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Is digitalization necessary for e-commerce adoption at small and medium-sized enterprises? The pandemic effects

Muhammad Usman Khan, Samia Nassar, Mohammad Fakhrul Islam, Md Billal Hossain, Laszlo Vasa

ABSTRACT

Objective: The study aimed to conduct a comparative analysis of e-commerce adoption in small and medium-sized enterprises (SMEs) of Pakistan and Bangladesh in the period following the COVID-19 pandemic. This study aims to observe in detail the significance of e-commerce adoption for small and medium sized enterprises, their abilities to evolve consumer preferences and to dissect the challenges that hinder in the way of e-commerce adoption in Bangladesh and Pakistan. The key focus of this study was to find out how digitisation acts as a moderator to overcome challenges.

Research Design & Methods: We based the study on a quantitative design using a structured questionnaire to collect data from 500 SMEs with 250 respondents from each country, Bangladesh and Pakistan. We collected the study sample through a stratified random sampling from key industrial cities in both countries. We analysed the data of the study with SmartPLS version 4.0 to explore the relationship between external factors, need-bead factors, organisational factors, technological factors and e-commerce adoption with digitisation as a moderator.

Findings: This study has also examined that market related demands and the access to the technology has significant positive impact on digitisation in both countries. However, company's resources and cultural factors that are related to the organisational factors have negative impact on digitisation in Bangladesh and Pakistan. The multi-group analysis composed to find the distinguishing factors among two countries, found the impact of all the factors on digitisation.

Implications & Recommendations: We observed a crucial role of digitisation in different fields to adopt e-Commerce in SMEs of Pakistan and Bangladesh. This study has been conducted in the time of COVID-19 pandemic, suggests that it should be the top priority of the policymakers to focus more on digitisation to enrich the country's economic and digital infrastructure. The partnership programs can help both countries improve digitisation on modern standards. Findings suggests combined strategies to boost economic stability of both countries. However, this study has some limitations and future suggestions to entertain the role of artificial intelligence (AI) to examine the adoption of e-Commerce in both countries.

Contribution & Value Added: This study has provided a qualified analysis of the drivers of e-commerce adoption in SMEs of Pakistan and Bangladesh in the specific context of the post-COVID-19 pandemic, with digitisation as a moderator. It offers novel insight into the different types of challenges faced by SMEs in both countries and in the transformation of digitisation in the South Asian region.

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INTRODUCTION

The COVID-19 pandemic has had a profound impact on the world, especially regarding the way businesses function. A key change has been the rising popularity of e-commerce, driven by people's

desire to minimise physical interactions. This shift to online shopping has rapidly gained momentum and is expected to persist even after the pandemic recedes. Consequently, there has been a surge in demand for e-commerce platforms, with traditional establishments also adapting by incorporating online sales channels into their operations (Farmaki *et al.*, 2020).

Consumer behaviour has also changed in the wake of this global crisis (Kułyk & Michałowska, 2016). We can now buy products typically purchased in local stores through online retailers, expanding into new categories such as groceries or homewares while minimising transmission risks, especially with the increasing adoption of mobile payments (Hayashi & Bradford, 2014). As consumer trends fundamentally change during this challenging period, companies that rely on face-to-face interactions have no choice but to accelerate their digital transformation initiatives. This drives sellers to become more adaptable to existing technologies such as customer experience and delivery (Gourinchas, 2020). Consequently, such sharp changes brought substantial growth potential with contractors looking increasingly back at building out requirements based on data proactively gathered transforming themselves before upsetting fragile industries influenced predominantly impacts. Such timely adaptation highlights the earthen-like importance of cultivating both indeed successful readings within still operating uncertainty giving voice to humanity's welfare across ecosystems (Syriopoulos, 2020). The pandemic has highlighted the importance of having an online presence and adapting quickly to changing consumer behaviour. There is a close relationship between e-commerce adoption and digitisation. The term 'digitisation' refers to the transformation of information from analogue to digital. In that case, the information is transferred through different sources. E-commerce is electronic commerce that involves digital technology for buying and selling products and services (Chaudhuri & Kumar, 2015). As the digitisation increases in the society, e-commerce will prosper more and more. The prosperity factor of e-commerce is directly linked with awareness and propagation of digitisation in businesses. Digitisation has increased the chance for companies and firms to prosper their businesses by selling and engaging with consumers over the Internet through different mediums (Bashir *et al.*, 2023). Websites have been a platform to introduce e-commerce to the world. Now, smartphone applications, and social media platforms are involved in e-businesses. Consumers' direct access to the online stores is 24/7 with unlimited brands and products (Bhatti *et al.*, 2020). Digitisation has transformed the payment system in businesses (Marushchak *et al.*, 2021). The online transaction process is the best example of digitisation. Digital payments eased the consumers to pay for products anytime, anywhere without any hassle. The invention of 'digital payments' accounts has eliminated the cash-carrying risk. The system of online payment is not only easy but also offers a safer and more convenient mode of shopping (Fatonah *et al.*, 2018).

The remote way to observe the factors driving e-commerce adoption in SMEs is the need-based approach (Huseynov & Yıldırım, 2017). What are the common challenges that a small or medium-sized industry has to face to adopt e-commerce? These challenges have different aspects. The challenges are not common in the developed and developing world, rather the developing world faces different types of challenges. It includes the process of facilitation to the consumers regarding the products, minimising the risk of fraudulent payments and settling the easy instalment plans because the people in the developing world are not all rich enough to pay the price. In the COVID-19 pandemic, need-based challenges converted into survival challenges for the SMEs. Millions of SMEs were affected during the COVID-19 pandemic and many more came to an end (Ahmed *et al.*, 2020). Moreover, SMEs observed lockdowns, limitations and restrictions all over the globe. In that time, product-making processes, and supply chains were disrupted (Bhatti *et al.*, 2020). E-commerce adoption was the only hope for the businesses to stay alive in despair.

This research examined the 'role of digitisation' as a moderator to examine the adoption of e-commerce in the COVID-19 pandemic. The process of digitisation for the SMEs was slow before the COVID-19 pandemic. However, the pandemic sped up the digitisation for small and medium-sized enterprises in the developing world. Several studies in the developing world have observed the e-commerce adoption in the post-COVID period (Ahmed & Kumari, 2022; Higueras-Castillo *et al.*, 2023; Kumari & Ahmed, 2022). Scholars observed that the adoption process was slow but progressive, and there was no urgency to accomplish the transformation of business to e-business. However, researchers noted a remarkable shift after the COVID-19 period and during it (Akpan & Ibidunni, 2021).

Digitisation has offered a variety of benefits to SMEs by enhancing their profit margin, minimising their problems and providing a better and enhanced payment system, which is the cashless process of purchase and buying (Parviainen *et al.*, 2017). This process is secure, unique, and consumer-friendly. Cost reduction is the prominent benefit that every small and medium-sized enterprise enjoys. Owning a store in a luxury apartment building, and making slow progress, was much more painful than offering products online by creating a website, smartphone application and similar services (Ritter & Pedersen, 2020). This is the reason; policymakers and stakeholders prioritized the e-commerce adoption through digitisation process. Digitisation has progressed and sped up the delivery of products on time, inspecting the location of the product and observing the supply chain process smoothly (Hossain *et al.*, 2022). In a classic business environment, it takes time to transfer the product, make a shipment, and notify the consumer when the product will be delivered, and how the payment will be made. In the digitisation era, the consumers place the product order online with several modes of payment available (Akpan & Ibidunni, 2021).

E-commerce adoption and digitisation are interlinked with each other. The interlinking process of digitisation is simple, because it is a part of electronic technology. It works as a framework. The role of digitisation is the role of a kernel in a computer system, which links the hardware and software in a system (França *et al.*, 2018). Without a kernel, the communication between hardware and software is not possible. The case with digitisation is similar. It serves the purpose of kernel between consumer and e-commerce (Jamil, 2021; Alam, 2023). The availability of smartphone applications, websites, social media platforms, and user-friendly networks has made e-commerce an opportunity for consumers and buyers (Fedorko *et al.*, 2018). Every business has strategic goals to achieve in a certain period. Digital transformation is the process of using tools and processes to achieve the target in the business. It helps fulfil the target (Santos-Jaén *et al.*, 2023). It has a diverse role to mutually meet the requirements of the consumers and organisations at the same time. Innovation in the field of digitisation has minimised the distances between the consumer and the producer and SMEs. Online stores have a special place in the minds of consumers. Providing a better experience to the consumer is the goal of every e-commerce company. It is the first and foremost duty of a company to handle its customers with care. Customers of e-commerce are fragile. Therefore, it is necessary to keep a customer happy, safe and attached to the store (Baubonienė & Gulevičiūtė, 2015). Through digitisation, companies can reach out the customers with the help of artificial intelligence (AI) tools that are built into the system. These tools observe the needs of the consumer, note down every click, time of staying, and observing a product, showing interest, etc. Through this, the AI tool offers the customer what a customer needs. We call this process personalisation (Bawack *et al.*, 2022; Goy *et al.*, 2007; Khrais, 2020). The personalised traffic is easy to deal with, and customers are eager to buy a product of AI's choice.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

E-commerce Adoption

E-commerce has become important for businesses as more consumers turn to online shopping, especially in the time of COVID-19 pandemic. The purpose of this literature review is to investigate the factors affecting e-commerce and its impact on business performance. Many studies have identified factors that influence e-commerce performance, such as operational planning, external stressors, and consensus. For example, research shows that strategic planning (including IT infrastructure, organisational culture, and workforce planning) is a critical factor in e-business adoption (Poong *et al.*, 2006). Other variables paying external pressures are the rules and regulations of the government and competition. Research proves that perceived benefits have a positive impact on e-commerce adoption (Chandra & Kumar, 2018).

