

USER INTERFACE ANALYSIS AND A CASE STUDY OF E-COMMERCE IN JORDAN

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Abstract

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This study conducts a systematic review of academic research on website user interfaces and e-commerce adoption in Jordan. The primary goal is to determine the most efficiently used characteristics of online user interfaces in terms of the most prominent journals, papers, and authors in the Jordanian context. Furthermore, a full content analysis of the 37 most influential publications is offered to identify important study qualities such as data characteristics, techniques, and major discoveries. The analysis identifies 177 papers on internet user interfaces from well-known journals. The findings demonstrate that academic papers are classified into five groups: 1) website design, 2) quality factors, 3) socio-psycho factors, 4) security issues, and 5) environmental variables. For future directions, it would be interesting to examine moderating/mediating elements, such as the technology acceptance model, with an emphasis on some characteristics such as competitiveness, delivery speed, quality, flexibility, and cost. The scholarly significance of this work comes in its thorough evaluation of website user interfaces and e-commerce adoption in Jordan, which provides useful insights and identifies relevant variables for future research and practical consequences. It adds to the existing literature and directs future academic research in this area.

Keywords: Website, User Interfaces, E-Commerce

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1. INTRODUCTION

The variety of computing devices available to users today is expanding, and many of them aim to take the place of traditional laptops and desktop computers in common e-tasks (Thuneibat et al., 2022). As a result, companies compete to sell more of their innovative and distinctive products (Abu-AlSondos et al., 2023; Nawaiseh et al., 2022; Shan et al., 2022; Shniekat et al., 2022). The website

user interface must contend with the challenge of creating user interfaces that meet the technical specifications of the devices and the demands of the makers while continuing to be useable and accessible for all possible users in such a contentious environment (Lam et al., 2021).

According to Bodker (2021), the user interface can be as simple as a pager, iPad, tablet, personal organizer, etc. There are several methods for creating user interfaces for various devices that have been put forth on the subject of human-computer

interaction. The fact that there are so many different techniques indicates that none of them can adequately address all of the new design issues (Jawabreh et al., 2022; Li et al., 2022). The most appropriate or least troublesome technique is typically used, depending on the variety of devices, the business-specific requirements of the application, the experience of the user interface designer, and the project limits in terms of money and/or time (Al-Tarawneh et al., 2023).

Online buying and selling through websites have emerged as a result of the internet's unrelenting growth and the quickening of technological advancement (Alqaraleh et al., 2022; Alrabei et al., 2022; Misa, 2022; Shibly et al., 2021). The way businesses market and sell their goods and services has changed significantly over the past ten years because of Internet-based technology (Rosário & Raimundo, 2021). Internet selling is expanding everywhere, particularly in poorer nations (Kumar & Lata, 2021). In the modern world, e-commerce offers clients a wide range of options, convenience, and flexibility in terms of goods, services, and delivery times (Daugherty et al., 2019).

This reduces expenses and creates opportunities for significant revenue generation from the seller's and the buyer's perspectives (Majchrzak-Lepczyk & Blašková, 2019). E-commerce gained attention as it helps achieve better prices, improved quality, and lower customer satisfaction with lower (Al-Qaisi et al., 2015). User satisfaction is an important factor in the design of smartphone-based UIs (Abu-AlSondos et al., 2023; Khan et al., 2018).

Recent research on the evaluation of websites uses the assumption that users or future users will engage cognitively with the wide range of features on a website, which will open the door to additional review once the website has been used for a significant amount of time (Chiew et al., 2018). First impressions of Web sites are allegedly created in a matter of milliseconds (Rahman & Tomar, 2020). The ability of a destination Web site to draw customers quickly and without cognitive elaboration must therefore be evaluated. As a result, it is crucial for e-commerce to develop evaluation measures that can do so (Kim & Fesenmaier, 2008).

The navigation design refers to the organization and content layout of a website. Information design is the process of making a website's content accessible to users in a way that is accurate, current, and easy to understand (Hasan, 2016). According to Park et al. (2012), often prefer to obtain as much information as possible before making specific purchases (such as apparel, jewellery, or accessories) that have sensory features including colour, design, fabric, and fit. A well-designed website that offers aesthetically pleasing product features might affect consumers' decisions to explore or do information searches (Dua & Uddin, 2022).

This study examines the difficulties that website user interfaces confront in satisfying the technical criteria of various computing devices and the needs of manufacturers while being accessible and useable to all users. It also discusses the expansion and importance of e-commerce, as well as the necessity for well-designed websites that allow simple access to product and service

information. The study aims to explore the usefulness of a literature review and the purposes it might achieve, such as giving background for a topic, emphasizing its importance, and identifying essential research methodologies and methods. Finally, the paper highlights the objectives of the ongoing systematic literature review (SLR), which intends to investigate the issues associated with website user interfaces and e-commerce adoption in order to improve competitive advantage. On the other hand, the study discusses the difficulties that website user interface designers confront in building interfaces that are functional and accessible across a wide range of devices, as well as how companies are responding to changes in the way goods and services are advertised and sold via e-commerce. It also explores the value of literature reviews in research, emphasizing their capacity to give a theoretical framework and a jumping-off point for future study. The study concludes by discussing the objectives of a literature review and how they may be utilized to get a more in-depth grasp of a research topic. Finally, it offers a SLR and aims to determine the most efficiently used website user interface variables in terms of the most significant journals, papers, and authors in the Jordanian context.

