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Research article

The mediating role of customer attitudes in the linkage between e-commerce and the digital economy

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Abstract: Recently, TechCrunch, a digital economy news site, noted that "Uber, the world's largest taxi company, owns no vehicles. Facebook, the world's most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbnb, the world's largest accommodation provider, owns no real estate, something interesting is happening." All these companies are involved in e-commerce business, namely the process of buying and selling products by electronic means, such as mobile applications and the Internet. In light of this, this study aimed to examine the relationship between e-commerce and digital economy, with a particular focus on the mediating role of customers' attitudes. To achieve this objective, the study employed a mixed research approach and adopted an explanatory research design. The target population consisted of all customers who are potential e-commerce users. Convenience sampling techniques were employed to collect data from respondents. The findings of the study revealed a positive and significant relationship between e-commerce and the digital economy, both in terms of direct and indirect effects. Additionally, the study identified the partial mediating role of customer attitudes in this relationship. Based on these findings, the study recommends that e-commerce companies should explore the

potential of social networking media platforms such as Facebook and Instagram to further enhance overall e-commerce usage among customers. This strategic approach can complement their existing platforms and contribute to their growth and success in the digital economy.

Keywords: e-commerce; digital economy; customers' attitude

JEL Codes: L81; D11

1. Introduction

The rise of technology has brought about a profound transformation in the trading landscape, with e-commerce emerging as a pivotal component (Li et al., 2013). This shift has created promising prospects for sustainable economic development in both developed and developing countries (Kiu & Lee, 2017). E-commerce has been widely recognized as a means for developing nations to establish a stronger presence in the multilateral trading system (Sui & Rejeski, 2002). Additionally, the widespread adoption of information and communication technologies (ICT), including the Internet, tablet devices, and smartphones, along with the expanding consumer base, has propelled the global business community toward embracing e-commerce at a rapid pace (Palacios, 2003).

The advent of e-commerce has bestowed buyers with distinct advantages, primarily through the Internet's provision of access to the global market (Dan & Song, 2009). This newfound accessibility empowers buyers to compare prices across different regions, ascertain whether prices differ based on order fragmentation, and gain awareness about substitute products (Brand & Huizingh, 2008). Moreover, the transparency of the online market enables customers to easily compare the services offered by various e-commerce platforms (Chai et al., 2018). In the realm of e-commerce, competitors are just a click away from customers (Dong, 2017). If clients are dissatisfied with the products, prices, or services provided by a particular e-commerce site, they can swiftly switch to alternative options much more easily than in the physical realm (Yu et al., 2009). From the perspective of sellers, the physical existence of a brick-and-mortar shop is no longer a prerequisite for conducting business. The successful adoption of e-commerce is a gradual process that unfolds through a series of small adoption stages, allowing companies to progress gradually from simple to more complex stages of e-commerce implementation (Brand & Huizingh, 2008).

E-commerce can be summarized as the process of buying and selling goods and services online through electronic means, such as websites, mobile applications, and online platforms. It specifically focuses on the transactional aspect of business conducted over the Internet. On the other hand, the digital economy encompasses a broader scope. It refers to the overall economic activities that are driven by digital technologies, including not only e-commerce but also various other digital platforms, services, and technologies (Johnson & Turner, 2004).

The digital economy encompasses digital transformation across multiple sectors, including finance, communication, entertainment, healthcare, education, and more. While e-commerce is a specific subset of the digital economy, the digital economy encompasses a wider range of activities beyond just online transactions. It includes various digital services, data-driven innovations, digital

infrastructure, and the overall impact of digital technologies on economic growth and productivity (Qin et al., 2016).

The growth of e-commerce over time drives toward a digital economy (Priescu et al., 2009). According to Mentsiev et al. (2020), the digital economy is experiencing significant growth, with an annual rate of 10%–15%, surpassing the growth rates of other economic sectors. Moreover, the digital economy is often considered a green economy, as it is not solely focused on economic activities but also encompasses environmentally sustainable practices (Pan et al., 2021).

Digital economy and e-commerce share a direct relationship (De Mendonca & De Andrade, 2018). Gazieva (2021) argues that e-commerce plays a significant role in shaping digital economy. Although much existing literature acknowledges the direct relationship between digital economy and e-commerce, there is a lack of clear studies exploring the specific impact of e-commerce on the digital economy or vice versa. However, it is important to note that the findings of these studies are predominantly based on research conducted in developed economies, where there is ample availability of ICT infrastructure to support e-commerce activities. The context and conditions in developing and poor countries may significantly differ, potentially leading to different outcomes when assessing the impact of e-commerce.

In developing and poor countries, the lack of adequate ICT infrastructure and limited access to technology can pose significant challenges to the widespread adoption and successful implementation of e-commerce platforms. Issues such as limited internet connectivity, unreliable power supply, and low digital literacy rates can hinder the growth and effectiveness of e-commerce initiatives. Furthermore, the absence of well-established logistics and transportation networks in these countries can impede the smooth functioning of e-commerce operations, including the timely delivery of goods and services. Poor physical infrastructure and inadequate payment systems may also present obstacles to the growth of e-commerce in these contexts.

As a result, the relationship between e-commerce and the digital economy may manifest differently in developing and poor countries compared to developed economies. Factors such as the level of ICT penetration, infrastructure development, regulatory frameworks, and cultural factors can significantly influence the impact and effectiveness of e-commerce initiatives in these regions. In addition to the points mentioned earlier, it is important to consider the level of illiteracy in developing and poor countries as another significant factor that can influence the volume and growth of e-commerce transactions, thereby impacting the digital economy as a whole.