Researchers have also studied the impact of e-commerce on business activities. Research consistently showed the role of e-Commerce with plus impact on business performance, including amplified sales, profit margin and consumer satisfaction (Yadav & Mahara, 2018). Moreover, the positive impact of e-commerce is particularly evident for small and medium-sized enterprises (SMEs), which is benefi-

cial to increasing the number of customers and reducing transaction costs (Bite *et al.*, 2020). Advantages and challenges in e-commerce goes side by side. There are major issues, one such issue is scarcity of skills and resources in SMEs. Security and privacy concerns and high initial investment are another challenges that hinder the adoption of e-commerce (Lertwongsatien *et al.*, 2004). If a business stays competent, e-commerce adoption is the first adoption kit for it. Along with it, planning, pressure and benefits goes side by side as key determinants of e-commerce.

The e-commerce Adoption Framework

Scholars widely use diffusion of innovations (DOI) and technology acceptance model (TAM) methods in e-commerce research. Rogers and Cartano's DOI development (1962) 'suggests that the use of new technologies is influenced by factors such as: relative advantage, compatibility, complexity, trialability, and observability.' Meanwhile, TAM framework, developed by Davis (1968) which was stated that the intention to use technology is affected by perceived usefulness and perceived ease of use. Both frameworks are popular in the context of e-commerce adoption (Jacob *et al.*, 2020). Moreover, Ahmed *et al.* (2020) found that the DOI framework is useful in explaining e-commerce adoption. The relative advantages of e-commerce, such as efficiency and cost savings, are important factors in e-commerce adoption. Furthermore, Wani and Ali (2015) found that compatibility with existing business practices and values is important for the use of e-commerce. Complexity and trialability have also been found to influence e-commerce adoption (Marangunić & Granić, 2015).

Scholars widely use the TAM framework in e-commerce research. According to Tanos *et al.* (2024), perceived usefulness and perceived ease of use are the most important factors in e-commerce studies. A study by Ajibade (2018) found that perceived usefulness and ease of use were beneficial to Korean SMES suggesting adopting e-commerce. Moreover, the TAM framework can serve to predict the usage of various types of e-commerce, trading, and marketing (Abualrob & Kang, 2016). Diffusion of innovation and TAM define the key elements that influence e-commerce, such as perceived value, perceived ease of use, and relative advantage (Paris *et al.*, 2016).

Factors Relating to e-Commerce Adoption

E-commerce has changed the way modern businesses operate. It has created new opportunities for businesses and consumers around the world. In this process, it is mandatory to define e-commerce. E-commerce refers to the process of integrating online innovative technologies into businesses, allowing them to sell goods and services from online platforms and websites. The reasons to adopt e-commerce in SMEs are diverse and complex (Chowdhury *et al.*, 2021). However, the advantages of e-commerce for organisations are global scale, cost reduction, supply chain simplification, 24/7 business open, fast production, and product introduction. The benefits of e-commerce adoption for consumers and customers are anonymity, ubiquity, choice to choose between the large selection of products, personalisation, prompt delivery, cheap delivery charges, no-travel costs. The benefits of e-commerce for society include availability of a wide range of services, improved standards of living, improved national security, online sales, and reduced digital divide (Panasenko *et al.*, 2021). In the case of digitisation, it has been removing a singular link between the consumers and shopping. Through e-commerce, digitisation has enabled a direct interaction among the consumers and salesmen, and in some cases, it has enabled the consumers to establish a link with manufacturers (Zhang, 2021). Digitisation has improved the consumer satisfaction index (Sesar *et al.*, 2021). In cross-border e-commerce trade, digitisation has played an important role to establish a strong link, making it convenient and efficient. The use of digital technology has accurately located the target markets, helped the manufacturers to develop new customers, improved customer satisfaction and sales (Luthfiandana *et al.*, 2024). Digitisation strongly supports foreign trade, and supply chain management. It helps to reduce costs, upgrade logistics and improve customer experience. However, there are some challenges attached to e-commerce and digitisation (Mihailă *et al.*, 2021). In the case of protecting consumer rights, providing security to the customers, dealing with complex financial issues and regulatory policies etc. (Mihailă *et al.*, 2021). To this end, we hypothesised:

H1: Digitisation has a strong positive impact on e-commerce adoption in Pakistan and Bangladesh.

External Environment Factors: Perceived Benefits

Another important factor affecting e-commerce is the 'perceived benefits of e-commerce' (Ismail & Masud, 2020). It has been argued that companies are eager to adopt e-commerce if they believe that e-commerce will bring them benefits such as increased sales, improved customer relationships, and reduced costs. Many factors cam affect the perceived benefits of e-commerce, such as the market in which the company operates, the level of competition and the company's overall strategy. Internet infrastructure is also an important factor affecting the implementation of e-commerce. According to Ismail and Masud (2020), companies located in regions with better communication will be more likely to adopt e-commerce. This is because e-commerce requires reliable, high-speed Internet connections, and companies located in areas with poor Internet connectivity may have difficulty using e-commerce (Emon *et al.*, 2023; Shahriar, 2024).

H2: In Pakistan, in comparison to Bangladesh, the adoption of e-commerce increased more due to external environmental factors after the COVID-19 pandemic.

H2a: External environmental factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.

Need-based Factors

E-commerce has become an important part of the modern business world, providing many benefits to consumers and businesses. However, many factors influence market acceptance of e-commerce. These include demand-driven requirements. One of the main factors affecting e-commerce is the need for online sales. Research shows that companies that are more involved in online sales are more likely to adopt e-commerce (Vaidya & Khachane, 2017). The need for e-commerce can arise from many factors such as the competitive environment, customer needs, and cost savings (Jacob *et al.*, 2020). Another demand-based factor affecting e-commerce is the size of the company. Small and medium-sized businesses (SMES) seem to have a greater need for e-commerce due to limited resources and the need to compete with large companies (Onjewu *et al.*, 2022). In contrast, larger companies may find that they have a lower need to adopt e-commerce because they have established sales pipelines. Furthermore, IT infrastructure and the level of expertise within a company are other demand-driven factors that influence e-commerce implementation. Companies with a higher level of IT infrastructure and expertise will be perceived to have a greater need for e-commerce (Cuellar-Fernández *et al.*, 2021). This is because they have the resources and talent to effectively build and manage e-commerce platforms (Alam *et al.*, 2022; Rana *et al.*, 2022). The perceived risk associated with e-commerce also affects the demand for e-commerce implementation. Companies that perceive higher risk in adopting e-commerce are less likely to adopt e-commerce (Paris *et al.*, 2016). These risks may include security issues, privacy concerns, and uncertainty regarding return on investment. However, many demand-driven factors influence e-commerce, including the need to sell online, company size, IT infrastructure and expertise, and the risk involved (Garai *et al.*, 2023). Understanding these factors can help businesses make e-commerce decisions and develop effective e-commerce strategies.

H3: After the COVID-19 pandemic, the need-based factors led to a greater adoption of e-commerce in Bangladesh compared to Pakistan.

H3a: Need-based factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.

Organisational Factors

Another important factor affecting e-commerce is the organisationsize. According to Chandra and Kumar (2018), small businesses are more likely to adopt e-commerce because they have less capital and can benefit more from cost savings and business efficiency. Large organisations may be less likely to adopt e-commerce because their operations may be more complex and more resistant to change. Organisational culture is an important institution in influencing e-commerce. Organisational culture refers to the shared

values, beliefs, and behaviour that shape the behaviour of the organisation. A study by Chandra and Kumar (2018) and Emon *et al.* (2023) revealed that organisational culture affects e-commerce culture. Organisations with a culture that prioritizes innovation and risk-taking are more likely to adopt e-commerce. Therefore, organisations need to create a culture that values innovation and risk-taking to make e-commerce more profitable. Culture is another important institution that affects e-commerce. Managers play an important role in improving behaviour and decision-making, and their support is essential in e-commerce implementation. A study by Peterson (2004) found that corporate support affects e-commerce performance. Therefore, organisations need to have a culture that supports increasing the adoption rate of e-commerce. Capital is also an important institution that affects the e-commerce business. Adopting e-commerce requires significant investments in technology, infrastructure, and human resources. A study by Alqodsi (2021) found that resources influence e-commerce adoption, with organisations with more resources being more likely to adopt e-commerce. Therefore, organisations need to have adequate resources to invest in e-commerce adoption to increase adoption rates.

H4: The adoption of e-commerce increased more in Bangladesh compared to Pakistan after the COVID-19 pandemic due to organisational factors.

H4a: Organisational factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.

Technological Factors

One of the most important factors guiding e-commerce is the company's willingness to use new technologies. According to Hossain *et al.* (2022), companies with more technology are more likely to adopt e-commerce. This is because e-commerce requires significant technology investment, and companies that are already using advanced technology have the necessary skills and expertise to incorporate e-commerce into their business. User experience is an important technology that affects e-commerce applications. User experience includes ease of navigation, user interface design, website loading speed, and overall website functionality. Pedro *et al.* (2015) showed that user experience is the most important factor in e-commerce. Therefore, e-commerce websites should be designed to enable communication and interaction with users, and their implementation should be encouraged. Security is another important technology in e-commerce. Online shoppers need to feel safe when shopping online, and e-commerce platforms need to provide secure payment systems and protection against cyber threats. Kaiser *et al.* (2021) found that perceived security and trust in e-commerce platforms are important factors in the e-commerce decision-making process. Therefore, e-commerce platforms need to prioritise security measures to increase customer trust and adoption. The widespread use of smartphones has made it important for e-commerce platforms to have mobile-responsive websites and mobile applications. The accessibility of mobile devices also affects e-commerce. Consumers prefer to shop from mobile devices due to convenience and ease of use (Oliinyk *et al.*, 2023). Therefore, e-commerce platforms need to ensure mobile compatibility to increase adoption. Technology infrastructure is an important technology in e-commerce. E-commerce platforms need advanced technology to provide high-speed internet, payment security, and flawless website performance (Emon *et al.*, 2023; Przetacznik, 2022). Axman and Kročová (2019) found that technology is an important determinant of e-commerce. Therefore, e-commerce platforms need to prioritise investing in technology to increase adoption.