The rest of this paper is structured as follows. Section 2 reviews the related works. Section 3 conducts the research methodology. Section 4 shows the results of this study. Section 5 presents the discussion. Section 6 highlights the study's conclusion with implications and ideas for future research in the area of website user interfaces and e-commerce adoption in Jordan.

2. LITERATURE REVIEW

In this section, there is an attempt to provide a thorough study of the challenges surrounding the relationship between website user interfaces and e-commerce adoption. There are many empirical studies that looked into 1) website user interfaces and e-commerce adoption in Jordan and 2) the obstacles and issues that affect e-commerce adoption. Even though the term "Arab world" has gained popularity as a general term, it is important to recognize that the various Arab nations exhibit significant differences in terms of their various cultural identities, customs and conventions, nationalities, religious beliefs, ethnicities, and political views (Khashman & Large, 2011). Accordingly, this current study is focused only on the Jordanian context as Jordan is an independent country and has its population with its variations among other Arab countries. This study also evaluated other conceptual papers to support the conclusions. Indeed, the motivation for such studies is that website user interfaces are important. In this regard, it is highlighted that a website's user interface and functionalities are very important in giving visitors a hedonic advantage (Doghan & Albarq, 2022). These elements also make things easier to use and make it more enjoyable for customers to shop. Due to the competitiveness and technological improvements of today, businesses must search for the elements that affect their customers' pleasure and loyalty (Alqaraleh et al., 2020).

The articles considered are from a specific period which is 2012–2022 are conducted in the Jordanian context. They are analyzing the Website User Interfaces. We will try to answer the research questions:

RQ1: What are the effectively employed variables of website user interfaces in the Jordanian context, and how do they contribute to e-commerce adoption?

RQ2: What are the most frequent factors affecting the relationship between the website user interface and e-commerce adoption in Jordan?

3. RESEARCH METHODOLOGY

3.1. Identification of relevant literature (eligibility criteria)

Table 1 presents the process of relevant literature identification by specifying the population, subject, comparison, outcomes, and context (PSCOC) structure of the research questions (Hamzah et al., 2015) and the recommendation form.

Table 1. Summary of PSCOC

Population	<i>Jordanian users of technology</i>
Subject	Website design interface and e-commerce adoption
Comparison	Factors, challenges, difficulties, issues,
Context	Review(s) of any empirical and conceptual studies of website design interface and e-commerce adoption discussing the difficulties, issues, problems, and challenges of website design interface and e-commerce adoption in the Jordanian context.
Outcomes	Trends of website design interface and e-commerce adoption in Jordan

Source: Hamzah et al. (2015).

Table 1 explicitly elaborates on the relevant literature works selection employed throughout this study. We, at the initial SLR stage, adapted from preferred reporting items for systematic reviews and meta-analyses (PRISMA) a framework that presents a systematic way when reviewing literature regarding a specific topic. More specifically, PSCOC allows researchers to follow precise steps as follows: identifying the population, and then a subject to be investigated. Next, researchers can compare between articles studied to sort them in a way that achieves the research’s main goal. After that, researchers identify the context of articles presenting specific topics investigated that are associated with

a specific issue e.g., website design interface and e-commerce adoption. In this research, Jordanian users of technology are the population. Website design interface and e-commerce adoption are the subjects of the present article. Researchers, later, sorted articles based on the factors, challenges, difficulties, and issues highlighted. Lastly, the conducted study concluded will present findings. Such implementation of this framework is to safeguard that the procedures followed to extract relevant data are being adhered to the issues discussed in the current research. Figure 1 illustrates the PRISMA process.