In many developing and poor countries, a significant portion of the population faces challenges related to illiteracy, particularly in rural areas. Illiteracy can present a major barrier to the adoption and usage of e-commerce platforms, as it requires basic reading, writing, and digital literacy skills to navigate online interfaces, understand product descriptions, and complete transactions securely. The lack of widespread literacy can limit the accessibility and usability of e-commerce platforms, leading to lower participation rates and reduced consumer trust. Individuals with limited literacy skills may rely on assistance from others or prefer traditional brick-and-mortar retail channels due to familiarity and ease of interaction. Moreover, the concentration of illiteracy and limited access to ICT infrastructure in rural areas exacerbates the challenges faced by individuals in these regions. Rural areas often have limited connectivity, making it difficult for residents to access the internet and engage in online activities, including e-commerce. The lack of infrastructure, such as reliable electricity and internet connectivity, further hinders the growth of e-commerce in these areas. Therefore, it is crucial to conduct research specifically tailored to the context of developing and poor countries to gain a

comprehensive understanding of the relationship between e-commerce and the digital economy in these settings.

In Ethiopia, e-commerce is in its beginning stage, with very few organizations present (Kinfemichael, 2019). Ethiopia's performance on UNCTAD's B2C e-commerce Index of 2018 was relatively low, with a score of 17.8 out of 100, trailing behind countries like Nigeria (54.7), Kenya (46.2), and Rwanda (32.7) (Megersa, 2019). However, Ethiopia presents a significant growth opportunity due to its large population, the second largest in Africa, and its expansive domestic market. Recognizing this potential, the government of Ethiopia has expressed its commitment to supporting the development of e-commerce across various platforms. Notably, Ethiopia's reputation for exporting products such as coffee, textiles, and leather goods can contribute to driving the country toward a digital economy by bolstering the e-commerce sector. Ethiopia has already made efforts to establish itself in the IT business industry, demonstrating its determination to thrive and prosper in e-commerce. In Ethiopia, businesses of all sizes, from small enterprises to larger corporations, face competition and must seek ways to meet the demands of their customers. Consequently, e-commerce has emerged as a driving force in promoting the digital economy in Ethiopia, which is still in the early stages of development, with only a few private sector players offering digital services and some government-led digitization initiatives. However, e-commerce is expected to open new markets for local small and medium enterprises, reduce the unemployment rate, and drive the country to a digital economy. Hence, e-commerce needs to get serious attention in developing route strategies for the digital economy since it is affected by different factors. However, there is a lack of scientific studies highlighting these opportunities.

According to Michałowska et al. (2015), among the different factors that affect e-commerce business, customers purchasing decisions are the leading variable (Lee et al., 2007). Customer purchasing decisions are assumed to be influenced by customers' attitudes, learning, motivation, perception, and customer beliefs. Customers' attitudes encompass their evolving evaluations, emotions, and preferences towards objects or ideas in a general sense. These attitudes are shaped by the customers' accumulated experiences and learning through interactions with various products or services over time. The motivation of customers stems from their inherent drive to fulfill their individual needs, while their beliefs encompass the thoughts and perceptions they hold regarding a particular product or service (Zimmermann, 2015). Together, these elements of attitudes, learning, motivation, and beliefs play a significant role in shaping customers' behaviors and decisions in the marketplace.

Given the existing research gap and the significance of the topic, this study aims to investigate the impact of e-commerce on the promotion of the digital economy. Specifically, the study explores the mediating role of customer attitudes to determine whether the effect of e-commerce on the digital economy is direct or indirect. The primary objective of this study is to examine the role of e-commerce in fostering the digital economy, with a focus on understanding the mediating influence of customer attitudes between e-commerce and the digital economy.

2. Literature review

2.1. Theoretical evidence

In the realm of e-commerce, understanding consumer behavior plays an important role for businesses aiming to excel in the digital marketplace. The stimulus-organism-response (SOR) theory

provides a valuable framework for understanding the nuances of consumer responses to stimuli encountered in online environments. SOR theory holds advantages over other theories when applied to understanding consumer behavior in e-commerce (Chen et al., 2017). Its comprehensive framework encompasses external stimuli, internal organismic processes, and observable behavioral responses, facilitating a thorough examination of the intricate dynamics within digital marketplaces (Chen et al., 2017). Particularly relevant to e-commerce, SOR theory emphasizes the significance of environmental stimuli, such as website design and product presentation, in shaping consumer responses. By considering consumers' cognitive, affective, and motivational reactions, SOR theory provides insights into the underlying mechanisms guiding online purchase decisions and engagement with digital platforms (Zhang & Benyoucef, 2016).

Moreover, SOR theory offers practical implications for e-commerce practitioners by identifying key stimuli influencing consumer behavior and understanding the mediating role of organism variables. Supported by empirical research (Lin & Shen, 2023), SOR theory's applicability to e-commerce is underscored by its ability to inform targeted interventions aimed at improving website design, product offerings, and marketing strategies. Overall, the holistic perspective and practical utility of SOR theory render it preferable for elucidating consumer behavior in e-commerce compared to alternative theoretical frameworks. This literature review delves into the application of SOR theory in understanding attitudes and behaviors in e-commerce, emphasizing key concepts, empirical studies, and implications for businesses.