H5: After the COVID-19 pandemic, the adoption of e-commerce increased more in Pakistan compared to Bangladesh due to technological factors.

H5a: Technological factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.

Research Gap

Based on the extensive literature review, there are many different potential research areas in e-commerce that need further research. Literature analysis discusses various aspects such as technology, collaboration, external environment, and internet usage. Further research can focus on understanding the interrelationship and importance of these factors. Examining how these factors interact and how together they influ-

ence e-commerce's decision-making can provide further insight. The studies generally broaden the perspective on e-commerce adoption factors. This study shows how these conditions play out differently in different sectors, regions, and organisations. This provides an intuitive understanding of the changing context for e-commerce adoption. The literature review focuses on corporate values, but cultural and social factors can also play a role in shaping attitudes and decisions regarding e-commerce adoption, as observed in the study of Hendricks and Mwapwele (2024). Investigating how culture and tradition influence decision-making, especially across different cultures, is an interesting area of research. While the literature mentions benefits of e-commerce to businesses, there are also different studies examining its long-term benefits. Investigating whether there are positive effects over time or whether there are problems after the adoption of e-commerce may provide further information. This study focuses on the diffusion of innovations (DOI) and technology acceptance model (TAM) models. This study will help future researchers to discover and develop newer strategies such as digital transformation, online platform marketing, and data decision-making. Whereas, issues and problems persist, such as a lack of digital skills among consumers, security breaches and theft issues and high investment. However, the solution lies in analysing practices among e-commerce platforms, successful strategies adopted by small and medium-sized enterprises to overcome challenges. According to previous literature, it has been supposed that SMEs will benefit by adopting e-commerce in their respective firms, which will broaden their scope and reach.

Theoretical Framework

Technology organisation-environment (TOE) developed by Tornatzky and Fleischer (1990) forms the basis of the study's theoretical design. This framework presents three factors that influence SMEs, *i.e.*, technological advancements, organisation upgradation, and external environmental factors. The organisational context refers to the resources of the firms, employees' structure, a process of communication between the firms. This study examined organisational factors to identify the relationship between the innovation adoption process. The environmental context includes industry's structure, firm life cycle, availability of technology, and its providers. We observed the structure of the industry in the form of intense competition and innovation adoption. Researchers observed that a rapidly growing industry tends to adopt innovation better than others. However, in reverse, if a company is in decline, it cannot be said it is due to non-innovative practices (Baker, 2011). One can furnish the TOE framework according to the COVID-19 pandemic-related e-commerce adoption. We modified the TOE framework to include demand-driven dimensions to explain SMEs' e-commerce ubiquitously after the COVID-19 pandemic. We based the demand on demand available online, the need to reduce costs and the need to enter new markets. The TOE framework suggests that three factors influence the technological innovation in organisations, *i.e.*, technology, organisation, and external environment. Building on this framework, this study brings together insights from previous studies to shed light on the e-commerce performance of SMEs post-COVID-19. Technology availability and performance influence SMEs' adoption of e-commerce (Ajibade, 2018; Marangunić & Granić, 2015). An emphasis on preparation and compatibility is important in determining the successful integration of e-commerce platforms. In e-commerce, the size of the organisation and formal and informal communication play an important role. According to the study of Chandra *et al.* (2018), design and internal communication processes are relevant factors in e-commerce decision-making. Government policies, business models, and technological processes support the activities of small and medium-sized businesses. Chandra and Kumar (2018) underscore the importance of government policies and industry ecosystem dynamics on SMEs' technology adoption strategies. This study continues TOE's mission to include needs as a key factor in explaining SMEs' e-commerce in the wake of the COVID-19 pandemic. These factors include the need for an online presence, cost reduction costs, and entering new markets. Evidence from studies by Vaidya and Khachane (2017) shows that there have been post-pandemic changes in consumer and business behaviour, creating significant demand for SMEs.

These factors will become more important for SMEs due to changes in consumer behaviour and business practices after the pandemic. Digitalization will be included as a moderator in the revised TOE framework. Digitalization refers to the extent to which companies adopt digital technologies to transform their business processes and operations. The degree of digitisation should ensure a good relationship between needs and the use of e-commerce. The size of the organisation, informal

and formal systems, and communication systems also influence the use of e-commerce (Gallant, 2024). Environmental factors such as government regulations, business models, and technology trends can also affect SMEs' use of e-commerce.

We introduced the concept of digitalization as a practical step in the reform of the TOE framework. Digitalization, defined as the degree of integration of digital technologies in the transformation of the economy, should ensure the relationship between needs and the acceptance of e-commerce. According to the findings of Parviainen *et al.* (2017), the positive impact of digitalization demonstrates its ability to expand or reduce the impact of demand for e-commerce products. The revised TOE includes demand-driven requirements and digitalization as moderators to explain SMEs' e-commerce after COVID-19. Combining insights from previous research with a cross-sectional study framework, we sought to better understand the underlying mechanisms driving e-commerce implementation in the evolving business environment.

RESEARCH METHODOLOGY

Research Design

We employed across-sectional survey with a structured questionnaire to collect data from the target population. Small and medium-sized enterprises encountered the profound impact of the COVID-19 pandemic over the course of a year, during which these SMEs transformed their business operations over the Internet (Abuhussein *et al.*, 2023). This change made products more convenient for customers, ensured on-time delivery, and supported cashless payment options. The COVID-19 pandemic has had a huge influence on the health of people, including employees and managers working in small and medium-sized businesses around the world. Strict COVID-19 regulations imposed by the government have caused consumers to turn to online platforms to purchase products. Simultaneously, existing online platforms were also benefiting from this change in consumer behaviour. Digitisation has become a key strategy for these SMEs, allowing them to store information online for easy access from anywhere in the world while reducing operating costs. This includes information collected from websites, social media platforms, and similar online sites. Small and medium-sized businesses in both Pakistan and Bangladesh saw digitalization as a way to reduce supply costs, ensure continuous customer engagement, and solve problems arising from the government's COVID-19 lockdown.

We established the comparative structure of the two diverse population from Pakistan and Bangladesh by collecting data. The segmentation was clear to justify two national cohorts for direct comparison. The TOE framework guided the selection of specific factors to examine in the study. In SmartPLS, the core-technique adopted to compare two countries data was through multi-group analysis (MGA), which allows to inspect the difference with path coefficient variability. We used path coefficient values as statistical indicators to represent direction and strength among different factors. Moreover, P-values determined the statistical significance of relationship among countries and MGA calculated the 'differences' between hypothesized relationships.

The independent factors included in the study were: (1) need-based factors, (2) external environment factors, (3) organisational factors, (4) technological factors, and the dependent factor of the study was (5) e-commerce adoption. There exist several researches on Hungarian companies' export activities from macroeconomic.

Sampling

Small and medium sized enterprises in Pakistan and Bangladesh were the study's target population. We selected the sample using stratified random sampling which increased the chances of data collection. For the study, we selected a sample size of 500 SMES. We divided the sample into two sections, 250 respondents from each country (Bangladesh, Pakistan) participating in the study. The target industrial cities in Pakistan were Faisalabad, Lahore, and Karachi, in Bangladesh; Dhaka, Chittagong, and the Dhaka-Chattogram industrial corridor, Bangabandhu Sheikh Mujib. We limited the sample of the study limited to 500 respondents through statistical considerations of power analysis for the SmarPLS tests. Similar studies of Abtahi *et al.* (2023) and Azam *et al.* (2023) have adopted the similar pattern.

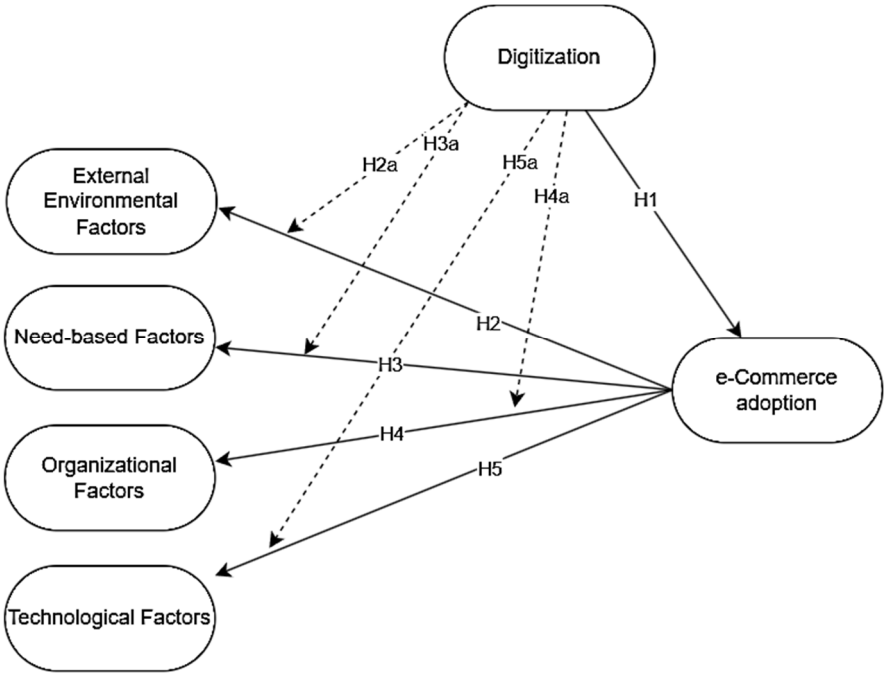

Figure 1. Conceptual Framework of the Study
Source: own elaboration in draw.io.