Figure 1. PRISMA process

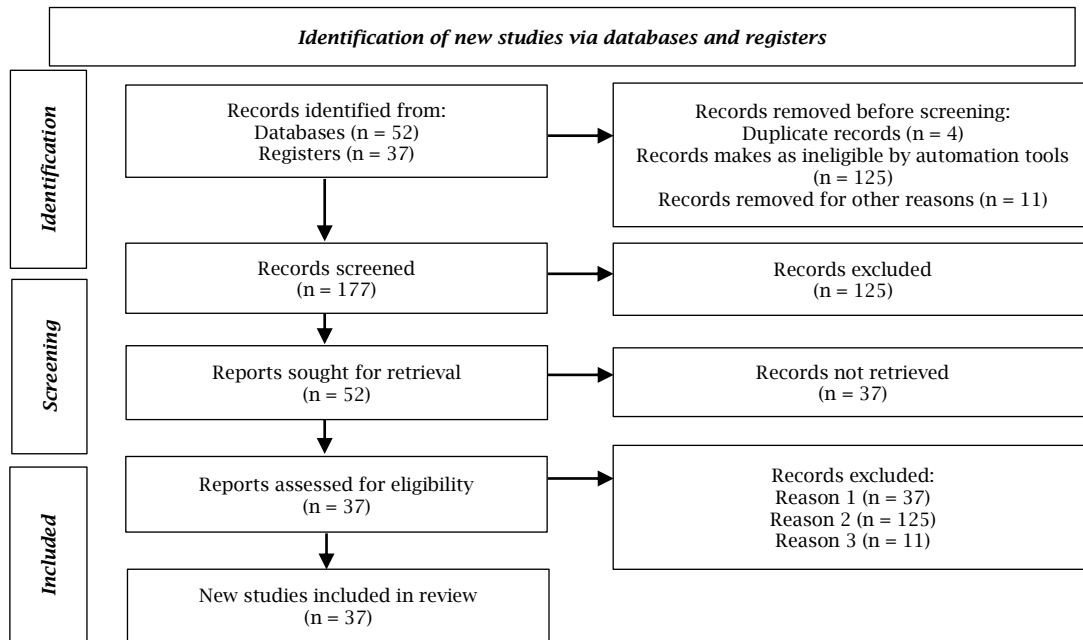


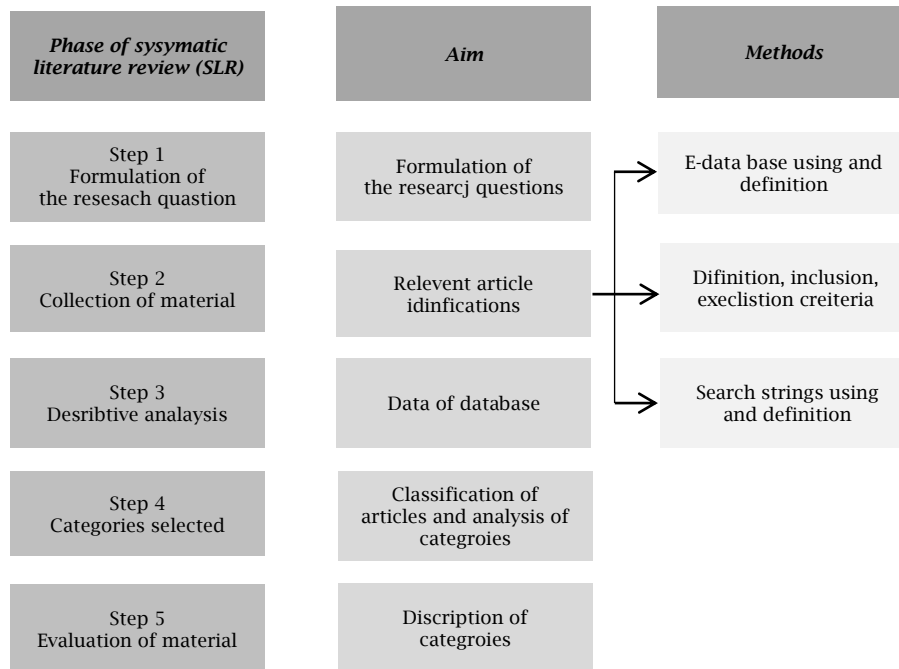
Figure 1 includes three main parts: identification, screening, and then, inclusion. This study identified 52 articles after screening 177 articles. Out of 52 articles, 37 were eligible to be

reviewed. Four articles were duplicated and 11 articles were excluded. We concentrate primarily on challenges/problems/difficulties of e-commerce adoption regarding website design interfaces in

Jordan. In this study, the value of 'n = 37' was the total number of studies used in the investigation. We reviewed a large number of studies on e-commerce adoption and then these studies were narrowed down at the end of the narrowing procedures for further evaluation.

In this review, we retrieved literature from a variety of online databases. EBSCOHost, JSTOR, Google Scholar, ProQuest, SAGE Journals, Emerald, and Wiley Online Library. In total, this study included seven online databases.

Figure 2. Revision process



3.2. Methods and studies' selection

The study suggests an SLR to examine the connection between e-commerce research and website user interface. The SLR is based on the recognition and evaluation of specific research problems or study occurrences. The foundation of SLR is the identification and assessment of specific research themes or study events.

The SLR process is based on the following steps, according to the literature (Cagnetti et al., 2021):

- 1) Development of the research inquiry.
- 2) Materials collection: material and analytical unit identification.
- 3) Descriptive analysis: a review of the materials gathered.
- 4) Category selection: specify the categories and scope of the investigation.
- 5) Evaluation of the material: assessing specified categories and dimensions and obtaining.