2.1.1. SOR theory and e-commerce

The SOR theory, first introduced by Mehrabian and Russell in 1974 (Lin, & Shen, 2023), presents a conceptual framework wherein environmental stimuli (S) evoke internal organismic responses (O), ultimately leading to observable behavioral responses (R). In the context of e-commerce, stimuli encompass various factors, including website design, product information, social cues, and promotional incentives. Organismic responses encompass cognitive, affective, and motivational processes evoked by these stimuli, thus shaping consumers' attitudes, perceptions, and intentions. Behavioral responses denote the actions taken by consumers, such as browsing, purchasing, and engaging with online platforms, which are influenced by their internal reactions to environmental stimuli.

Many studies have delved into the impact of specific stimuli on consumer behavior within e-commerce settings. For example, Li and Zhang (2002) demonstrated that visually appealing websites with intuitive navigation enhance user satisfaction and encourage further exploration. Likewise, social influence cues, such as user reviews and social media endorsements, significantly influence consumers' purchase intentions and trust levels (Cheung et al., 2009; Kim and Johnson, 2016).

Comprehending the cognitive and affective mechanisms underlying consumer responses is crucial for elucidating the SOR framework. Scholars have explored various mediating variables that moderate the relationship between stimuli and behavioral outcomes. For instance, attitude formation, perceived risk, and emotional arousal mediate the influence of stimuli on consumers' purchase decisions (Cheung et al., 2014; Liang and Huang, 1998). Moreover, individual characteristics, such as personality traits and prior online shopping experience, shape consumers' interpretations and responses to environmental stimuli (Wang and Sun, 2010).

The evolution of technology has transformed the e-commerce landscape, presenting both opportunities and challenges for researchers and practitioners. Recent studies have examined the role

of emerging technologies, such as augmented reality (AR), virtual reality (VR), and artificial intelligence (AI), in shaping consumer behavior. For instance, AR-based product visualization enhances consumers' sensory experiences and reduces perceived risk during online shopping (Chen et al., 2020). Similarly, AI-driven personalized recommendations and chatbots enhance user engagement and satisfaction by tailoring content and assistance to individual preferences (Li et al., 2019).

Insights derived from the SOR theory offer valuable implications for e-commerce practitioners aiming to optimize their platforms and marketing strategies. By comprehending the interplay between environmental stimuli, consumer responses, and mediating variables, businesses can design more effective interventions to enhance user experience and drive desired outcomes. Strategies such as website optimization, social proof integration, and personalized recommendations can be implemented to create immersive, engaging, and persuasive online environments (Huang and Benyoucef, 2013; Verhagen et al., 2015).

2.2. Empirical evidence

E-commerce, the practice of conducting business transactions over the Internet, has revolutionized the way goods and services are traded on a global scale (Singh, 2005). By eliminating the constraints of time and distance, e-commerce has transformed traditional trade patterns and facilitated the seamless circulation of merchandise, capital, and information (Savchenko, 2015). As a result, businesses leveraging e-commerce gain a competitive edge by effectively reducing production costs and achieving improved outcomes in terms of speed, efficiency, and cost-effectiveness (Qin et al., 2016). One of the key advantages of e-commerce is the creation of a universal platform that connects buyers and sellers worldwide, enabling faster and more convenient transactions (Johnson & Turner, 2004). The digital nature of e-commerce has eliminated the need for a physical presence, allowing businesses to operate and reach customers beyond traditional boundaries. This expanded reach, coupled with efficient online payment systems and streamlined logistics, has accelerated the pace of transactions and reduced transaction costs. Moreover, e-commerce has democratized the trading landscape by providing equal opportunities for businesses of all sizes. Small enterprises and entrepreneurs now have the potential to compete on a level playing field with established companies, as the internet provides a platform where innovative products and services can gain visibility and reach a global audience. This leveling of the playing field fosters competition, innovation, and market growth. Regarding this, the study conducted by Qi et al. (2016) highlighted several benefits of e-commerce. These include the reduction of transaction costs, decreased need for additional personnel, and time savings for both customers and companies.

The adoption of e-commerce offers numerous benefits to businesses across various aspects of their operations. One significant advantage is improved customer service, as e-commerce platforms allow businesses to provide enhanced convenience, accessibility, and responsiveness to customer needs (Molla & Heeks, 2007). Moreover, e-commerce facilitates better inventory control by enabling real-time tracking and management of stock levels, reducing the risk of overstocking or stockouts (Kiu & Lee, 2017).

E-commerce also presents opportunities for businesses to reduce marketing and distribution costs. Online platforms provide cost-effective channels for promoting products and services, reaching a wider audience and targeting specific customer segments (Yehorov, 2017). By leveraging e-commerce, businesses can streamline their marketing efforts and optimize their distribution strategies, resulting in

cost savings. The adoption of e-commerce has been shown to reduce cycle time, enabling businesses to complete transactions and processes more efficiently (Mohd Thas Thaker et al., 2021). This increased speed and efficiency can lead to improved customer satisfaction and loyalty, as well as reduced operational costs.

Another key benefit of e-commerce adoption is the expanded market reach it offers. Businesses can transcend geographical limitations and access a global customer base, allowing for increased sales and revenue potential (Jahanshahi et al., 2013). Additionally, e-commerce can lead to reduced operational costs by eliminating the need for physical storefronts and reducing overhead expenses associated with traditional brick-and-mortar operations (Sirurmath, 2004). Furthermore, the benefits of e-commerce can be classified as tangible and intangible. Tangible benefits include measurable outcomes such as increased sales, cost savings, and market expansion (Sandberg & Håkansson, 2014). In contrast, intangible benefits are more challenging to quantify but are interconnected with tangible benefits. For instance, if a company reduces its product development lifecycle through e-commerce, it can lead to cost savings, better customer satisfaction, and ultimately increased sales (Sandberg & Håkansson, 2014). However, understanding their customer requirements and developing an appropriate Web presence are key challenges for the development of e-commerce (Barnes & Vidgen, 2002). Regarding technological advancement, many firms in developed countries (the United States and Europe) have benefited from the application of e-commerce by increasing their productivity and customer chain (Rattanawiboonsom, 2016). However, those countries that used traditional trade strategies still have a rare chance of developing e-commerce businesses (Martinsons, 2008). Hence the importance of e-commerce in economic development in general, and specifically in the digital economy (Kwadwo et al., 2016). E-commerce plays a significant role in the development of the digital economy (Priescu et al., 2009); without e-commerce, it is almost impossible to achieve a digital economy (Abid et al., 2021).

