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Research of Factors Affecting Satisfaction in E-Procurement

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Abstract

Theoretical background: Nowadays, the development of digital technologies, including e-service portals in the public procurement, is crucial for improving purchasing processes and expanding markets for companies, including family businesses. Understanding the factors influencing satisfaction with the use of e-procurement is important for optimizing these processes and improving work efficiency. In the context of public procurement, such studies are few. None of the publications found results of research combining the areas of business family, e-procurement, and user experience. This shows that there is a research gap related to the experiences of employees of family businesses and their interactions with e-procurement for public area, especially in the context of the impact of UX on the efficiency and satisfaction of procurement processes in the public sector.

Purpose of the article: The main objective of the study, of which results are presented below, is to develop a model of key factors and the relationships between them that influence the efficiency of work in an e-procurement dedicated to public area. Despite the numerous benefits of using e-procurement, there are also many challenges and barriers that can affect the level of satisfaction of employees using these types of solutions, including in the procurement area. Understanding the factors that influence satisfaction and dissatisfaction with the use of e-procurement is crucial for improving procurement processes and work efficiency. In the application area, the research results can be helpful for creators and suppliers of e-procurement, enabling them to tailor their solution to the specific needs of family business employees.
Research methods: In order to examine the factors of satisfaction with the use of e-procurement in the public area, a survey was conducted among contractors submitting offers in public procurement procedures. The online survey was sent to over 10,000 business entities, obtaining 406 correctly completed responses, including 109 from family businesses. The analysis of the obtained results allowed, among others, to identify satisfaction factors in the use of e-procurement.
Main findings: In a study assessing the use of e-procurement in the public area, respondents rated their digital competences on average at 4.7 on a scale of 1–6, indicating high digital skills. Intuitiveness of use and ease of searching for advertisements turned out to be crucial for satisfaction with e-procurement, which emphasizes the importance of good UX practice in the design of these tools. Respondents also highly rated functions such as automatic encryption of offers and the ability to create an electronic signature, which affects the security and efficiency of purchasing processes. Surprisingly, training for users of e-procurement was considered less important, which may be due to the already high digital competences of the respondents.

Introduction

Family businesses in Poland constitute a significant element of the economy, playing a key role in job creation and generating national income. They are often characterized by a long tradition and the transfer of management from generation to generation, contributing to their stability and strong organizational values. Their success frequently relies on close relationships with customers and suppliers, as well as a deep understanding of the local market. Family businesses face various challenges, including the need for digitalization, professionalization of management, and succession planning (Bartczak, 2018; Ceipek et al., 2021; Rovelli et al., 2022; Soluk et al., 2021; Sułkowski et al., 2012; Sułkowski, 2012).

In recent years, many Polish family businesses have begun the process of digitalization and modernization to meet the growing demands of the global economy and to utilize new technologies for the development of their operations. However, only 35% of respondents participating in a PwC study believe that their organization possesses solid digital competencies (Sieczkowski, 2023).

In today's era, rapidly evolving digital technologies play a crucial role in the functioning of organizations. Digital transformation is defined as the use of new digital technologies to achieve significant improvements in business operations (Begnini et al., 2023). Moreover, the digitization of many areas of enterprise activities presents an opportunity that allows various entities to streamline their operations and find new markets previously beyond their reach due to factors such as lack of resources (Bresciani et al., 2021; Mitrega et al., 2021; Pfajfar & Małecka, 2022; Vial, 2019; Vuchkovski et al., 2023).

One of the solutions in this area are e-service portals dedicated to public procurement. They have become a commonly used tool in procurement processes, due to the EU's mandate for the digitalization of procedures in the public procurement sector (EU Commission, 2020) and the increasing digitalization of various organizational activities. These solutions have their origins in B2B procurement portals, as that is where such products were initially developed. Some of them are adaptations from this market segment, some are specifically designed for the public procurement market, and there are also solutions provided by the EU.

The implementation of new digital technologies is linked to the infrastructure and software that require appropriate skills and attitudes from employees, which the organization should ensure (Kodama, 2020; Reuschl et al., 2022). From the perspective of digital transformation, research has focused on change initiatives, referring to employee training (Ribeiro-Navarrete et al., 2021), employee information (van den Heuvel et al., 2015), and the creation of a digital mindset (Solberg et al., 2020) as key factors in sustainable digital transformation.