4. RESULTS

In the selection phase, the researchers included both empirical and conceptual works linked with website user interface and e-commerce research in Jordan. The studies considered for the literature review were published between 2012 and 2022. The detailed eligibility requirements were as follows: 1) website user interface and e-commerce research; 2) studies that address technology acceptance and adoption factors with the use of the relationship between the website user interface and e-commerce research in the Jordanian context and 3) studies that

investigated the issue of how factors of website user interface affect e-commerce adoption by Jordanian online users and/or consumers. More precisely, there are specific keywords including (e-commerce website design in Jordan/website user interface and e-commerce adoption in Jordan/the effect of website design on e-commerce adoption/any some rephrasing including main two factors: 1) website user interface and 2) e-commerce adoption in Jordanian context). Accordingly, Table 2 displays the eligibility criteria for investigated articles.

Table 2. Eligibility criteria for investigated articles

Eligibility criteria	
Inclusion criteria	Exclusion criteria
English language	The paper is not in English
Jordan	Outside Jordan
The time scale was 2012-2022	Papers published pre 2012
Jordanian users of e-commerce	None Jordanian users of e-commerce
The focus of studies includes all investigated factors	The focus of studies that did not include all investigated factors

A form was prepared as a checklist to gather appropriate evidence linked to the research topics (website user interface factors and e-commerce adoption) to confirm the data extraction procedure and assure the validity of this study. This checklist criterion was adopted by Hamzah et al. (2015). Furthermore, the quality of the associated studies was implemented by employing the data extraction form. The study quality checklist was made up of seven primary items on the form (see Table 3). The ratio of answers for each question was used to

judge the quality of both quantitative and qualitative investigations: Yes = 1 point, No = 0 point, and Neutral = 0.5 points. As a result, the quality score

accumulated in a total of between 0 (very poor) to 7 (very good).

Table 3. The checklist of the study quality

Items	Answers
Was the article related?	Yes/No
Were the aim(s) of the study clearly stated?	Yes/No/Neutral
Were the participants adequately described? (i.e., customers, users, consumers, etc.)	Yes/No/Neutral
Was the data collection carried out well? (i.e., how to study settings may influence data, discussion of procedures)	Yes/No/Neutral
Were potential confounders adequately controlled in the analysis?	Yes/No/Neutral
Were the approach and analysis well conveyed? (i.e., the rationale of the method used)	Yes/No/Neutral
Were the findings credible? (i.e., the findings and methods used were well explained and could be trusted)	Yes/No/Neutral

Source: Hamzah et al. (2015).

5. DISCUSSION

As previously stated, this investigation found 52 studies that included both empirical and conceptual works. Only 37 articles were considered suitable for evaluation at the end of the procedure as the evaluation of the retrieved studies, including inclusion criteria, was discussed earlier in this work. Duplicate studies, irrelevant studies, and insufficient abstracts were all factors. Findings agree with Doghan and Albarq (2022), who recommended further studies in this regard. In addition, stated that “The designed application had a positive influence on users’ level of satisfaction” (p. 331) and recommended future studies in the Jordanian

context that can enhance customers’ satisfaction of using suitable and effective website designs enhancing companies’ productivity.

5.1. Descriptive studies

Through the descriptive analysis, it was possible to carry out a descriptive-quantitative analysis of the completeness of the available data.

Figure 3 presents the publication numbers for each year. It, specifically, illustrates that the highest frequencies were for the following years (2018; 2013) 16.2% for each year, followed by (2012; 2015) 13.5% for each year.

Figure 3. Number of publications for years

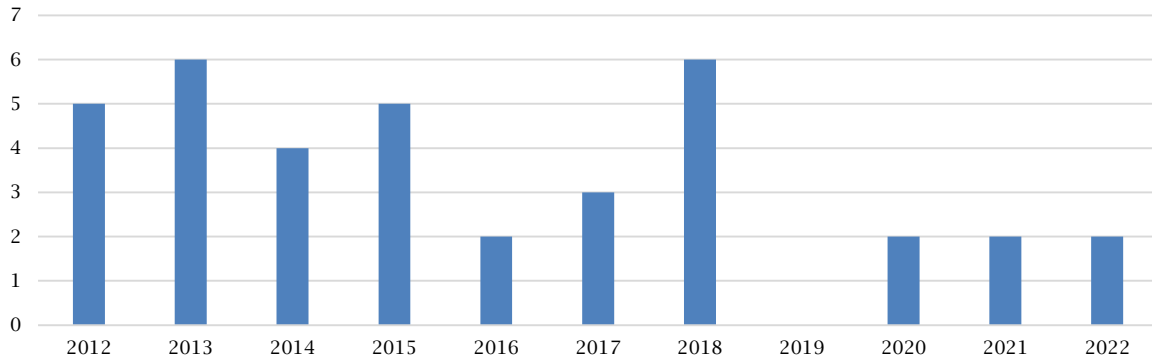


Figure 4 displays the publications for journals. It shows that 37.8% of the articles were published in

engineering/technology journals. It is followed by management journals at 16.2%.