Data Collection

We used a structured questionnaire to collect data from the SMES in Pakistan and Bangladesh. To carry on the research process, it was necessary to transform the questionnaire into an online platform to circulate the link between the SMES of Bangladesh and Pakistan. We designed the questionnaire based on the research objectives and hypotheses of the study. The questionnaire is pre-tested to ensure that it is clear, concise, and easy to understand. We conducted a pilot study to pre-test questionnaire's reliability and validity. The main purpose to conduct pre-testing was to ensure that the structured questionnaire was concise to collect data, understandable to the targeted SMEs in Pakistan and Bangladesh. The pilot testing targeted 30 samples, 12 from Bangladesh, and 18 from Pakistan. Once we achieved satisfactory refinement, we circulated full-scaled questionnaire to collect data from each country. We collected the data with a 5-point Likert scale, (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree. We collected the primary data from the SME employees, including the (1) manager, (2) supervisor, (3) junior staff, (4) procurement manager, and (5) others (Training & Diplomas). The data collection process started in August 2022 to June 2023. We used English in the questionnaire development, which is understandable for both countries. However, the questionnaire has been translated into Urdu and Bengali for a proper understanding of the questions for the respondents of Pakistan and Bangladesh.

RESULTS AND DISCUSSION

The Table below provides demographic details of the respondents. It shows their gender, age, educational level, position in the SMES, and type of e-commerce industry.

Respondents were men and women as observed in the Table 1. Male respondents constituted 420 (84.0%), whereas female respondents – 80 (16.0%). We categorised respondents by age as follows: between 21 and 30 years, 92 (18.4%); between 31 and 40 years, 280 (56.0%); between 41 to 50 years, 210 (42.0%); and aged 51 and above, 8 (1.6%) of the total respondents. Respondents having a graduate-level education amonunted to 45 (9.0%), post-graduate education, 305 (70.0%), whereas others, including diploma holders, training staff, amounted to 150 (30.0%). Junior staff positions made up 220 (44.0%), supervisor positions accounted for 120 (34.0%), managerial position holders

were 35 (17.0%), the procurement manager position holders were 10 (2.0%), and other position holders were 15 (3.0%). We observed that this study encompassed 100 manufacturing firms (20%), 35 construction firms (7%), 65 financial industries (13%), services firms 130 (26%), communication firms 65 (13%), technology firms 100 (20%), and others 5 (1%).

Table 1. Demographics

Category	Subgroup	Pakistan (N=250)	Bangladesh (N=250)	Total (N=500)
Gender	Male	220 (88%)	200 (80%)	420
	Female	30 (12%)	50 (20%)	80
Age	21-30 years	40 (16%)	52 (20.8%)	92
	31-40 years	135 (54%)	145 (58%)	280
	41-50 years	50 (20%)	70 (28%)	120
	51+ years	2 (0.8%)	6 (2.4%)	8
Education	Graduate	22 (8.8%)	23 (9.2%)	45
	Post-graduate	175 (70%)	130 (52%)	305
	Others (Training/Dip.)	53 (21.2%)	97 (38.8%)	150
Position	Junior staff	110 (44%)	110 (44%)	220
	Supervisor	85 (34%)	35 (14%)	120
	Manager	25 (10%)	10 (4%)	35
	Procurement manager	5 (2%)	5 (2%)	10
	Other	25 (10%)	90 (36%)	115
Industries	Manufacturing	50 (20%)	50 (20%)	100
	Construction	17 (6.8%)	18 (7.2%)	35
	Finance	32 (12.8%)	33 (13.2%)	65
	Service	65 (26%)	65 (26%)	130
	Communication	32 (12.8%)	33 (13.2%)	65
	Technology	50 (20%)	50 (20%)	100
	Other	4 (1.6%)	1 (0.4%)	5

Source: own study.

Measurement Model Assessment

Reliability and Validity

We examined reliability and validity based on Cronbach's alpha value, composite reliability, and average variance extracted (AVE). As observed in the Table 2, composite reliability and validity (rho c), and composite reliability (rho a) for digitisation, external environment factors, need-based factors, organisational factors, technological factors, and e-commerce adoption were higher than 0.7. According to Hair Jr *et al.* (2017), the reliability and validity of the study is satisfactory if the values remain higher than 0.7. The average variance extracted for digitisation, external environment factors, need-based factors, organisational factors, technological factors and e-Commerce adoption were 0.860, 0.795, 0.748, 0.783, 0.907, and 0.914 respectively. All the values of the latent variables regarding AVE were higher than 0.5 showing enough validity (Hair Jr *et al.*, 2017).

Table 2. Reliability and validity

Latent variables	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Digitisation	0.980	1.022	0.982	0.860
External environment factors	0.820	1.319	0.872	0.795
Need-based factors	0.706	1.233	0.752	0.748
Organisational factors	0.867	1.121	0.626	0.783
Technological factors	0.974	0.978	0.980	0.907
e-Commerce adoption	0.969	0.974	0.977	0.914

Source: own study in SmartPLS.

Discriminant Validity

We used Fornell-Larcker criterion to observe latent variable's discriminant validity. It is the parameter to observe; how different each latent variable is from the other construct as stated in the Table 3. We observed that each value was above 0.50 which is the threshold value. Technology factors was 0.956 and e-Commerce adoption – 0.954, which shows excellent convergent validity. External environmental factors (0.560) and organisational factors (0.629) meet the criteria.

Table 3. Fornell-Larcker criterion

Pakistan						
Construct	D	EEF	NBF	OF	TF	ECA
Digitisation	0.928					
External env. factors	-0.036	0.560				
Need-based factors	0.054	0.079	0.635			
Organisational factors	-0.092	0.066	0.182	0.629		
Technological factors	0.009	-0.042	-0.097	-0.127	0.956	
E-commerce adoption	0.056	0.223	-0.083	-0.083	0.096	0.954
Bangladesh						
Digitisation	0.928					
External environment factors	0.101	0.629				
Need-based factors	0.005	-0.165	0.669			
Organisational factors	-0.084	0.005	0.128	0.627		
Technological factors	0.230	0.087	-0.009	0.026	0.953	
E-commerce adoption	-0.069	0.054	-0.103	0.138	0.255	0.956

Source: own study in SmartPLS.

We observed the Heterotrait-monotrait (HTMT) ratio of the latest variables as above the threshold value 0.8, which shows a good discriminant validity according to the (Ab Hamid *et al.*, 2017).

Table 4. Heterotrait-monotrait ratio (HTMT)

Construct Pairs	**Bangladesh**	**Pakistan**	**Validation**
External env. factors ↔ Digitisation	0.247	0.124	**Valid** (Both < 0.85)
Need-based factors ↔ Digitisation	0.069	0.060	**Valid**
Need-based factors ↔ External env. factors	0.450	0.156	**Valid**
Organisational factors ↔ Digitisation	0.158	0.161	**Valid**
Organisational factors ↔ External env. factors	0.528	0.473	**Valid**
Organisational factors ↔ Need-based factors	0.277	0.491	**Valid**
Technological factors ↔ Digitisation	0.245	0.044	**Valid**
Technological factors ↔ External env. factors	0.190	0.070	**Valid**
Technological factors ↔ Need-based factors	0.109	0.095	**Valid**
Technological factors ↔ Organisational factors	0.155	0.139	**Valid**
E-commerce adoption ↔ Digitisation	0.062	0.041	**Valid**
E-commerce adoption ↔ External env. factors	0.094	0.261	**Valid**
E-commerce adoption ↔ Need-based factors	0.080	0.072	**Valid**
E-commerce adoption ↔ Organisational factors	0.106	0.088	**Valid**
E-commerce adoption ↔ Technological factors	0.260	0.090	**Valid**

Source: own study in SmartPLS.

Factor Loading

Figures below show latent variables and their respective factor loading regarding Bangladesh and Pakistan. The factor loading of each construct is above the threshold value 0.7. Each indicator has a positive factor loading.

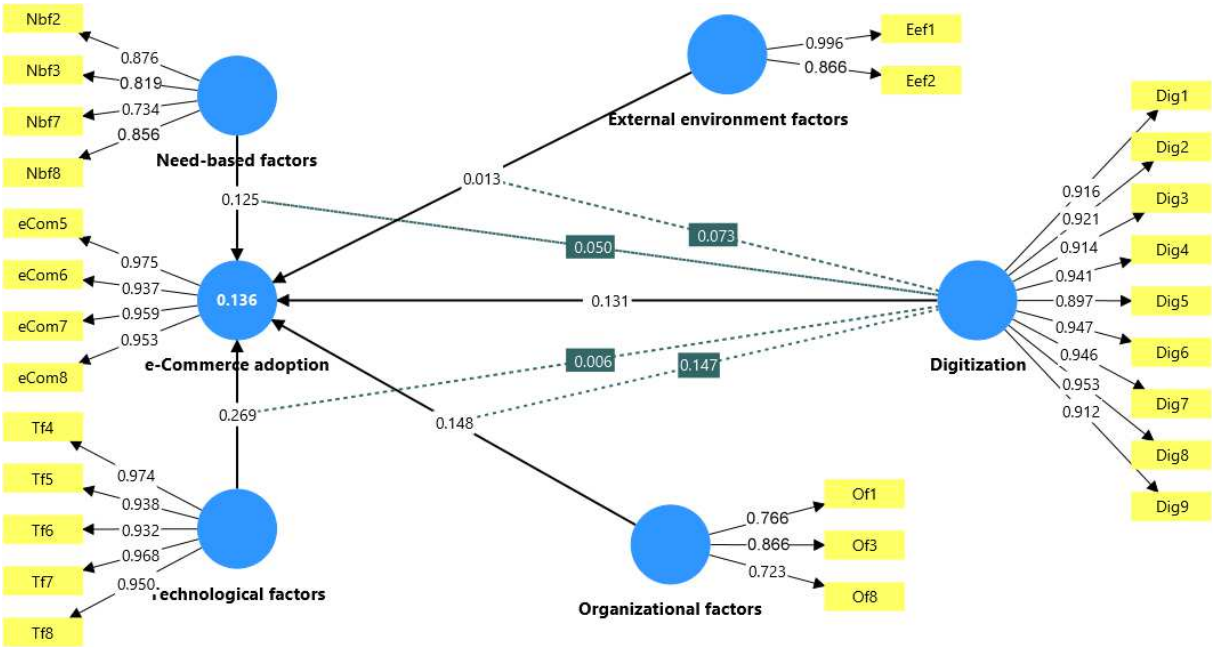

Figure 2. PLS path model (Bangladesh)
Source: own elaboration in SmartPLS.