On the other hand, the adaptation of digital solutions in business is associated with the need to ensure high-quality User Experience (UX). This means designing systems in an intuitive and user-friendly way to facilitate adaptation and increase the efficiency of using new technologies (Croom & Brandon-Jones, 2005). The identification of factors influencing UX, especially in the B2C segment, has been undertaken in many publications (Cullen & Taylor, 2009; Huang & Wang, 2022; Eid et al., 2002; Jennex et al., 2004; Lee & Cata, 2005; Puspasari, 2019). However, research and analysis concerning UX in the B2B market are significantly less common (Khan et al., 2022; Syahrina & Kusumasari, 2020).

In the context of public procurement, such studies are few, as shown by Hashim et al. (2022) in their systematic review. Currently, analyzing the results for the keywords "user experience" and "e-procurement" in WoS and Scopus yields 14 results, of which only 6 are actually related to the analyzed area of knowledge. None of the publications found results of research combining the areas of business family, e-procurement, and user experience. This shows that there is a research gap related to the experiences of employees of family businesses and their interactions with e-procurement for public area, especially in the context of the impact of UX on the efficiency and satisfaction of procurement processes in the public sector.

The above considerations indicate that there is a research gap concerning the factors influencing the quality and efficiency of employees' work in e-service portals. The results can provide valuable guidelines on how to better design and implement digital tools. Furthermore, understanding how family businesses use e-service portals can help tailor these platforms to the specific needs and challenges faced by these enterprises, which, in turn, can contribute to their greater efficiency and competitiveness in the market.

The main objective of the study, of which results are presented below, is to develop a model of key factors and the relationships between them that influence the

efficiency of work in an e-procurement dedicated to public area. Despite the numerous benefits of using e-procurement, there are also many challenges and barriers that can affect the level of satisfaction of employees using these types of solutions, including in the procurement area. Understanding the factors that influence satisfaction and dissatisfaction with the use of e-procurement is crucial for improving procurement processes and work efficiency. In the application area, the research results can be helpful for creators and suppliers of e-procurement, enabling them to tailor their solution to the specific needs of family business employees. The study asked the following research questions:

What are the satisfaction factors for e-services indicated in the literature?

How do employees of family businesses assess their skills in the context of using e-procurement?

What are the key factors of satisfaction with the use of e-procurement in public area for employees of enterprises submitting offers in proceedings?

Considering the exploratory nature of the research questions, an inductive theory approach was employed (Strauss & Corbin, 1990). To investigate the factors contributing to satisfaction in using e-procurement in the realm of public procurement, a survey was conducted among contractors identifying as family businesses, submitting offers in public procurement proceedings. Consequently, this study not only contributes to the scholarly literature on digital management in family businesses but also has the potential to impact business practices in this sector.

Furthermore, the article addresses themes of business family, e-procurement, and user experience. It then presents the methodology and research results. The discussion section, including future research directions and implications for business practice, concludes the article.

Literature review

Family businesses constitute a significant and key segment of many nations around the world (Miller & Le Breton-Miller, 2005). Family enterprises dominate global business, generating 70–90% of the world's gross domestic product (GDP) (Maloni et al., 2017). According to the European Family Businesses (EFB) study, family businesses account for 65 to 80% of all European companies and provide on average over 40 to 50% of all jobs (EFB, 2023), and in the EU, they have a turnover exceeding more than 9% of the European GDP (Chahal & Sharma, 2020).

A company, regardless of its size, is a family business according to the definition of the European Commission if (EFB, 2023):

– the majority of decision-making rights are held by a natural person (persons) who founded the company, or a person (persons) who acquired the share capital of the company, or is in possession of their spouses, parents, child, or direct heirs of the child,

– the majority of decision-making rights are indirect or direct,

– at least one representative of the family or relatives is formally involved in the management of the company.

Public companies meet the definition of a family business if the person who founded or acquired the company (share capital), or their families or descendants, hold 25% of the decision-making rights derived from the share capital (EFB, 2023).

Family businesses are unique organizational forms where the combination of family and business systems gives a special character to strategic decision-making. The specificity of family businesses is the strong attachment of the family to the business and the characteristic mechanisms of learning and knowledge management induced by their specific goals and resources (Soluk et al., 2021). This is manifested in the continuous interweaving of business relationships and family ties (Petrů et al., 2020; Sułkowski & Marjański, 2015).

