2, pp. 99–104, 2021.

[37] M. Mauri, G. Rancati, A. Gaggioli, and G. Riva, "Applying Implicit Association Test Techniques and Facial Expression Analyses in the Comparative Evaluation of Website User Experience," *Front. Psychol.*, vol. 12, no. October, pp. 1–17, 2021.

[38] A. Al-hunaiyyan, R. Alhajri, B. Alghannam, and A. Al-shaher, "Student Information System : Investigating User Experience (UX)," *Int. J. Adv. Comput. Sci. Appl.*, vol. 12, no. 2, pp. 80–87, 2021.

[39] J. Becker, "Systems and e-procurement - improving access and transparency of Public porcurement," Brussels, Belgium, 2018.

[40] O. M. Okunola and J. Rowley, "User experience of e-government: the Nigeria Immigration Service," *Libr. Hi Tech*, vol. 37, no. 3, pp. 355–373, 2019.

[41] J. Yablonski, *Laws of UX: Using Psychology to Design Better Products & Services*. United State: O'Reilly Media, Inc, 2020.

[42] E. B. Aduwo, E. O. Ibem, E. A. Ayo-Vaughan, A. O. Afolabi, U. O. Uwakonye, and A. A. Oluwunmi, "Determinants of e-procurement implementation in construction in Nigeria," *Int. J. Emerg. Technol.*, vol. 11, no. 2, pp. 746–755, 2020.

[43] M. S. A. B. A. Ghani and S. N. B. Wan Shamsuddin, "A Systematic Literature Review: User experience (UX) Elements in Digital Application for Virtual Museum," *Int. J. Adv. Trends Comput. Sci. Eng.*, vol. 9, no. 3, pp. 2801–2807, 2020.