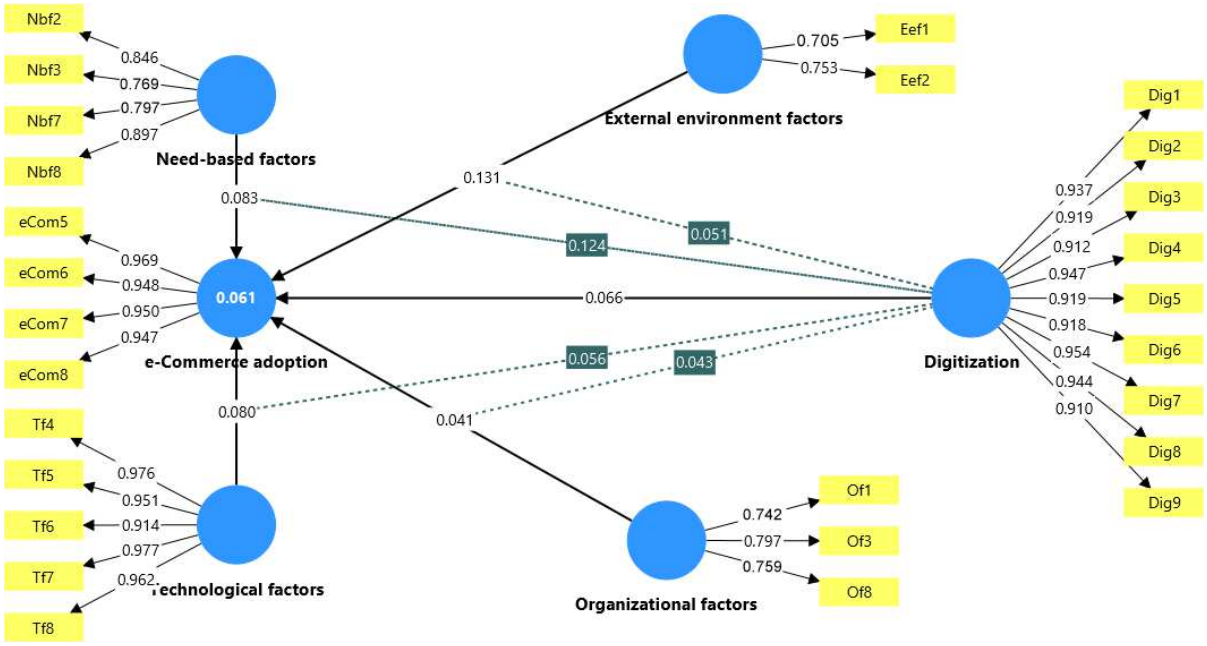

Figure 3. PLS path model (Pakistan)
Source: own elaboration in SmartPLS.

R Square

As stated in the Table 5, shows values of R^2, adjusted R^2 in Bangladesh and Pakistan for e-commerce adoption. We observed that Bangladesh, value of R^2 was 0.136 (adjusted 0.082), whereas the value of R^2 in Pakistan was 0.061 (adjusted 0.054).

Table 5. R Square

Variable	Bangladesh		Pakistan	
	R^2	R^2 adjusted	R^2	R^2 adjusted
e-Commerce adoption	0.136	0.082	0.061	0.054

Source: own study in SmartPLS.

Moderation Analysis

Modelling in SmartPLS refers to the part of SEM that shows the relationship between latent variables. In SmartPLS, a graph can represent the model. The model shows paths or arrows connecting the latent variables and coefficients that represent the strength of the relationship between them (Kamis *et al.*, 2020). The model in SmartPLS is estimated using a technique called partial least squares (PLS) regression. PLS regression is a multivariate analysis method used to model the relationship between variables. The purpose of SmartPLS modelling is to estimate the relationship between latent variables in the model and evaluate the significance and strength of the relationship (Kamis *et al.*, 2020). The output of the model in SmartPLS includes estimates of path coefficients. These measurements serve to evaluate the overall quality of the model and it's fit to the observed data.

Table 6. Multi-group analysis

Path	Bangladesh	Pakistan	difference	p
Digitisation -> E-commerce adoption	0.131	0.066	0.065	0.001
Digitisation x External environment factors -> E-commerce adoption	0.073	0.010	0.063	0.000
Digitisation x Need-based factors -> E-commerce adoption	0.050	-0.035	0.085	0.000
Digitisation x Organisational factors -> E-commerce adoption	0.147	0.022	0.125	0.000
Digitisation x Technological factors -> E-commerce adoption	0.006	0.028	-0.022	0.000
External environment factors -> E-commerce adoption	0.013	0.131	-0.118	0.000
Need-based factors -> E-commerce adoption	0.125	0.083	0.042	0.000
Organisational factors -> E-commerce adoption	0.148	0.041	0.107	0.000
Technological factors -> E-commerce adoption	0.269	0.080	0.189	0.003

Source: own study in SmartPLS.

As stated in Table 7, in Bangladesh, multi-group analysis a significant positive relationship between e-commerce adoption and digitisation -> e-com adoption β=0.131, p<0.000, digitisation x external environment factors -> e-commerce adoption β=0.073, p<0.001, digitisation x need-based factors -> e-commerce adoption β=0.050, p=0.001, digitisation x organisational factors -> e-commerce adoption β=0.147, p<0.001, digitisation x technological factors -> e-commerce adoption β=0.006, p<0.001, external environment factors -> e-com adoption β=0.013, p<0.001, need-based factors -> e-com adoption β=0.125, p<0.001, organisational factors -> e-com adoption β=0.148, p<0.001, technological factors -> e-commerce adoption β=0.269, p<0.001. Whereas in Pakistan, multi-group analysis found that there is a significant positive relationship between e-com adoption and digitisation -> e-com adoption β=0.066, p<0.000, digitisation x external environment factors -> e-com adoption β=0.010, p<0.001, digitisation x need-based factors -> e-com adoption β=-0.035, p=0.001, digitisation x organisational factors -> e-commerce adoption β=0.022, p<0.001, digitisation x technological factors -> e-com adoption β=0.028, p<0.001, external environment factors -> e-com adoption β=0.131, p<0.001, need-based factors -> e-com adoption β=0.083, p<0.001, organisational factors -> e-com adoption β=0.041, p<0.001, technological factors -> e-com adoption β=0.080, p<0.001.

Hypothesis Testing

As stated in the Table 8, hypothesis H1 'digitisation has a strong positive impact on e-commerce adoption in Pakistan and Bangladesh' showed the difference between Bangladesh and Pakistan 0.065 (P> 0.05). The difference indicates that path coefficient of Bangladesh was higher than Pakistan. The result was significant. We accepted the hypothesis as digitisation has a strong impact on both countries,

Bangladesh (Bangladesh β=0.131, p<0.000) and Pakistan (β=0.066, p<0.000 in one analysis). Hypothesis H2: 'In Pakistan, the adoption of e-commerce increased more due to external environmental factors after the COVID-19 pandemic compared to Bangladesh.' In the case, of external environmental factors, the difference was -0.118, which shows that e-commerce adoption in Bangladesh after the COVID-19 pandemic was significantly higher as compared to Pakistan. We rejected this hypothesis because external environmental factors had a greater impact in the adoption of e-commerce in Bangladesh. In the case of organisational factors and technological factors, there was a significant increase of e-commerce adoption in Bangladesh with the difference of 0.107, and 0.189 as compared to Pakistan. Hypothesis H3: 'After the COVID-19 pandemic, the factors based on needs led to a greater increase in the adoption of e-commerce in Bangladesh compared to Pakistan.' We observed that need-based factors have performed better in Bangladesh as compared to Pakistan, with a difference of 0.042. We accepted the hypothesis. Hypothesis H4 'The adoption of e-commerce increased more in Bangladesh compared to Pakistan after the COVID-19 pandemic due to organisational factors.' The difference was 0.107 because the organisation factors performed better in Bangladesh as compared to Pakistan. Hypothesis H5: 'After the COVID-19 pandemic, the adoption of e-commerce increased more in Pakistan compared to Bangladesh due to technological factors.' The results showed the difference of 0.189, which shows that technological factors performed better in Bangladesh for the adoption of e-Commerce as compared to Pakistan. Hence, we rejected hypothesis H5.

Table 7. Multi-group analysis

Relationship	Difference (BANGLADESH – PAKISTAN)
Digitisation -> E-commerce adoption	0.065
Digitisation x external environment factors -> E-commerce adoption	0.063
Digitisation x need-based factors -> E-commerce adoption	0.085
Digitisation x organisational factors -> E-commerce adoption	0.125
Digitisation x technological factors -> E-commerce adoption	-0.022
External environment factors -> E-commerce adoption	-0.118
Need-based factors -> E-commerce adoption	0.042
Organisational factors -> E-commerce adoption	0.107
Technological factors -> E-commerce adoption	0.189

Note: if (p <0.05).

Source: own study in SmartPLS.

Table 8. Hypothesis testing

#	Hypothesis	Difference	P	Remarks
H1	Digitisation has a strong positive impact on e-commerce adoption in Pakistan and Bangladesh	0.065	0.001	**Accepted**
H2	In Pakistan, the adoption of e-commerce increased more due to external environmental factors after the COVID-19 pandemic, compared to Bangladesh	-0.118	0.000	**Rejected**
H2a	External environmental factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.	0.063	0.000	**Rejected**
H3	After the COVID-19 pandemic, the need-based factors led to a greater increase in the adoption of e-commerce in Bangladesh compared to Pakistan	0.042	0.000	**Accepted**
H3a	Need-based factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.	0.085	0.000	**Accepted**
H4	The adoption of e-commerce increased more in Bangladesh compared to Pakistan after the COVID-19 pandemic due to organisational factors	0.107	0.000	**Accepted**
H4a	Organisational factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.	0.125	0.000	**Accepted**
H5	After the COVID-19 pandemic, the adoption of e-commerce increased more in Pakistan compared to Bangladesh due to technological factors	0.189	0.003	**Rejected**
H5a	Technological factors increased the adoption of e-commerce in Bangladesh as compared to Pakistan.	-0.022	0.000	**Accepted**

Source: own study.