Family businesses tend to think long-term, are financially conservative, and avoid risk in their business considerations. Long-term internal relationships and concentrated ownership allow for much more efficient and rapid decision-making (Maloni et al., 2017). Decision-makers from business-leading families are guided in their strategic choice perspectives by the desire to protect and preserve the accumulated capital of affect-related value that the investing family has invested in the firm, also known as socioemotional wealth (Dutot et al., 2022). The interaction between the family and business systems and the involvement of family members create a unique environment (Alberti & Pizzurno, 2013), nurtured by a set of unique resources and capabilities (Zahra et al., 2004). From this perspective, the interaction between family and business contributes to building competitive advantage (or disadvantage) through higher or lower stocks of social, human, and financial capital (Campopiano et al., 2020).

Digital transformation has accelerated the use of technologies in organizations and is perceived as a paradigm shift by managers of small and medium-sized enterprises (SMEs). As the majority of these are family businesses, due to their specific nature, digitalization may involve a change in business strategy, as well as business models, which generates significant strategic challenges and high risks. Therefore, the process of digital transformation and its strategic value, especially for small and medium-sized family businesses, is current and significant (Begnini et al., 2023).

Public procurement, the governmental process of purchasing goods and services from private suppliers, has significantly developed over the past few decades. This process encompasses the entire life cycle, starting from the initial concept and definition of business needs to the end of the useful life of an asset or the conclusion of a service contract (Carayannis & Popescu, 2005).

Generally, two types of entities usually participate in the process of public procurement: public organizations (procuring entities), which publish their intent to purchase goods and services according to certain rules and restrictions imposed by the government of each country, and suppliers (private enterprises, usually SMEs), who

respond to invitations to tender, indicating their intent to sell (Carayannis & Popescu, 2005). Traditional public procurement faces many problems, especially in developing countries characterized by bureaucratic procedures or corruption (Yap & Souder, 1994). However, emerging information technologies offer governments the opportunity to transform the area of public procurement (Carayannis & Popescu, 2005).

Recent years have allowed for the digitization of the public procurement area, and IT solutions have emerged in the market to streamline this process. The e-procurement is an integrated, online system that carries out all procurement processes and related activities, such as sending and receiving information regarding valuations, tenders, awarding contracts, payments, and others (Aminah et al., 2018; Ibem et al., 2020). Some of these solutions are adapted to the B2B segment, some are created solely for the public procurement market, and there are also solutions provided by the EU or the government. The purpose of using these tools is to ensure improved accountability and transparency in all public proceedings (Nawi et al., 2017). Among the problems associated with implementing e-procurement for public area are the complexity of solutions, lack of flexibility, high cost of internet services, and time consumption. Meanwhile, users are dissatisfied with systems that are less efficient, costly, and less user-friendly (Hashim et al., 2022).

The rapid development of available artificial intelligence, cloud-based solutions, and big data sets encourages companies to utilize digital technologies. Despite the growing recognition of the benefits of digitization, the percentage of companies engaging in digital transformation remains low. The digitization of family SMEs is urgent but poses a challenge, as they are particularly vulnerable to the effects of digitization and must undergo digital transformation to survive (Pan et al., 2023). One reason digital transformation may proceed slowly is the lack of consideration for UX in IT solution design. Companies often focus on the technological aspects of digitization, neglecting ease of use and the intuitiveness of interfaces, which are crucial for the effective implementation and acceptance of new technologies by employees (Ren et al., 2023).

User experience encompasses all forms of user engagement with an organization's services and products (Norman & Nielsen, 2020). UX refers to the emotions and feelings of users during individual interactions with a system, such as an e-service portal (Hashim et al., 2022). Moreover, user experience includes many research disciplines, including human-computer interaction (HCI), product design and development, psychology, and physical state, resulting from previous experiences, attitudes, skills, and personality (Díaz-oreiro et al., 2019).

In ISO standard 9241-210, UX is defined as: "a person's perception and responses resulting from the use and/or anticipated use of a product, system, or service" (Morales et al., 2019). Currently, UX is becoming an increasingly important parameter for achieving market success of a product, system, or service. This also applies to solutions dedicated to public e-procurement (Hashim et al., 2022).

Research methods

The aim of the study was to evaluate IT solutions supporting the submission of offers electronically in public procurement tenders. The research methodology is presented in Figure 1. The study asked the following research questions:

RQ1: What are the satisfaction factors for e-services indicated in the literature?