Figure 4. Publications for journals

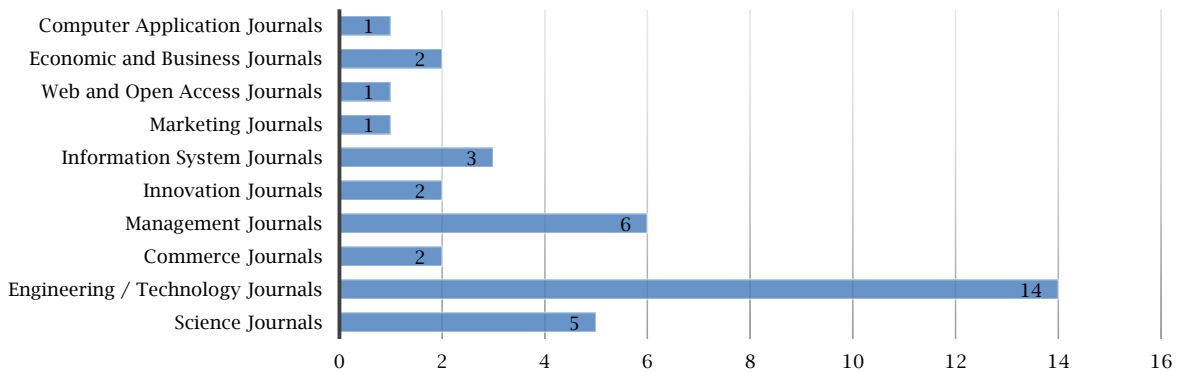


Figure 5. Studies by research method approach

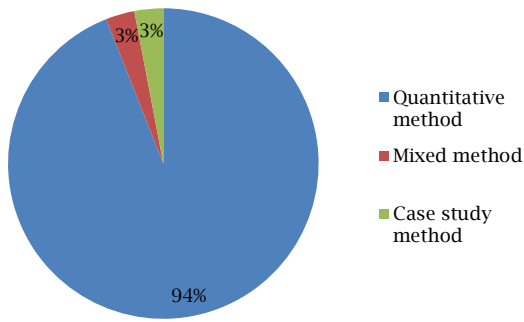
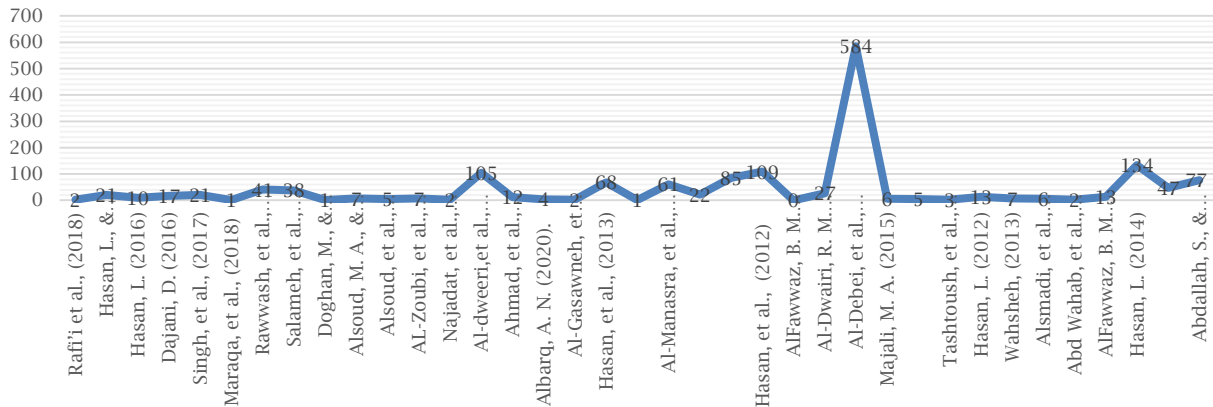


Figure 5 shows studies by research method approach. It is observed that quantitative research design is the most frequent research methodology approach used in previous studies. This could be because quantitative is used to examine specific theories and variables' relationships based on hypotheses. It is also used as it can reach more population. The objective of the quantitative method is to explain, control, and forecast social processes. Furthermore, Sekaran and Bougie (2016) mentioned that a quantitative research approach strives to contribute to the explanation and resolution of complicated issues. A quantitative approach, according to Zikmund et al. (2012), can address a study's aims through empirical valuations that

involve numerical measurements and analysis. According to Sekaran and Bougie (2016), a quantitative research strategy allows researchers to focus on specific concerns, use rigorous procedures, and come to valid results. In addition, this could be attributed to the fact that website user interface as an effective factor on e-commerce adoption in the Jordanian context needs varied research designs to be used, as the selected studies were all aiming to examine the effect of website user interface on enhancing e-commerce adoption to achieve competitive advantage among companies.