The digital economy, often referred to as the Internet economy, network economy, new economy, or Web economy, encompasses economic activities that heavily rely on digital technologies and digital communication networks. It is characterized by the utilization of technologies such as the Internet, intranets, computers, software, and other related information technologies (Unold, 2003). In the digital economy, businesses and individuals leverage the enhanced interconnectivity of networks and the interoperability of digital platforms. This is made possible by utilizing the capabilities of the Internet and IP-enabled communication systems, including mobile networks, electronic payment systems, and public service networks (Henry et al., 1999; Pan et al., 2021).

A key driver of the digital economy is innovation, which involves the creation or adoption of new technologies, the repurposing of existing technologies for new uses, and the introduction of existing technologies to new geographies and user groups. Innovation plays a critical role in developing the digital economy by fostering the creation of new and improved goods, services, and business practices. This continuous process of innovation drives economic growth and enables businesses to adapt to the evolving digital landscape. In essence, the digital economy is characterized by the pervasive influence of digital technologies on economic activities, transforming traditional business models and enabling new forms of commerce, communication, and interaction. The digital economy thrives on the constant evolution of technology and its widespread adoption, providing opportunities for businesses and individuals to leverage digital tools and platforms for increased productivity, efficiency, and connectivity.

E-commerce plays a vital role as one of the key components of the digital economy, encompassing the online buying and selling of goods and services, including transactions facilitated through platform-based companies (Khan, 2016). Within the digital economy, e-commerce has significant implications in terms of cost reduction, price optimization, and overall business efficiency (Terzi, 2011). These benefits extend across the entire value chain, influencing business interactions and transactions with other businesses (Moore, 2000). The role of e-commerce in the digital economy is unequivocal and essential (Jehangir et al., 2011). It not only enables a greater volume of transactions but also connects previously disconnected entities to the global marketplace (Sirurmath, 2004). Through electronic transmissions, e-commerce promotes Internet penetration and mobile connectivity, which are fundamental elements of the digital economy (Yapar et al., 2015). It contributes to the expansion of access to digital technologies, fostering connectivity and inclusion within the global digital ecosystem.

By leveraging e-commerce, businesses can streamline their operations, improve supply chain management, and enhance customer experiences. The digital marketplace enables businesses to reach a broader customer base, both domestically and internationally, transcending geographical boundaries. Additionally, e-commerce enables businesses to reduce costs associated with physical infrastructure, such as brick-and-mortar stores, and optimize resource allocation. Furthermore, e-commerce facilitates the growth of digital entrepreneurship and the emergence of innovative business models. Small and medium-sized enterprises (SMEs) can harness the power of e-commerce to compete on a global scale, accessing new markets and customers without the traditional barriers of physical location and limited resources. This democratization of access to markets promotes economic growth and job creation and fosters a more inclusive digital economy. The studies conducted on the relationship between the two variables show the existence of a strong relationship (Series, 2015), (Unold, 2003), (Sandberg & Håkansson, 2014), (Savchenko, 2015), (Singh, 2005), (Jehangir et al., 2011), (Mesenbourgh, 2001), (Yang, 2017), (Khodaei Valahzaghard & Bagherzadeh Bilandi, 2014). Hence, by driving from previous empirical studies, this study expects a positive and significant effect of e-commerce on the digital economy.

H1: E-commerce has a positive and significant effect on the digital economy.

The management of customer attitudes towards e-commerce services, including trust, belief, perception, motivation, satisfaction, and loyalty, is crucial for the long-term success of businesses (Eid, 2011). Previous studies have highlighted the challenges faced by e-commerce businesses in effectively managing customer attitudes (Eid, 2011). Research conducted by Mevik and Wehrens (2007) emphasizes the importance of user interfaces as the primary channel through which consumers interact with e-service providers. Further, the study conducted by Zuroni and Goh (2012) highlights socio-demographic factors such as age, income, and occupation, as well as patterns of online buying (e-commerce experience, types of goods purchased, and time spent on the internet) and purchase perception (product perception, customer service, and perceived risk), as influencing consumers' attitudes towards e-commerce purchases through online shopping.

Customer attitudes, learning, motivation, perception, and beliefs are assumed to play a significant role in influencing customers' purchasing decisions. These attitudes encompass customers' progressively favorable or unfavorable assessments, feelings, and inclinations towards an object or idea in general (ALraja & Aref, 2015; Hernandez et al., 2009; Kassim & Asiah, 2010; Bauboniene & Guleviciute, 2015; Ardiansah et al., 2019; Sharma & Lijuan, 2014). Understanding and effectively managing these attitudes is vital for businesses operating in the e-commerce sector. Furthermore,

previously conducted empirical studies have viewed the relationship between customers' attitudes and the digital economy (Fokina & Barinov, 2019) (Quinton et al., 2018) (Lavrov et al., 2020) (Alam and Gani, 2019). The findings of these studies imply that customers' attitude has a positive and significant relationship with e-commerce and the digital economy. Based on this fact, we constructed our hypothesis as follows.