RQ2: How do employees of family businesses assess their skills in the context of using e-procurement?

RQ3: What are the key factors of satisfaction with the use of e-procurement in public area for employees of enterprises submitting offers in proceedings?

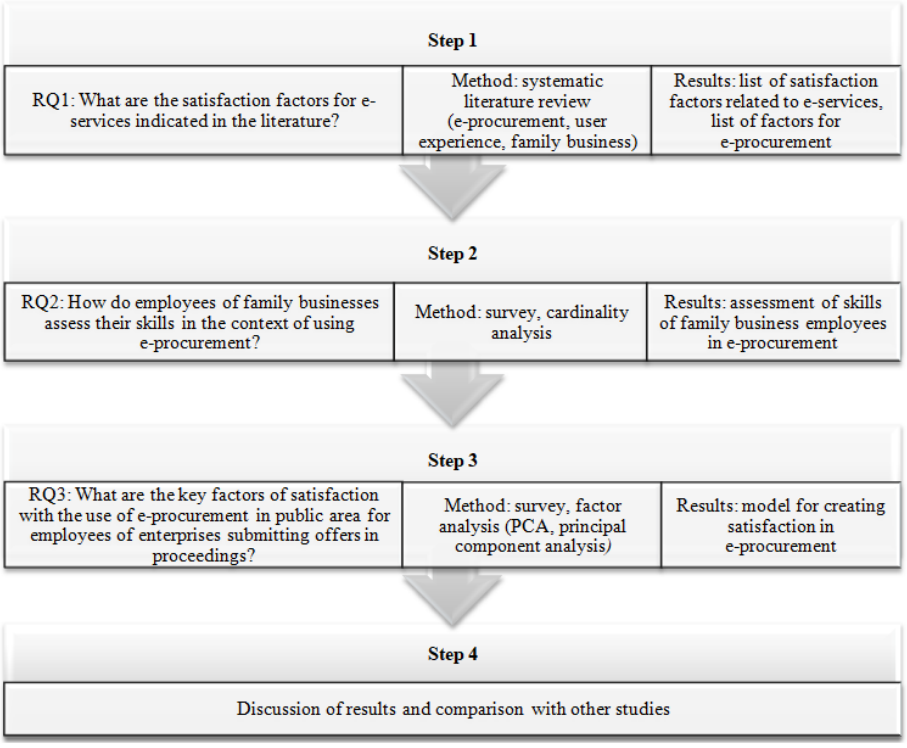

Figure 1. Research methodology

Source: Authors' own study.

Due to the selected type of IT solution – e-procurement for public area, satisfaction factors were initially formulated on the basis of previous experience, user opinions and analysis of selected solutions available on the market. Factors were rated on a scale from 1 – *unimportant* to 6 – *crucial*. Moreover, there was also room to add your own factor.

The survey method was chosen as the research method and the online survey technique was used. The selection of respondents was purposeful due to their place of employment – an employee as a contractor submitting offers in public procurement procedures. A request to participate in the study was sent by e-mail to over 10,000 business entities, 406 correctly completed questionnaires were received, of which 109 enterprises identify themselves as family businesses. The obtained research results were analyzed using statistical methods – factor analysis PCA (principal component analysis) (Greenacre et al., 2022).

The survey results presented here have several limitations that may affect the interpretation of the results and their generalization. Firstly, the survey focuses exclusively on employees of family businesses in Poland, which limits the possibility of generalizing the results to other geographical regions. Secondly, although the number of responses is statistically reliable for the entire population of family businesses in Poland, the specific nature of family businesses may introduce some distortion in the perception of digital competence and satisfaction with the use of e-procurement. In addition, the survey is mainly based on respondents' self-assessment of their digital competences, which may lead to subjectivity in the responses.

Results

A systematic review of the literature allowed us to identify satisfaction factors related to the use of e-service portals (RQ1 – step 1). The authors' own analysis is consistent with the results of Hashim et al. (2022). The issues of user experience for e-procurement or related electronic administration systems can be divided into two groups. The first one refers to satisfaction, transparency, efficiency and reliability, while the second one includes the following features related to UX: honesty, usability, compatibility, visibility, efficiency, attractiveness and operational efficiency. These features of e-service systems were influenced by the specificity of public procurement and a survey questionnaire was prepared and verified by experts.