In addition, it is important to identify the citation scale to examine how studies focus on website interface topics. Citations can indirectly indicate the number of studies on this topic. Figure 6 illustrates citation frequency as presented for each article. The study indicates that the highest citation was for the study of Al-Debei et al. (2015). This could be due to the factors used in this study including the following factors trust, perceived benefits, perceived web quality, and electronic word of mouth, attitudes. Indeed, these factors are most frequent in studies. It is also important to sort out citations based on years to identify how studies were more frequent yearly (Al-Rawashdeh et al., 2023; Al-Tarawneh et al., 2023; Alananzeh et al., 2023; Alhaj et al., 2023).

Figure 6. Citation frequency per article



The study demonstrates that the frequency of years is variable. It reached its top in 2015 with a percentage of 44.5%. It also shows that the number of citations between 2012 and 2015 was 81%, while

19% was from 2016–2022. This indicates a decline in studies in the Jordanian context. Figure 7 shows that research in the Jordanian context was low in the last four years.

Figure 7. Citation of previous studies based on year of writing

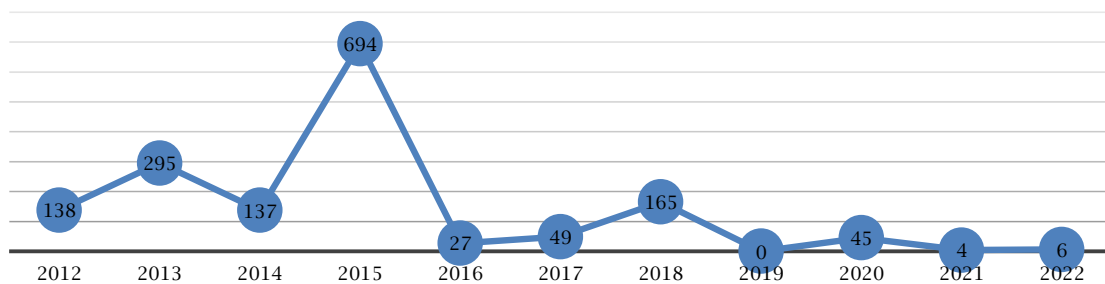
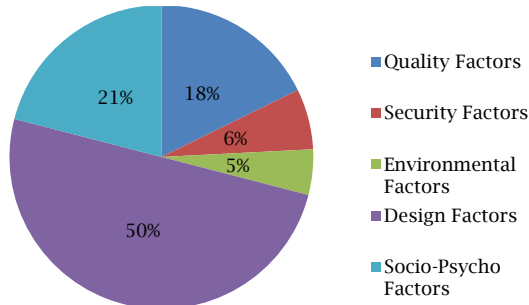


Figure 8 shows the factors investigated in the related studies. It is observed that website design, quality, socio-psycho, security, and environmental factors are highlighted to be effective factors.

Figure 8. Factors investigated in the related studies



The SLR identified 37 studies in Jordanian addressing various website user interfaces' effective factors. These studies investigated one of the following issues: 1) website user interface factors on e-commerce adoption; 2) web-based for successful e-adoption; 3) website evaluation using web diagnostic tools; 4) consumer intention to use commerce websites; 5) websites' quality based on customers' satisfaction.

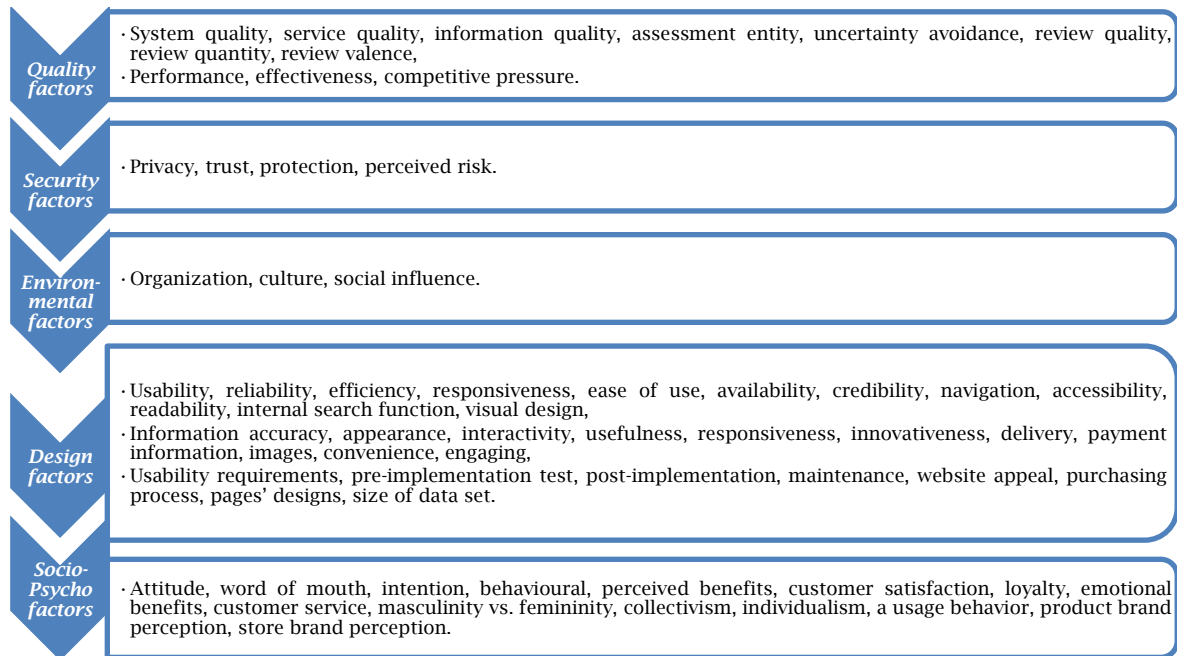
The study presents the most investigated factors affecting e-commerce adoption when investigating website user interface studies.