Discussion

We observed a significant impact on small and medium sized enterprises all over the globe. It was not limited to any country or specific place. Developed and developing countries have faced the similar situation. In the developing countries of South Asia, Pakistan and Bangladesh faced severe consequences of the COVID-19 pandemic. Many businesses have faced unprecedented challenges, survival issues. After the COVID-19 pandemic, it was necessary for every business to progress. This progression resulted in the form of e-commerce adoption for businesses. The revival of businesses in the time of pandemic needed e-commerce adoption to innovate their business models. E-commerce not only made the businesses remote, but also facilitated the consumers with lower costs and rapid movement. Research indicates that small and medium sized enterprises in Pakistan and Bangladesh were more likely to adopt e-commerce as they embrace digital tools and technologies. This study's observations align with the study of Chaudhuri and Kumar (2015) and Hossain *et al.* (2021) as observed in our research's literature review section. However, we observed that adoption of e-commerce with the help of digitisation in Bangladesh was more advanced as compared to Pakistan. The findings revealed that small and medium-sized enterprises (SMEs) in Pakistan and Bangladesh leverage digital technologies to strengthen their e-commerce operations, enabling business growth through improved operational efficiency and enhanced adaptability to market demands. The findings also revealed that need-based factors and digitisation is more likely to have strong positive impact, but the case of need- based factors is different in the case of Bangladesh, more favourable as compared to Pakistan. It is more likely because the economic condition of Bangladesh is better than Pakistan. This study's observations totally align with a similar study of Alam *et al.* (2023) and Rana *et al.* (2022) as observed in our literature review. The case with external environmental factors significantly affecting e-commerce adoption in Bangladesh is similar. However, the direct effect of environmental factors is stronger in Pakistan as compared to Bangladesh. Emon *et al.* (2023) and Shahriar (2024) observed a similar case in their studies. Onjewu *et al.* (2022) reaffirm the importance of need-based factors as observed in the literature review. This study has observed the moderation impact of environmental factors on the adoption of e-commerce. The study showed that Bangladesh likely contributed more the impact of environmental factors as compared to Pakistan. Organisational factors have strong impact on businesses. In the case of Bangladesh, organisational factors were more likely to have better impact as compared to Pakistan. Emon *et al.* (2023) have drawn similar conclusions. The organisational factors have a strong impact on e-commerce adoption in Bangladesh, whereas the organisational factors are weak in Pakistan. In the case of technological factors that contribute in the development of businesses for small and medium sized enterprises, impact more likely remained positive in both countries. This study's observation align with the studies of Emon *et al.* (2023) and Przetacznik, (2022) as discussed in our study's literature review. The comparative analysis shows that Pakistan has several issues regarding the economic crisis and shutdown of industries due to the economic collapse. Due to the economic crisis, Pakistan received less support from the external environment. The results show that SMES in Pakistan and Bangladesh can benefit from a strategic approach through the use of e-commerce that focuses on the use of technology to enhance their capabilities. Policymakers and business organisations can facilitate this adoption by investing in digital infrastructure, promoting digital literacy and skills training, and creating a regulatory environment that supports innovation and growth in e-commerce. Small and medium-sized businesses need to establish an online presence to attract customers who are reluctant to visit stores due to the pandemic. They also need to simplify operations by using technology to help them manage inventory, order processing, and delivery more efficiently. The integration of digital technologies has emerged as a critical facilitator for e-commerce implementation among small and medium enterprises in Pakistan and Bangladesh as stated in the studies of (Jamil, 2021; Alam, 2023). Technologies such as cloud computing and AI can help SMEs achieve automation, reduce costs, and increase efficiency. This technology can also help them develop new business models that suit the changing needs of customers in the post-pandemic era. Policymakers and industry bodies can play an important role in promoting

e-commerce among SMEs in Pakistan and Bangladesh. They can provide them with training and resources to help them develop their digital capabilities and implement e-commerce solutions based on their specific needs. They can also work to create a regulatory environment that supports innovation and growth in e-commerce. In Pakistan and Bangladesh, the adoption of need-based e-commerce by SMEs is important after the COVID-19 pandemic. By using technology and developing new business models, SMEs in these countries can overcome the problems caused by the pandemic and revolutionize the economic conditions of both countries. After the COVID-19 pandemic, Pakistan did not survive the e-commerce revolution in the country. In Bangladesh, the situation regarding economic stability is better than in Pakistan, which is the reason for its e-commerce adoption.

The comparative analysis between Pakistan and Bangladesh's SMEs in the adoption of e-commerce have shown distinct challenges. These challenges demand from both countries specific policies to mitigate the challenges and enrich the adoption of e-commerce on broad standards. Meanwhile, both countries have accepted digitisation is a major role player for the adoption of e-commerce, especially in the time of COVID-19 pandemic. The findings underscore the importance of tailored strategies. Bangladesh has shown an emerging trend for digital transformation and its economic stability is better than Pakistan. However, we recommend an advanced level of e-commerce adoption. To achieve this target, authorities should devise policies accordingly for a sustainable development. Policy makers should focus more on digital infrastructure to provide support for the adoption of e-commerce in industries.

CONCLUSIONS

The COVID-19 pandemic has profoundly reshaped the landscape for SMEs across nations, casting a particular spotlight on Pakistan and Bangladesh, because these developing countries are facing the aftermath of the COVID-19 pandemic. The e-commerce adoption moderated by digitisation has a pivotal role in the survival setup of small and medium industries in both countries. The results of the study explain the role of digitisation, and its deep-rooted principles for need-based e-commerce adoption that empower the small and medium-sized enterprises to engage with potential consumers, and customers, empowering their production line based on competitiveness. As these businesses deal with the impact of the pandemic, the integration of e-commerce solutions is vital for the survival and growth of small and medium-sized businesses. E-commerce adoption is a great opportunity for small and medium industries to enter the digital world, engage with customers in online atmosphere, improve business processes and become more efficient and competitive. Comparative analysis of the two countries reveals that Bangladesh has emerged as the hub of digital transformation and development initiatives have intricately driven e-commerce adoption. The interaction of many multifaceted factors affects the course of e-commerce. In particular, Bangladesh has taken full advantage of these factors to create fertile ground for e-commerce adoption after the COVID-19 pandemic. Bangladesh has implemented protectionism and security, and Pakistan faces growing economic challenges such as rising inflation and rising poverty. The post-pandemic situation has put Pakistan in a difficult situation, hindering the survival of small and medium-sized businesses and creating an economic quagmire. Bangladesh's keen understanding of leveraging the intricacies of digitalization has ensured its leading position in e-commerce. Instead, Pakistan's problem constitutes an important reminder of the unity of financial stability and e-commerce.

Limitations

Some of the limitations of this study may include the use of a convenience sampling technique which may not be representative of the target population. The self-reported nature of the data may also introduce bias in the results. Moreover, the study may not be generalisable to other industries outside of the e-commerce industry, and the study is limited to the post-pandemic era.

Future Recommendations

We can make several recommendations to promote the need-based e-commerce adoption for SMEs after the COVID-19 pandemic with special reference to digitisation as a moderator in Pakistan and Bangladesh.

There is a need to encourage partnership programs between small and medium-sized enterprises and internet service providers to help SMEs attain their potential target of e-commerce facilitation for consumers at all levels. There is a need to joint venture the investment process between public and private bodies to expand the e-commerce in Pakistan. Moreover, there is a need to initiate e-Commerce mutual platforms that can cover both country's needs. Through this platform, consumers can buy products from other countries that are linked with one system. The level of inflation is high in Pakistan and Bangladesh. Due to high inflation, internet access, availability of smartphones is not easy for every potential customer. Through partnership, SMEs can introduce smartphones on easy instalments for every consumer, that will enrich their business. On government level, authorities must initiate business awareness programs and e-commerce adoption programs to ensure the level of business literacy in the country.

REFERENCES

Ab Hamid, M.R., Sami, W., & Sidek, M.M. (2017). Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion. Paper presented at the Journal of physics: Conference series. https://doi.org/10.1088/1742-6596/890/1/012163

Abualrob, A.A., & Kang, J. (2016). The barriers that hinder the adoption of e-commerce by small businesses: Unique hindrance in Palestine. *Information Development, 32*(5), 1528-1544. https://doi.org/10.1177/0266666915609774

Abuhussein, T., Barham, H., & Al-Jaghoub, S. (2023). The effects of COVID-19 on small and medium-sized enterprises: Empirical evidence from Jordan. Journal of Enterprising Communities: *People and Places in the Global Economy, 17*(2), 334-357. https://doi.org/10.1108/JEC-03-2021-0043

Abtahi, A.T., Farhana, N., & Hasan, M.M. (2023). A study on the impact of E-commerce adoption for enhancing supply chain efficiency in Bangladesh SMES. *Business and Economics in Developing Countries, 1*(1), 29-33. https://doi.org/10.26480/bedc.01.2023.29.33

Ahmed, N., & Kumari, A. (2022). The Implication of E-commerce Emerging Markets in Post-Covid Era. *International Journal of Entrepreneurship and Business Management, 1*(1), 21-31. https://doi.org/10.54099/ijebm.v1i1.102

Ahmed, S.A.S., Ajisola, M., Azeem, K., Bakibinga, P., Chen, Y.-F., Choudhury, N.N., . . . Kibe, P. (2020). Impact of the societal response to COVID-19 on access to healthcare for non-COVID-19 health issues in slum communities of Bangladesh, Kenya, Nigeria and Pakistan: results of pre-COVID and COVID-19 lockdown stakeholder engagements. *BMJ Global Health, 5*(8), e003042. https://doi.org/10.1136/bmjgh-2020-003042

Ajibade, P. (2018). Technology Acceptance Model Limitations and Criticisms: Exploring the Practical Applications and Use in Technology-related Studies, Mixed-method, and Qualitative Researches. *Library Philosophy and Practice (e-journal)*

Akpan, I.J., & Ibidunni, A.S. (2021). Digitization and technological transformation of small business for sustainable development in the less developed and emerging economies: a research note and call for papers. *Journal of Small Business & Entrepreneurship,* 1-7. https://doi.org/10.1080/08276331.2021.1924505

Alam, M.J., Hassan, R., & Ogawa, K. (2023). Digitalization of higher education to achieve sustainability: Investigating students' attitudes toward digitalization in Bangladesh. *International Journal of Educational Research Open, 5, 100273*. https://doi.org/10.1016/j.ijedro.2023.100273

Alqodsi, E.M. (2021). The right to pre-contractual information in e-commerce consumer contracts: uae law and comparative perspectives. *Journal of Legal*, *Ethical and Regulatory Issues, 24*(2), 1-16.