Then, survey research was conducted (Step 2). The respondents rated digital competences of using e-procurement in their professional work at an average level of 4.7 on a scale of 1–6, which allows us to conclude that most of them have high digital skills and are relatively well prepared to use these tools effectively (RQ2). However, despite the relatively high rating, there is still room for improvement and further development of digital skills, which may contribute to an even better use of the potential of e-procurement in professional work, especially in the context of continuous technological progress and the growing role of IT solutions, also using artificial intelligence.

The key factor of satisfaction in using e-procurement is the intuitiveness of use and the ease of searching for advertisements (Figure 2). High scores for these two factors indicate that users want to have IT solutions designed in accordance with the principles of good user experience design (UX). It is worth noting that positive user

experiences translate not only into satisfaction with using a given tool, but can also affect overall work productivity and loyalty to the platform. Therefore, designers of e-procurement should place special emphasis on UX optimization to provide users with the most positive experience possible.

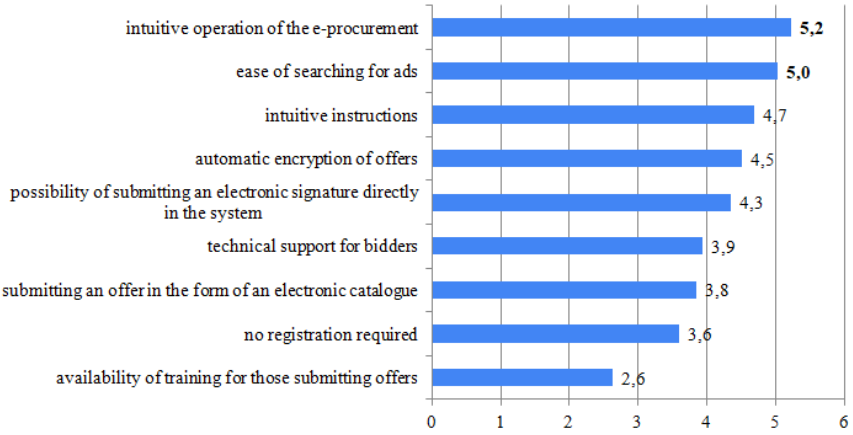

Figure 2. Average importance of factors influencing satisfaction in using e-procurement

Source: Authors' own study ($N = 109$).

Other satisfaction factors that were rated quite highly by respondents include: automatic encryption of offers and the ability to place an electronic signature directly in the system. These are requirements specific to this category of solutions in the area of purchasing management, which significantly affect the security and efficiency of purchasing processes. Automatic encryption of offers ensures that all transmitted data is protected against unauthorized access, which is crucial when processing confidential information. In turn, the ability to place an electronic signature directly in the system significantly simplifies and speeds up the transaction finalization process, eliminating the need to print documents and sign them manually. Additionally, these factors contribute to the automation of work in the purchasing department, which is particularly important in the context of optimizing working time and resources. This automation allows employees to focus on more strategic aspects of their work, while reducing the risk of errors resulting from manual data processing.

Interestingly, the least important thing for respondents is training for those submitting offers. According to the author, this is due to the high digital competences of those answering questions. It is also possible that users of e-procurement already know the system and its functionalities so well that additional training seems unnecessary to them. However, it is worth considering whether it would be worth offering optional training that could help new or less experienced users make fuller use of the potential of available tools, especially people who are starting to work in this area and whose competences are at a much lower level.

Then, in accordance with the procedure described in the Statistica®, a PCA factor analysis was performed, which aimed to group the satisfaction factors in the use of e-procurement. The Kaiser–Meyer–Olkin (KMO) measure of suitability was 0.66, and Bartlett's test of sphericity was statistically significant ($\chi^2(36) = 754.26$; $p < 0.001$), which confirms the validity of conducting factor analysis (www1).

The analysis used the principal components method with a varimax rotation. Based on the eigenvalue and the scree plot chart, three groups of factors can be distinguished that explain a total of 59.9% of the variance in satisfaction with using the e-procurement. The values of factor loadings are presented in Table 1.