H2: Customer's attitude has a positive and significant relationship with digital economy.

H3: Customer's attitude has a significant mediating role between e-commerce and digital economy.

Indeed, the relationship between e-commerce and the digital economy is considered a significant factor in driving sustainable economic development. E-commerce, with its utilization of digital technologies and communication networks, has transformed traditional business models and opened up new avenues for economic growth. The digital economy, encompassing various economic activities reliant on digital technologies, has emerged as a crucial component of modern economies. By leveraging the power of the Internet, online platforms, and digital communication systems, e-commerce has revolutionized the way businesses operate, connect with customers, and conduct transactions. It has enabled companies to reach a broader customer base, expand their market presence, and enhance efficiency in various business processes. Moreover, e-commerce has facilitated global trade, enabling businesses to engage in cross-border transactions and access international markets. The digital economy, propelled by e-commerce, has fostered innovation, entrepreneurship, and job creation. It has provided opportunities for SMEs and individuals to establish online businesses, driving economic inclusivity and empowering a wide range of stakeholders. Additionally, the digital economy has spurred technological advancements, digital skills development, and knowledge sharing, leading to increased productivity and competitiveness. Overall, the symbiotic relationship between e-commerce and the digital economy has played a pivotal role in promoting economic growth, enabling efficient resource allocation, and facilitating the integration of businesses into the global marketplace. Embracing and nurturing this relationship is crucial for sustainable economic development in the digital era (Milewska, 2019).

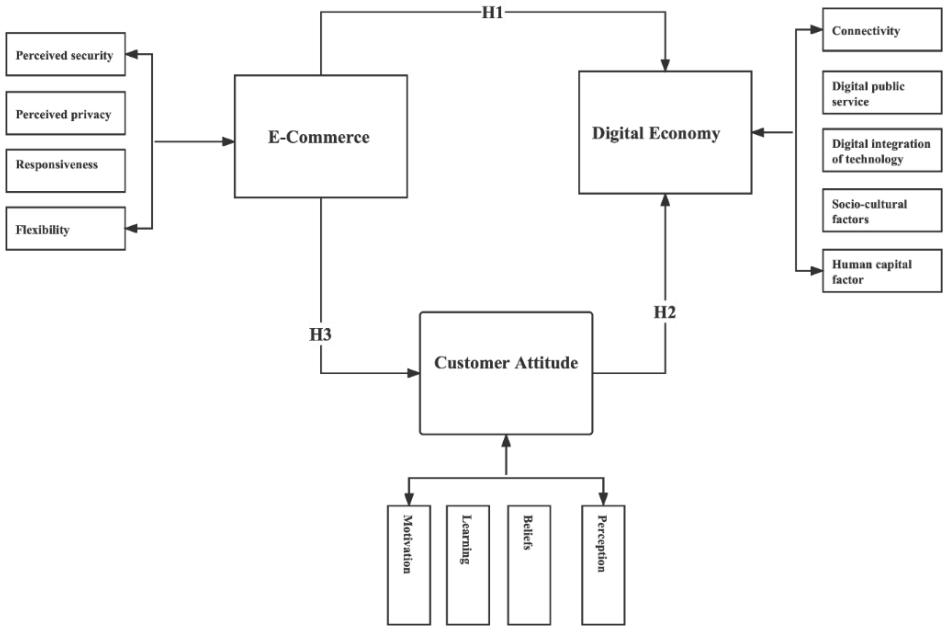

Figure 1. Conceptual framework of the study. Source: constructed by authors.

3. Materials and methods

In conducting this study, a mixed research approach was used, which combines both qualitative and quantitative methods. This decision was made to address the potential drawbacks of relying solely on one type of research method, as highlighted by Frels and Onwuegbuzie (2013). By integrating qualitative and quantitative approaches, the study aimed to leverage the strengths of each method while mitigating their respective limitations. This mixed approach allows us to explore the details of our research topic from multiple angles, providing a more comprehensive understanding than what would be achieved with just one approach. At the same time, an explanatory research design was adopted to investigate the impact of e-commerce on the digital economy. The study also used both primary and secondary data sources for data collection (Hox & Boeije, 2004). The primary data was collected by distributing questionnaires to e-commerce users in Addis Ababa. The study found these users through online platforms and referrals. The target population consisted of individuals who had subscribed to e-commerce platforms and services through popular social media platforms such as Facebook, Instagram, Telegram, and WhatsApp (Mohd Thas Thaker et al., 2021). These platforms were chosen due to their widespread usage and popularity among the target population.

A convenience sampling technique was used to collect the data. This sampling method was chosen for its convenience, selecting respondents based on accessibility rather than random selection. This approach allowed us to efficiently gather data from individuals who were readily available and willing to participate in our study. In addition to primary data collection, secondary data was gathered through an extensive review of relevant literature, documents, and online sources, including academic journals. This comprehensive approach facilitated a contextualized understanding of the research topic and complemented the primary data collected.

To determine the appropriate sample size, the study followed the recommendation of Hidiroglou et al. (2016) for an unknown target population, resulting in a sample size of 384 respondents. The sample size was considered adequate for the study's purposes. The study employed partial least squares structural equation modeling (PLS-SEM) as the estimation technique, which is well-suited for analyses with small sample sizes (Hair et al., 2019).