The study illustrates that 50% of previous studies focused on design factors. This clearly raise can be observed that website designs can affect customers' behaviours. In addition, quality factors can play a significant role as it also attracts customers. Accordingly, it can be seen in Figure 9 that website design, quality, socio-psycho, security, and environmental factors are highlighted to be effective factors. To precisely present these factors, Figure 9 shows what are the variables used in previous studies to evaluate the variables' existence and draw a conclusion and recommendation for neglected ones.

The main goal of SLR was to understand how the factors listed above affect the role of website user interface on e-commerce adoption in Jordan. The second research question also highlights the most frequent factors mentioned in the studies retrieved in the SLR.

Results from the conducted study are discussed in this section. The analysis of the paper (limited to the analysis of the sample) reveals a growing interaction over time between the relationship between e-commerce and website user interface. These days, there is not enough literature on the various concepts, a review of the literature on website user interface and e-commerce in Jordan found a shifting pattern in the number of publications over time, with the most publications in 2018 and 2013.

Figure 9. List of the most investigated factors



These articles were discovered in 10 distinct journals spanning a wide range of topics, including Science, Engineering, Commerce, Management, Innovation, Information Systems, Marketing, Web and Open Access, Economics and Business, and Computer Applications. The study identified three structural dimensions: methodological research, effective factors, and citations. The study found that

the majority of papers employed quantitative research methodologies. The publications covered a wide range of topics; the publication received the most attention. When studying the link between website user interface and e-commerce, the paper emphasized website design, quality, socio-psycho, security, and environmental aspects as effective features. The previous article neglected some crucial

elements and dimensions that might influence website interface adoption, such as user-friendliness and intuitiveness. Overall, the study's findings can help practitioners, researchers, and policymakers understand the important elements and dimensions of website user interface and e-commerce adoption.

Clarity: By using language, flow, hierarchy, and metaphors for visual elements, the interface minimizes ambiguity.

Concision: Ironically, however, over-clarification of information can, and, under most normal circumstances, most likely will lead to the obfuscation of whatever information. For example, labelling the majority, if not the entire, of items displayed on-screen at once, regardless of whether or not the user would require a visual indicator of some kind to identify a given item.

Response: A good user interface should not seem slow. This implies that the interface should give the user clear feedback regarding what is happening and whether or not their input was correctly handled.

Consistency: It is crucial to maintain consistency.

Aesthetics: While you do not need to make an interface appealing for it to function, doing so will make users' experiences with your application more enjoyable, and this can only lead to happier users.

Efficiency: Because time is money, a great user interface should increase productivity by providing shortcuts and attractive design.

Forgiveness: A good user interface should provide users with the tools to fix their errors rather than punishing them for making them.

Findability: Can users easily locate the information they need? The information must be easy to locate and navigate. Never make a user search for your information or goods.

Competitive advantage: This competitive advantage including e.g., competition, delivery speed, quality, flexibility, and costs is seen to be ignored in the Jordanian context.

Moderating/mediating factors: These two main variables are ignored in previous studies looking at the effective use of website interfaces. Future studies can use some theories such as behavioural ones, technology acceptance, and adoption theories as moderators and/or mediators to study the relationship between website interface and e-commerce.