Table 1. Values of factor loadings

	G1	G2	G3
ease of searching for ads	0.704248	0.007503	-0.195340
availability of training for those submitting offers	0.505239	0.023764	-0.104872
automatic encryption of offers	0.424544	0.329523	-0.550868
intuitive operation of the e-procurement	0.766163	0.113333	-0.040215
no registration required	0.164143	0.130240	0.803627
technical support for bidders	0.655579	0.024783	0.383812
intuitive instructions	0.851291	0.047661	0.145189
possibility of submitting an electronic signature directly in the system	0.005503	0.792832	-0.148232
submitting an offer in the form of an electronic catalogue	0.079140	0.831281	0.187934
Variance	2.706191	1.461510	1.225728
Participation	0.300688	0.162390	0.136192

Source: Authors' own study ($N = 109$).

In the first factor (G1: Intuitiveness and Ease of Use), three variables were included: intuitive instructions, intuitiveness of e-procurement operation, and ease of searching for announcements. The second factor (G2: Electronic Documentation) comprised: submitting offers in the form of an electronic catalog and the ability to sign electronically directly in the system. The third satisfaction factor (G3: Simplicity of Access) was associated with the lack of a registration requirement. Group 4 (User Support and Security) contains the remaining variables that were not included in any of the first three factors.

The authors propose a model for creating satisfaction using e-procurement, presented in Figure 3. The factors included in G1 are of particular importance in building satisfaction. This is a group whose share in shaping satisfaction with the use of e-procurement is 30%. Therefore, when designing and implementing solutions in this area, care should be taken primarily to ensure intuitive instructions, intuitive operation of the e-services portal and ease of searching for advertisements.

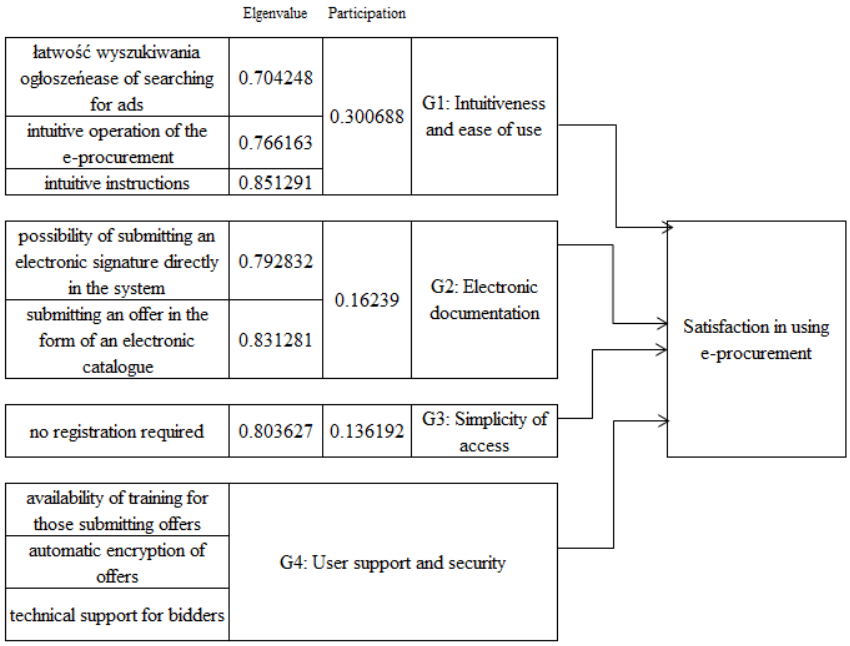

Figure 3. Model of creating satisfaction with the use of public e-procurement for family business submitting offers in proceedings

Source: Authors' own study.

Discussions

In our opinion, the groups identified by Hashim's team (2022) are too general and their contribution to filling the research gap, especially the application gap, is difficult to understand. Hence, the division of variables (Figure 3) seems to better fill the application and research gap, offering a more detailed and targeted approach to UX analysis, which may contribute to a better understanding and optimization of user interactions with e-procurement systems.

Intuitiveness and ease of use (G1) appear in many studies concerning UX. Usability is most often cited, understood as ease of learning, operability, protection against user errors, user interface aesthetics, and accessibility (Hashim et al., 2022). If a system is troublesome to use, users will be disappointed as it requires significant effort (Sharabati et al., 2015). The ease of use dimension in e-procurement allows specific users to learn about the system and record their speed in performing a task and achieving specified goals using a new interface (Kamau et al., 2016). According to Alnuaimi et al. (2021), skills are important to use the e-procurement system, and the right skills are needed to successfully complete the job. Hence, the G1 group of variables identified in our study is crucial for satisfaction with using e-procurement.