The questionnaire was prepared for the constructed variable digital economy measured by five proxy measures recommended: digital public service, integration of digital technology, socio-cultural factors, human capital factors, and connectivity level of the country. The second construct variable was e-commerce, measured by responsiveness, perceived security, perceived privacy, and flexibility of the e-commerce business (Sirak, 2020). The third construct variable was customers' attitude, which was used as a mediating variable and measured by customers' belief, learning, motivation, and perception (Zimmermann, 2015). To simplify respondent answers and make it easier for them to answer research questions, a five-point Likert scale was used, as recommended by Dawes (2008). The response options ranged from strongly disagree (1) to strongly agree (5). Out of the 384 questionnaires distributed, only 324 were returned and used for analysis. The study collected 84.3% of responses, as suggested by Armstrong and Overton, (1977). According to the authors, by keeping nonresponse rates below 30% through appropriate procedures, such as effective follow-up strategies, researchers can minimize the impact of nonresponse bias.

4. Results

In this study, two estimation techniques of PLS-SEM were employed to thoroughly analyze the research framework. These techniques, namely the measurement model and the structural model, served distinct purposes in unraveling the complex relationships within the study's domain (Gefen, et al., 2011). The measurement model was specifically utilized to investigate and establish the connections between the observed indicators (outer factors) and their underlying constructs. By examining these relationships, the study aimed to comprehensively understand the underlying latent variables and their influence on the observed indicators. This approach provided valuable insights into the intricate interplay between the different components of the research framework, shedding light on the underlying mechanisms at work. On the other hand, the structural model was used to examine the relationships between the latent constructs themselves. The subsequent section will delve into the specific findings of the measurement and structural models, offering a comprehensive understanding of the study's outcomes.

4.1.Measurement model analysis

The measurement model was used to examine the relationships between the latent variables and their corresponding measures. The strength of these relationships was assessed by analyzing the factor loadings of the measures. According to the benchmark set by Gefen and Straub (2005), a factor loading value greater than 0.70 indicates a strong association between the measure and its construct. In this study, all measures exhibited factor loading values higher than 0.70, demonstrating their strong association with their respective constructs. The first component of the measurement model focused on reliability analysis, which was assessed through composite reliability and Cronbach's alpha. The benchmark for both measures, as suggested by Sarstedt et al. (2020), is a value greater than 0.70. The results of the reliability analysis in this study indicated that all variables surpassed the cutoff point, further affirming the reliability of the data (Table 1).

The second component of the measurement model examined convergent validity, which was evaluated using the average variance extracted (AVE) criterion. Sarstedt et al. (2020) recommend an AVE value greater than 0.50 to establish the validity of the data. The study's findings revealed that the AVE values exceeded 0.50, confirming the convergent validity of the measures (Table 1). To address the issue of collinearity, the variance inflation factor (VIF) was computed. Sarstedt et al. (2020) proposed a VIF value of less than 10 to dismiss collinearity concerns. The results of the collinearity test in this study indicated that all variables had a VIF value lower than 10, providing evidence against the presence of collinearity among the variables (Table 1). Based on the analysis of the outer model, including the strong factor loadings, satisfactory reliability, convergent validity, and the absence of collinearity, the study concluded that the measures used in the study were robust and reliable for further analysis. These findings laid a solid foundation for the subsequent examination of the relationships in the structural model.

Table 1. Reliability and validity analysis.

The model type - reflective	Outer loading	Alpha	CR	AVE	VIF
Customer attitude		0.799	0.87	0.627	
CA1 (customer beliefs)	0.807591				1.84
CA2 (customer learning)	0.874204				2.3
CA3 (customer perception)	0.745558				1.47
CA4 (customer motivation)	0.731061				1.43
Digital economy		0.82	0.874	0.582	
DE1 (digital public service)	0.806913				1.83
DE2 (integration of digital technology)	0.787503				1.73
DE3 (socio-cultural factors)	0.766210				1.59
DE4 (human capital factors)	0.71337				1.46
DE5 (connectivity)	0.7358102				1.58
E-commerce		0.805	0.872	0.631	
EC1 (perceived security)	0.703634				1.45
EC2 (perceived privacy)	0.836420				1.87
EC3 (responsiveness)	0.80488				1.64
EC4 (flexibility)	0.823699				1.70

Source: SMART-PLS output.

The study also assessed discriminant validity through cross-loading factors. Discriminant validity is established when the loading factors of a construct are significantly stronger with their own measures than with measures of other constructs (Gefen & Straub, 2005). In other words, if the measures of a construct exhibit stronger associations with their construct than with other constructs, it indicates discriminant validity. By examining the cross-loading factors, the study determined whether the measures showed stronger associations with their intended construct compared to other constructs. This analysis helps ensure that the measures are distinct and able to differentiate between the constructs under investigation. The strength of the loading factors against their own construct, relative to other constructs, provides evidence of discriminant validity (Gefen & Straub, 2005).

By conducting the cross-loading factor analysis, the study aimed to demonstrate that the measures of each construct had stronger associations with their respective construct than with other constructs, thereby establishing discriminant validity. This analysis further strengthened the validity and reliability of the measurement model employed in the study (Table 2).

Table 2. Reporting discriminant validity.

Cross loadings factor	Customer attitude	Digital economy	E-commerce
CA1 (customer beliefs)	0.807591	0.766210	0.699322
CA2 (customer learning)	0.874204	0.757106	0.836023
CA3 (customer perception)	0.745558	0.713337	0.566526
CA4 (customer motivation)	0.731061	0.705580	0.624765
DE1 (digital public service)	0.661238	0.806913	0.780691
DE2 (integration of digital technology)	0.64170	0.787503	0.717503
DE3 (socio-cultural factors)	0.666210	0.766210	0.699322

Continued on next page

Cross loadings factor	Customer attitude	Digital economy	E-commerce
DE4 (human capital factors)	0.70330	0.71337	0.506524
DE5 (connectivity)	0.701061	0.7358102	0.682768
EC1 (perceived security)	0.554968	0.553092	0.703634
EC2 (perceived privacy)	0.686263	0.707106	0.836420
EC3 (responsiveness)	0.64250	0.70750	0.80488
EC4 (flexibility)	0.66138	0.81813	0.823699

Source: SMART-PLS output.