Based on the current study's findings, numerous future trends for researchers interested in the link between the website user interface and e-commerce adoption in Jordan might be recommended. To begin, future research might look at the moderating and mediating impacts of various theoretical frameworks such as behavioural theories, technological acceptance models, and adoption theories. These constructs may aid in identifying the underlying elements that influence the link between website interface and e-commerce adoption, as well as providing a more comprehensive knowledge of this relationship. Second, future research might concentrate on the competitive advantage that website user interface can provide to Jordanian businesses. This involves investigating the influence of website design on e-commerce transaction delivery speed, quality, flexibility, and

cost. This would aid in determining the precise ways in which website design might give a competitive edge in the Jordanian market. Third, future research might look at the influence of new and developing technologies on the link between website user interface and e-commerce adoption, such as mobile devices and virtual reality. This would aid in determining how these technologies may be leveraged to improve the user experience and encourage e-commerce adoption in Jordan. Finally, future research should look at the feasibility of cross-cultural comparisons of website user interface and e-commerce adoption in Jordan and other countries. This will aid in identifying any specific cultural elements that may impact the link between website interface and e-commerce adoption in Jordan, as well as providing useful information for enterprises operating in this market.

Based on such discussion, it is important to highlight the usefulness of this work as being an SLR-reviewing related study in this field. This can be significant due to the fact that this study can contribute to theory, practice, empirical and policy-making systems. With this study, the researchers attempted to present SLR regarding the analytic of user interface as a case study of e-commerce in the Jordanian context contributing to e-commerce adoption by identifying related factors. In other words, this study is significant as it also determines the effective variables of e-commerce adoption. By contributing to the literature, this study is establishing the groundwork for future research on the importance of e-commerce. Furthermore, this study can be significant for policy-makers and companies' stakeholders. Furthermore, researchers can benefit from this study.

In addition, it is valued due to several factors pinpointing. This study strengthens the knowledge body on e-commerce adoption and then accepts the possible effect of related factors highlighted earlier. In addition, this study highlighted the point of moderating and mediating roles of e-commerce adoption affecting the relationship between independent variables and e-commerce adoption.

As for the implications of this study, it indicates that this study is the first to be addressed in the Jordanian context reviewing related literature and highlighting some essential and useful gaps. Accordingly, this study can provide an important recent database for researchers about the related subject offering some important points, e.g., it will assist policymakers to adjust their techniques of e-commerce adoption, it will also direct both policymakers and employees to enhance e-commerce, it is also of immense importance to people who wish to specifically study the e-commerce adoption in Jordan, hence, it can assist in making ideas available for this purpose., and the additional potential value of this research is that the several companies can employ the findings in order to enhance their effective performance and productivity.

6. CONCLUSION

Our research aimed to review website user interfaces and e-commerce adoption in Jordan. After the study, the following clusters have been identified, more specifically; it is found that 1) website design

containing website design features, 2) quality factors including system, service, information, and assessment qualities, 3) socio-psycho factors, 4) security factors, 5) environmental factors. In addition, some other factors were not investigated completely such as clarity, concision, responses, findability, aesthetics, efficiency, competitive advantage, forgiveness, and the role of mediating/moderating factors.

The study's findings have practical implications for Jordanian firms trying to strengthen their e-commerce strategy. Businesses should focus on enhancing their website design and quality aspects while also addressing socio-psycho, security, and environmental variables that may affect client perceptions and behaviour by identifying the important factors that influence website user interfaces and e-commerce adoption. In practice, businesses should build their websites to be user-friendly, dependable, efficient, responsive, and accessible, while also considering elements such as credibility, navigation, readability, and visual design. It is also critical to provide clients with a safe environment by addressing concerns such as privacy, trust, protection, and perceived risk. Furthermore, organizations should examine socio-psycho aspects such as attitudes, word of mouth, customer happiness, loyalty, emotional advantages, use behaviour, and perceptions that may impact consumer perceptions and behaviour. Businesses may create a more enjoyable shopping experience for their customers by addressing these characteristics, which can lead to increased loyalty and repeat business. Finally, organizations should examine environmental elements such as corporate culture and social impact that may influence e-commerce adoption. Businesses may boost their chances of success in this market by developing

a supportive corporate culture that fosters e-commerce adoption and harnessing social influence to promote their e-commerce products.

However, some limitations should be mentioned. To begin, the search was restricted to a specified time period and set of keywords, which may have omitted relevant research. Second, the study was limited to Jordan and did not take into account variations that may occur in other Arab nations or areas. Third, the study concentrated on website user interfaces and e-commerce adoption rather than other critical aspects that may influence adoption, such as pricing and payment alternatives. Fourth, there might have been linguistic hurdles in obtaining and interpreting non-English material, which could have hampered the study's comprehensiveness. Finally, the study did not contain a meta-analysis, which would have allowed for a more comprehensive interpretation of the included studies' conclusions.

Future research should widen the scope of keywords and population to guarantee that all relevant literature beyond website user interfaces and e-commerce usage in Jordan is gathered. Unexplored elements such as clarity, beauty, efficiency, competitive advantage, and mediating/moderating functions of factors should be investigated. Further investigation of the elements that influence website user interfaces and e-commerce adoption can lead to a more comprehensive understanding of their connection. It is also critical to keep up with the newest technological and e-commerce advances through regular updates and repeat searches. These measures will aid in keeping the findings current and applicable in a fast-evolving technological context.

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