Electronic Documentation (G2) and its associated transparency in the context of public e-procurement means that the system is completely transparent, qualifying it for a contract with the government and eliminating external interferences (Azmi & Rahman, 2015). Addressing this issue, Wang et al. (2020), Charpin et al. (2021), Oluka et al. (2022), and Koggalage et al. (2022) agreed on the need to increase the transparency of processes or procedures in e-procurement to enhance system usage.

Simplicity of Access (G3) is related to the ability to use the system. This issue can be viewed more broadly from the perspective of compatibility and interoperability of systems (Choi et al., 2016). Aduwo et al. (2020) mentioned the dimension of interoperability in the context of tools or applications of the e-procurement system. Imamoglu and Rehan (2015) presented research findings on the need to consider interoperability with information and communication technologies (ICT) in public procurement to facilitate communication between suppliers and government.

User Support and Security (G4) in our study is the last identified group. However, one factor – automatic encryption of offers – definitely received high importance (Figure 2). It is strongly associated with security, which is one of the most frequently identified UX dimensions in e-procurement research. Security is defined as the system's ability to protect the privacy of users and stakeholders, secure data against unauthorized access, use, modification, or destruction to maintain the confidentiality of information (Choi et al., 2016). This dimension is a key factor in implementing e-procurement in organizations as it can be linked to the features of e-procurement technology (Aduwo et al., 2020). In the studies of Afolabi et al. (2019), one can find analyses regarding the impact of e-procurement transaction security on procurement acquisition. It was shown that users use the system due to the existing security features.

It should be noted that we deliberately applied a limitation in the study related to the assessment of satisfaction in using e-procurement, as it would then (in the authors' opinion) be necessary to evaluate each e-procurement solution separately (and there are at least several on the market), which was not the subject of the research. Research and discussions related to satisfaction for e-procurement can be found in Crescenzi et al. (2016), Ramkumar et al. (2019), Seo et al. (2018), Sunmola and Shehu (2020). However, it must be emphasized that certainly previous user experiences had an impact on the assessment of the importance of the satisfaction factors analyzed in the presented study. Moreover, we did not consider the efficiency of using e-procurement solutions, as this would require measurements of users' ability to maintain a high level of productivity while simultaneously performing tasks in less time (Ibem et al., 2020; van Staden et al., 2015). Considerations related to this topic can be found in Charpin et al. (2021) and Wang et al. (2020). The subject of the analysis was also not reliability understood as the availability of devices and internet connection. Discussion in this area can be found in Afolabi et al. (2019) and Alnuaimi et al. (2021).

Conclusions

With regard to the results of research conducted by PwC (Sieczkowski, 2023), it can be noted that respondents rated their digital skills in the area of using e-procurement at a high level of 4.7 on a scale of 1–6. This may indicate that although the general level of digital competences in family businesses is perceived as low, in specific areas, such as the use of e-service portals, employees feel more competent and can use these solutions well during their work. The following general conclusions can be drawn, which can be applied to both science and business practice.

User Experience (UX) is important in the design of IT systems. Intuitive instructions, intuitive operation of the e-procurement and ease of searching for advertisements are key to user satisfaction. Family businesses should focus on implementing the digital solutions they have to increase their productivity and satisfaction. On the other hand, research should be conducted to develop and provide methods and techniques that will allow products and services to be offered in line with user expectations.

Automatic encryption of offers and the ability to place electronic signatures directly in the system are also of great importance – this is related to security and specialized functionalities in e-procurement. In order to identify this area, scientific research can be conducted to understand how these aspects influence the popularity and acceptance of these systems by various user groups. This will allow you to learn how acceptance and trust in e-service portals changes as new security features and specialized functionalities are introduced. On the part of e-procurement providers, it is worth considering introducing functionalities that will meet customer expectations.

Low ratings for training for contractors may indicate a high level of digital competence of users. This suggests that as digital competences develop in the population, the need for training may decrease, which is an important factor to consider when planning education and training strategies in the area of e-procurement. At the same time, these results may indicate the need to adapt the training offer to more advanced and specialized aspects of using e-procurement. One of the research directions that can be undertaken in this context is the identification and analysis of how training needs change as the digital competences of users of e-procurement increase.

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