4.2. Structural model analysis

The study employed a structural model analysis to investigate the relationships between variables. Specifically, it examined both the direct effect of e-commerce on the digital economy and the indirect effect mediated by customer attitude.

Hypothesis H1 posited that e-commerce has a positive and significant effect on the digital economy. The results of the structural model analysis supported this hypothesis, indicating a positive and significant relationship between e-commerce and the digital economy ($\beta = 0.433342$, t-statistics = 5.548330, p-value < 0.001). This finding is supported by the study conducted by Volkova (2021). This suggests that e-commerce directly contributes to the growth and development of the digital economy.

The increase in flexibility, responsiveness, perceived security, and perceived privacy associated with e-commerce leads to a corresponding increase in the digital economy, as indicated by the beta coefficient. Furthermore, Hypothesis H2 examined the impact of customer attitude on the digital economy. The results of the structural model analysis revealed a positive and significant relationship between customer attitude and the digital economy ($\beta = 0.558083$, t-statistics = 6.970188, p-value < 0.001). This suggests that customer perception, motivation, beliefs, and learning significantly influence the growth and development of the digital economy. As customer attitudes become more positive, the digital economy experiences a corresponding increase, as indicated by the beta coefficient. Overall, the findings of the study provide support for both hypotheses, indicating that e-commerce has a direct positive effect on the digital economy, and customer attitude plays a significant role in driving the growth of the digital economy. These results contribute to a better understanding of the relationship between e-commerce, customer attitude, and the digital economy (Table 3).

Table 3. Hypothesis testing and model summary.

Hypothesis	Direct	SD	T-statistics	P values	BI (2.5%; 97.5%)	Decision
H1: CA➝DE	0.558083	0.0759	6.970188***	0.000000	(0.422; 0.720)	supported
H2: EC➝CA	0.876357	0.0320	27.585329***	0.000000	(0.810; 0.936)	supported
H3: EC➝ DE	0.433342	0.0743	5.548330***	0.000000	(0.275; 0.567)	supported
Model fit	R-square		Adjusted R^2			
Customer	76.8%		76.4%			
Attitude	92.30%		92%			
Digital						
Economy						

Note: t > 3.29 at *** p < 0.001.

In this study, the R-squared value was calculated to assess the goodness of fit of the model and determine the percentage of the digital economy that is explained by customer attitude and e-commerce.

The results of the R-squared analysis indicated that customer attitude and e-commerce collectively explain 92.3% of the variation in the digital economy. This means that these two variables account for a substantial proportion of the changes observed in the digital economy. The remaining 7.7% of the variation is likely attributed to other factors that were not included in the study or accounted for by the independent variables examined. Overall, the high R-squared value suggests that the model is a good fit for explaining the relationship between customer attitude, e-commerce, and the digital economy. It demonstrates that customer attitude and e-commerce play a significant role in shaping the digital economy, explaining a large portion of its variability.

4.3. Mediating analysis

These findings suggest that customer attitude plays a significant mediating role between e-commerce and the digital economy. This means that the impact of e-commerce on the digital economy is not only direct but also indirect, operating through the influence of customer attitude. The results of the structural model analysis indicated that customer attitude has a positive and significant mediating effect, with a path coefficient of $\beta = 0.489080$, t-statistics = 7.236783, and p-value < 0.001. This suggests that changes in e-commerce have a positive influence on customer attitude, which in turn affects the digital economy. Therefore, the findings of the study provide compelling evidence that e-commerce has a significant impact on the digital economy, both through its direct effect and its indirect effect mediated by customer attitudes.

First, the direct effect of e-commerce on the digital economy was found to be highly significant. This means that e-commerce has a substantial and positive influence on the overall digital economy. The path coefficient, which measures the strength of the relationship, was estimated to be $\beta = 0.433342$. The t-statistics value of 5.548330 further supports the significance of this relationship. Additionally, the p-value being less than 0.001 indicates a high level of statistical significance, providing strong evidence for the direct impact of e-commerce on the digital economy. In simpler terms, this means that the growth and development of e-commerce activities have a direct positive impact on the digital economy. As companies engage in online buying and selling, they contribute to the expansion of the digital economy and its various sectors.

Furthermore, the study also examined the indirect effect of e-commerce on the digital economy through the mediating role of customer attitudes. Customer attitudes play a crucial role in shaping their behavior and decisions related to e-commerce. The findings indicated that customer attitudes partially mediate the relationship between e-commerce and the digital economy. This suggests that the influence of e-commerce on the digital economy is not solely direct but is also partially influenced by customers' perceptions, preferences, and attitudes towards e-commerce. Overall, the results of the study highlight the significant impact of e-commerce on the digital economy. The direct effect of e-commerce on the digital economy was found to be substantial and statistically significant. Additionally, customer attitudes were identified as a partial mediator in this relationship, emphasizing the importance of understanding and addressing customer perceptions in the e-commerce ecosystem (Table 4).

Table 4. Result of moderating analysis.