Axman, M., & Kročová, Š. (2019). Safety of technical infrastructure in crisis situations. *International Multidisciplinary Scientific GeoConference: SGEM*, *19*(3.1), 481-488. https://doi.org/10.5593/sgem2019/3.1/S12.062

Azam, M.S., Morsalin, M., Rakib, M.R.H.K., & Pramanik, S.A.K. (2023). Adoption of electronic commerce by individuals in Bangladesh. *Information Development, 39*(4), 764-786. https://doi.org/10.1177/02666669211052523

Baker, J. (2011). The technology-organization-environment framework. *Information Systems Theory: Explaining and Predicting Our Digital Society*, *1*, 231-245. https://doi.org/10.1007/978-1-4419-6108-2_12

Baubonienė, Ž., & Gulevičiūtė, G. (2015). E-commerce factors influencing consumers 'online shopping decision. *Social Technologies, 5*(1), 62-73.

Bawack, R.E., Wamba, S.F., Carillo, K.D.A., & Akter, S. (2022). Artificial intelligence in E-Commerce: a bibliometric study and literature review. *Electronic Markets, 32*(1), 297-338. https://doi.org/10.1007/s12525-022-00537-z

Bashir, M.A., Dengfeng, Z., Filipiak, B.Z., Bilan, Y., & Vasa, L. (2023). Role of economic complexity and technological innovation for ecological footprint in newly industrialized countries: does geothermal energy consumption matter?. *Renewable Energy, 217*, 119059. https://doi.org/10.1016/j.renene.2023.119059

Bhatti, A., Akram, H., Basit, H.M., Khan, A.U., Raza, S.M., & Naqvi, M.B. (2020). E-commerce trends during COVID-19 Pandemic. *International Journal of Future Generation Communication and Networking, 13*(2), 1449-1452.

Bite, P., Szombathelyi, M.K., & Vasa, L. (2020). The concept of labour migration from the perspective of Central and Eastern Europe. *Economics & Sociology, 13*(1), 197-216. https://doi.org/10.14254/2071-789x.2020/13-1/13

Chandra, S., & Kumar, K.N. (2018). Exploring factors influencing organizational adoption of augmented reality in e-commerce: empirical analysis using technology-organization-environment model. *Journal of Electronic Commerce Research, 19*(3).

Chaudhuri, P., & Kumar, A. (2015). Role of digitization and e-commerce in indian economic growth: an employment generation perspective. *98th Annual of Conference of Indian Economic Association*. December.

Chowdhury, M.S.A., Akter, S., Chowdhury, M.M., Ahsan, S.M.H., & Arafat, A.Y. (2021). Is COVID-19 a Blessing for Ecommerce: A View from Bangladesh. *Global Journal of Management and Business Research, 21*(B2), 17-21. Retrieved from https://www.managementjournal.info/index.php/IJAME/article/view/686 on July 2, 2024.

Cuellar-Fernández, B., Fuertes-Callén, Y., & Serrano-Cinca, C. (2021). Survival of e-commerce entrepreneurs: The importance of brick-and-click and internationalization strategies. *Electronic Commerce Research and Applications, 46*, 101035. https://doi.org/10.1016/j.elerap.2021.101035

Davis, F.B. (1968). Research in comprehension in reading. *Reading Research Quarterly*, 499-545. https://doi.org/10.2307/747153

Emon, M.M.H., & Nahid, M.M. (2023). Factors affecting sustainable e-commerce adoption: empirical evidence from Bangladeshi SMEs. https://doi.org/10.26480/csmj.01.2023.32.36

Farmaki, A., Miguel, C., Drotarova, M.H., Aleksić, A., Časni, A.Č., & Efthymiadou, F. (2020). Impacts of Covid-19 on peer-to-peer accommodation platforms: Host perceptions and responses. *International Journal of Hospitality Management, 91*, 102663. https://doi.org/10.1016/j.ijhm.2020.102663

Fatonah, S., Yulandari, A., & Wibowo, F.W. (2018). *A review of e-payment system in e-commerce.* Paper presented at the Journal of Physics: Conference Series. https://doi.org/10.1088/1742-6596/1140/1/012033

Fedorko, I., Bacik, R., & Gavurova, B. (2018). Technology acceptance model in e-commerce segment. Management & Marketing. *Challenges for the Knowledge Society, 13*(4), 1242-1256. https://doi.org/10.2478/mmcks-2018-0034

França, R.P., Peluso, M., Monteiro, A.C.B., Iano, Y., Arthur, R., & Vieira Estrela, V. (2018). Development of a kernel: a deeper look at the architecture of an operating system. Paper presented at the Brazilian technology symposium. https://doi.org/10.1007/978-3-030-16053-1_10

Gourinchas, P.-O. (2020). Flattening the pandemic and recession curves. Mitigating the COVID economic crisis: *Act Fast and Do Whatever, 31*(2), 57-62.

Gallant, N. (2024). The adoption and diffusion of e-commerce by township SMEs: a mixed methods methodology. Retrieved from The adoption and diffusion of e-commerce by township SMEs : a mixed methods methodology on June 2, 2024.

Garai-Fodor, M., Vasa, L., & Jäckel, K. (2023). Characteristics of consumer segments based on perceptions of the impact of digitalization. Decision Making: *Applications in Management and Engineering, 6*(2), 975-993. https://doi.org/10.31181/dmame622023940

Goy, A., Ardissono, L., & Petrone, G. (2007). Personalization in e-commerce applications. In The adaptive web: methods and strategies of web personalization. *Springer*, 485-520. https://doi.org/10.1007/978-3-540-72079-9_16

Hair Jr, J.F., Matthews, L.M., Matthews, R.L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. *International Journal of Multivariate Data Analysis, 1*(2), 107-123. https://doi.org/10.1504/IJMDA.2017.087624

Hayashi, F., & Bradford, T. (2014). Mobile payments: Merchants' perspectives. *Economic Review*, *99*(1), 5-30.

Hendricks, S., & Mwapwele, S.D. (2024). A systematic literature review on the factors influencing e-commerce adoption in developing countries. *Data and Information Management, 8*(1), 100045. https://doi.org/10.1016/j.dim.2023.100045

Higueras-Castillo, E., Liébana-Cabanillas, F.J., & Villarejo-Ramos, Á.F. (2023). Intention to use e-commerce vs physical shopping. Difference between consumers in the post-COVID era. *Journal of Business Research, 157*, 113622. https://doi.org/10.1016/j.jbusres.2022.113622

Hossain, M.B., Wicaksono, T., Nor, K.M., Dunay, A., & Illes, C.B. (2022). E-commerce adoption of small and medium-sized enterprises during COVID-19 pandemic: Evidence from South Asian Countries. *The Journal of Asian Finance, Economics and Business, 9*(1), 291-298.

Huseynov, F., & Yıldırım, S.Ö. (2017). Behavioural segmentation analysis of online consumer audience in Turkey by using real e-commerce transaction data. *International Journal of Economics and Business Research, 14*(1), 12-28. https://doi.org/10.1504/IJEBR.2017.085549

Ismail, N.A., & Masud, M.M. (2020). Prospects and challenges in improving e-commerce connectivity in Malaysia. E-commerce Connectivity in ASEAN. Jakarta, Indonesia: Economic Research Institute for ASEAN and East Asia, 78-98.

Jacob, C., Sanchez-Vazquez, A., & Ivory, C. (2020). Understanding clinicians' adoption of mobile health tools: a qualitative review of the most used frameworks. *JMIR mHealth and uHealth, 8*(7), e18072. https://doi.org/10.2196/18072

Jamil, S. (2021). From digital divide to digital inclusion: Challenges for wide-ranging digitalization in Pakistan. *Telecommunications Policy, 45*(8), 102206. https://doi.org/10.1016/j.telpol.2021.102206

Kaiser, B., Wei, J., Lucherini, E., Lee, K., Matias, J.N., & Mayer, J. (2021). Adapting security warnings to counter online disinformation. Paper presented at the 30th USENIX Security Symposium (USENIX Security 21).

Kamis, A., Saibon, R.A., Yunus, F., Rahim, M.B., Herrera, L.M., & Montenegro, P. (2020). The SmartPLS analyzes approach in validity and reliability of graduate marketability instrument. *Social Psychology of Education, 57*(8), 987-1001.

Khrais, L.T. (2020). Role of artificial intelligence in shaping consumer demand in E-commerce. *Future Internet, 12*(12), 226. https://doi.org/10.3390/fi12120226

Kułyk, P., & Michałowska, M. (2016). Consumer behaviour on the e-commerce market in the light of empirical research in Lubuskie voivodeship. *Management, 20*(1), 239-255. https://doi.org/10.1515/manment-2015-0037

Kumari, A., & Ahmed, N. (2022). The Implication of E-commerce: Emerging Markets in Post-Covid Era. *Pakistan Journal of Multidisciplinary Innovation, 1*(1), 26-36. https://doi.org/10.59075/pjmi.v1i1.31

Lertwongsatien, C., Wongpinunwatana, N., & Achakulwisut, A. (2004). Factors Influencing E-Commerce Adoption in Small to Medium Businesses: An Empirical Study in Thailand. In Electronic Commerce in Small to Medium-Sized Enterprises: Frameworks, Issues and Implications. *IGI Global107*-127 https://doi.org/10.4018/978-1-59140-146-9.ch007

Luthfiandana, R., Barus, G.A., Nuraeni, N., Yanthy, S., & Pujiati, H. (2024). Marketing Strategy: Segmenting, Targeting, and Positioning for Digital Business (Literature Review). *Siber International Journal of Digital Business (SIJDB), 1*(4), 11-22.