		Coefficient	SD	T-statistics	P values	BI (2.5%; 97.5%)
Total effect	EC⇢⇢ DE	0.922422	0.0214	43.002777***	0.000000	(0.878; 0.963)
Direct effect	EC⇢⇢ DE	0.433342	0.074	5.548330***	0.000000	(0.275; 0.567)
Indirect effect	EC⇢⇢CA ⇢⇢DE	0.489080	0.065	7.236783***	0.000000	(0.372; 0.627)

5. Discussion of the results

The study's primary objective was to explore the relationship between e-commerce and the digital economy by considering the mediating role of customers' attitudes. While previous studies have primarily focused on identifying the determinants of e-commerce and the digital economy individually, understanding the relationship between these two variables is crucial, particularly in the context of developing economies (Jehangir et al., 2011).

By examining the relationship between e-commerce and the digital economy, this study aims to shed light on the interconnectedness and impact of these variables. While studies have extensively examined the factors influencing e-commerce adoption and the determinants of the digital economy, investigating how these variables relate to each other can provide valuable insights into the development and growth of the digital economy in developing economies. By considering the mediating role of customers' attitudes, the study acknowledges the significance of understanding the perceptions, motivations, beliefs, and learning processes of customers in shaping the relationship between e-commerce and the digital economy. This approach recognizes that customers play a crucial role in driving the adoption and success of e-commerce platforms, which, in turn, contribute to the growth and development of the digital economy. Therefore, the study aims to bridge the gap between understanding the determinants of e-commerce and the digital economy by focusing on their relationship and the mediating role of customers' attitudes. By doing so, it provides valuable insights into the dynamics and interdependencies between these variables, particularly in the context of developing economies, where the digital economy has significant potential for growth and impact (Jehangir et al., 2011). The study found a positive and significant direct relationship ($\beta = 0.433342;\ SD = 0.0743; TS = 5.548330\ ***;\ p - value = 0.000000$), hence the H1 is accepted and ($\beta = 0.489080;\ SD = \&0.065;\ TS = 7.236783\ ***; P - value = 0.000000$), an indirect relationship between e-commerce and the digital economy. The result meets our expectations, and the justification for the positive relationship is that an increase in e-commerce measurement quality promotes the level of digital economy in Ethiopia. To this end, e-commerce affects the level of the digital economy through responsiveness, flexibility, perceived security, and perceived privacy. It is observed that an increase in the level of each measurement positively affects the level of the digital economy. Besides, the study highlights the mediating role of customer attitude between e-commerce and the digital economy, as e-commerce affects the digital economy through customers' attitude. These findings support the hypothesis developed by the study by implying that e-commerce affects the digital economy positively and significantly through customer's attitudes with P-value < 0.0001. Hence the mediating role of customer's attitude (H3) is accepted ($\beta = 0.489080;\ SD = 0.065;\ TS = 7.236783\ ***;\ P - value = 0.000000$).

More specifically, customer attitude was also found to positively and significantly relate to the digital economy, which implies that an increase in customers' attitude measurement (customer learning

for e-commerce, customers' motivation for using e-commerce, customers perception on e-commerce, and customers' belief on e-commerce) collectively affects the digital economy. Hence H2 of the study is accepted ($\beta = 0.558083$; $SD = 0.0759$; $TS = 6.970188 ***$; $P - value = 0.000000$). To summarize, the study findings confirm that e-commerce has a positive and significant relationship with the digital economy, both directly and indirectly. Hence, H1 (EC⇢⇢DE), H2 (CA⇢⇢DE), and H3 (EC⇢⇢CA⇢⇢DE) are accepted.

6. Conclusions

These findings have significant implications both theoretically and practically. Theoretically, the study challenges established theories by providing empirical evidence that expands our understanding of the relationship between e-commerce and the digital economy. By revealing the moderating role of customers' attitudes and the partial mediation effect of customer attitudes on this relationship, the study contributes to theoretical advancements in the field of e-commerce and digital economy research. This helps to refine existing theories and models by incorporating nuanced insights into the factors influencing e-commerce adoption and its impact on economic development.

Practically, the findings offer valuable guidance for policymakers, business leaders, and e-commerce companies operating in Ethiopia. By highlighting the importance of customers' attitudes in driving e-commerce usage and its subsequent impact on the digital economy, the study underscores the need for tailored strategies aimed at fostering positive customer perceptions and attitudes towards e-commerce platforms and services. Moreover, the recommendation to leverage social networking media platforms for e-commerce promotion provides practical insights for companies seeking to expand their reach and engagement with customers. Overall, these results bridge the gap between theory and practice by offering actionable insights that can inform policy decisions, business strategies, and operational practices aimed at promoting e-commerce adoption and fostering digital economic growth in Ethiopia.

7. Limitations and future research direction

While this study provides valuable insights into e-commerce in Addis Ababa, its scope is limited to this specific geographical area. Future research could benefit from expanding the scope to include a nationwide sample, allowing for a more comprehensive understanding of e-commerce dynamics across Ethiopia. By examining e-commerce practices and their impact on the digital economy on a national scale, researchers can uncover broader trends and variations that may exist beyond the confines of a single city. Additionally, the study relied on convenience sampling for participant selection, which may introduce biases and limit the generalizability of the findings. Future research could explore alternative sampling methods, such as random sampling or stratified sampling, to assess whether the results hold true across different sampling techniques. Comparing findings from studies employing different sampling methodologies can provide insights into the robustness and reliability of the study's conclusions.

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Author contributions

Goshu Desalegn: Conceptualization, Methodology, Software, Formal analysis, Resources, Data curation, Writing—original draft; Anita Tangl: Conceptualization, Investigation, Resources, Supervision, Project administration; Anita Boros: Conceptualization, Investigation, Resources, Data curation, Supervision, Project administration. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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