Marangunić, N., & Granić, A. (2015). Technology acceptance model: a literature review from 1986 to 2013. *Universal Access in the Information Society, 14*, 81-95. https://doi.org/10.1007/s10209-014-0348-1

Marushchak, L., Pavlykivska, O., Khrapunova, Y., Kostiuk, V., & Berezovska, L. (2021). The economy of digitalization and digital transformation: Necessity and payback. Paper presented at the 2021 11th International Conference on Advanced Computer Information Technologies (ACIT). https://doi.org/10.1109/ACIT52158.2021.9548529

Mihailă, S., Bădicu, G., Codrean, V., & Dascălu, I. (2021). E-commerce in the context of globalization and digitalization: opportunities, challenges and perspectives. *European Journal of Accounting, Finance and Business, 1-9.*

Oliinyk, O., Mishchuk, H., Vasa, L., & Kozma, K. (2023). Social responsibility: Opportunities for integral assessment and analysis of connections with business innovation. *Sustainability, 15*(6), 5608. https://doi.org/10.3390/su15065608

Onjewu, A.-K.E., Hussain, S., & Haddoud, M.Y. (2022). The Interplay of E-commerce, Resilience and Exports in the Context of COVID-19. *Information Systems Frontiers, 24*(4), 1209-1221. https://doi.org/10.1007/s10796-022-10342-w

Przetacznik, S. (2022). Key success factors of enterprise risk management systems: Listed Polish companies. *Central European Management Journal, 30*(1), 91-114. https://doi.org/10.17512/pjms.2022.25.1.10

Panasenko, S.V., Cheglov, V.P., Ramazanov, I.A., Krasil'nikova, E.A., & Sharonin, P.N. (2021). Mechanisms of e-commerce enterprises development in the context of digitalization. *Nexo Scientific Journal, 34*(01), 469-476. https://doi.org/10.5377/nexo.v34i01.11324

Paris, D.L., Bahari, M., Iahad, N.A., & Ismail, W. (2016). Systematic literature review of e-commerce implementation studies. *Journal of Theoretical and Applied Information Technology.*

Parviainen, P., Tihinen, M., Kääriäinen, J., & Teppola, S. (2017). Tackling the digitalization challenge: how to benefit from digitalization in practice. *International Journal of Information Systems and Project Management, 5*(1), 63-77. https://doi.org/10.12821/ijispm050104

Pedro, J.S., Proserpio, D., & Oliver, N. (2015). MobiScore: towards universal credit scoring from mobile phone data. Paper presented at the International Conference on user Modelling, adaptation, and personalization. https://doi.org/10.1007/978-3-319-20267-9_16

Peterson, D. (2004). Perceived leader integrity and ethical intentions of subordinates. *Leadership & Organization Development Journal*. https://doi.org/10.1108/01437730410512741

Poong, Y., Zaman, K.-U., & Talha, M. (2006). E-commerce today and tomorrow: a truly generalized and active framework for the definition of electronic commerce. Paper presented at the Proceedings of the 8th international conference on Electronic commerce: The new e-commerce: innovations for conquering current barriers, obstacles and limitations to conducting successful business on the internet. https://doi.org/10.1145/1151454.1151459

Priambodo, I.T., Sasmoko, S., Abdinagoro, S.B., & Bandur, A. (2021). E-Commerce readiness of creative industry during the COVID-19 pandemic in Indonesia. *The Journal of Asian Finance, Economics and Business, 8*(3), 865-873.

Rana, M., Rekha, R.S., & Islam, H. (2022). The impact of digitalization on the economic growth of Bangladesh. *Journal of Business Studies, 3*(1), 107-118. https://doi.org/10.58753/jbspust.3.1.2022.7

Ritter, T., & Pedersen, C.L. (2020). Digitization capability and the digitalization of business models in business-to-business firms: Past, present, and future. *Industrial Marketing Management, 86*, 180-190. https://doi.org/10.1016/j.indmarman.2019.11.019

Rogers, E.M., & Cartano, D.G. (1962). Methods of measuring opinion leadership. *Public Opinion Quarterly, 435-441*. https://doi.org/10.1086/267118

Santos-Jaén, J.M., Gimeno-Arias, F., León-Gómez, A., & Palacios-Manzano, M. (2023). The Business Digitalization Process in SMEs from the Implementation of e-Commerce: An Empirical Analysis. *Journal of Theoretical and Applied Electronic Commerce Research, 18*(4), 1700-1720. https://doi.org/10.3390/jtaer18040086

Sesar, V., Hunjet, A., & Primorac, D. (2021). The impact of digitalization on customer satisfaction and customer loyalty: literature review. *Economic and Social Development: Book of Proceedings, 297*-306.

Shahriar, A. (2024). Factors influencing the growth of e-commerce in Bangladesh. *International Journal of Trendy Research in Engineering and Technology*, *9*(02), 36-43. https://doi.org/10.54473/ijtret.2025.9203

Syriopoulos, K. (2020). The impact of COVID-19 on entrepreneurship and SMEs. *Journal of the International Academy for Case Studies, 26*(2), 1-2.

Tanos, M., Man, N., & Nawi, N. (2024). Perceived Ease of Use, Perceived Usefulness, and Intention to Use E-Commerce Platforms by Agribusiness Owners in Malaysia: A Review. *International Journal of Academic Research in Business and Social Sciences, 14*(2), 666-678. https://doi.org/10.6007/IJARBSS/v14-i2/20488

Vaidya, N., & Khachane, A. (2017). Recommender systems-the need of the ecommerce ERA. Paper presented at the 2017 International Conference on Computing Methodologies and Communication (ICCMC). https://doi.org/10.1109/ICCMC.2017.8282616

Wani, T.A., & Ali, S. (2015). Innovation diffusion theory. *Journal of General Management Research, 3*(2), 101-118.

Yadav, R., & Mahara, T. (2018). Preliminary study of e-commerce adoption in Indian handicraft sme: a case study. Paper presented at the Soft Computing: Theories and Applications: *Proceedings of SoCTA 2016, Volume 2*. https://doi.org/10.1007/978-981-10-5699-4_48

Authors

The contribution share of authors is as follows: Muhammad Usman Khan (30%): Conceptualization, draft writing, revising, formal analysis; Samia Nassar (20%): methodology, final writing for submitting, revising review & editing; Mohammad Fakhrul Islam (15%): Formal analysis, Writing –review and editing, Visualization, Software; Md Billal Hossain (15%): Conceptualization, Writing Original draft, Methodology, Project Administration; Laszlo Vasa (20%): Data curation; Methodology, Supervision, Investigation, Funding Acquisition.

Muhammad Usman Khan

His research interests include e-Commerce adoption in developing countries, social responsibility, Epistemology of entrepreneurship, Business ethics, and Philosophy based brand strategies.

Correspondence to: Muhammad Usman Khan, Department of Business and Information Technology, University of Punjab, 54000, Lahore, Pakistan. Canal Rd, Quaid-i-Azam Campus. e-mail: usmankhan228@hotmail.com

ORCID https://orcid.org/0009-0003-3301-605X

Samia Nassar

Her research interests include Project management, Strategic planning, Organisational knowledge management, Monitoring and Evaluation, Food security etc.

Correspondence to: Samia Nassar, Pater Karoly Street 1, Doctoral School of Economic & Regional Sciences, Hungarian University of Agriculture and Life Sciences, Hungary Godollo 2100, Pest, Hungary. e-mail: samia-nassar@hotmail.com

ORCID https://orcid.org/0000-0002-1837-2633

Mohammad Fakhrul Islam

He is currently a doctoral candidate at the Doctoral School of Economic and Regional Sciences, Hungarian University of Agriculture and Life Sciences (MATE), Gödöllő, Hungary. He has also been contributing to academia for thirteen years in different capacities- Academic, Researcher, Visiting research position, Research Trainer etc. His research interests include GHRM, Management, Sustainability, Organizational Behaviour etc.

Correspondence to: Mohammad Fakhrul Islam, College of Business Administration, International University of Business Agriculture and Technology (IUBAT), Dhaka, Bangladesh. e-mail: fakhrul.mate.hu@gmail.com

ORCID https://orcid.org/0000-0002-5638-5099

Md Billal Hossain (corresponding author)

He is currently holding Senior Lecturer position at Westminster International University in Tashkent (WIUT), Uzbekistan and also a visiting researcher at Széchenyi István University of Győr, Hungary. His research interests include Technology Acceptance, E-commerce, Knowledge Management, Organisational Management, Innovation etc.

Correspondence to: Md Billal Hossain WIUT Business School, Westminster International University in Tashkent (WIUT), 100047 Tashkent, Uzbekistan. 12 Istikbol street, e-mail: mbhossain@wiut.uz

ORCID https://orcid.org/0000-0003-0118-7076

Laszlo Vasa

He is a research professor at the Széchenyi István University and a Full Professor. His research interests include economics of transition, post-Soviet studies and international issues of agricultural economics. He is a Full Professor and PhD supervisor of Hungarian and foreign doctoral schools, member of the editorial board of different referred international and Hungarian scientific journals.

Correspondence to: Laszlo Vasa, Faculty of Economics, Széchenyi István University, Egyetem Tér 1, Győr, Hungary. Egytem ter 1, Gyor, 9026, Hungary, e-mail vasa.laszlo@sze.hu

ORCID https://orcid.org/0000-0002-3805-0244

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