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Exploring Future Trends in Electronic Commerce in the Fourth Industrial Revolution

Frankline Mugambi and Sharon Amayo

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Abstract

E-commerce, the buying and selling of goods and services online, is evolving with the fourth industrial revolution (4IR), marked by technologies like IoT, AI, VR, machine learning, and big data. These technologies enable seamless integration between the digital and physical worlds, transforming business operations making them more resilient. To remain competitive, e-commerce players must forecast mid- and long-term trends. The study assesses the e-commerce status in Kenya, identifies key adoption drivers, and explores the future of e-commerce in the 4IR context. The findings reveal that several key factors significantly influence the adoption and use of e-commerce in Kenya. Chief among these is the quality of internet infrastructure, which serves as the backbone for e-commerce. The widespread adoption of smart mobile phones is equally crucial, as it enables a larger segment of the population to access e-commerce platforms. Additionally, the development of digital skills is essential, empowering users to navigate online marketplaces effectively. Efficient trade logistics also play a vital role, ensuring that products can be delivered reliably and promptly. Lastly, environmental factors, including the sustainability practices of e-commerce businesses, are increasingly shaping consumer preferences and behaviors. To enhance e-commerce competitiveness, the government may develop a comprehensive e-commerce law and clear regulatory framework. Leveraging public-private partnerships is essential for actualizing Kenya's Digital Superhighway. Investments in internet access and equipping schools with digital tools will bridge the digital skills gap, building on programs like Ajira Digital and Jitume in Konza Technopolis. Creating industry-specific e-commerce service stations will help small vendors market their goods online. Implementing a National Addressing System (NAS) is critical for efficient delivery services, bolstering Kenya's e-commerce ecosystem and global competitiveness.

Abbreviations and Acronyms

4IR	Fourth Industrial Revolution Technologies
3D	Three-Dimensional Object
AI	Artificial Intelligence
IoT	Internet of Things
VR	Virtual Reality
B2B	Business to Business
B2C	Business to Consumer
C2B	Consumer to Business
C2C	Consumer to Consumer
UTAUT	Unified Theory of Acceptance and Usage of Technology
EV	Electric Vehicle
AGV	Autonomous Vehicles
ICT	Information Communication Technology
WTO	World Trade Organization
PESTLE	Political, Economic, Social, Technological, Legal and Environmental

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1. Introduction

Electronic commerce, commonly referred to as e-commerce, refers to the buying and selling of goods and services over the internet or through electronic means (Mohdhar and Shaalan, 2021). In a broader sense, e-commerce is made up of a variety of online business activities, including online retailing, electronic payments, digital marketing, and online banking.

E-commerce is categorized into four business models, that is: business to business(B2B), business to consumers (B2C), consumer to consumer (C2C) and consumer to business (C2B). B2B involves transactions between companies, retailers, and manufacturers (Ito, 2019). These transactions range from procurement, supplies, sales and purchases, inventory management, payment channels management and other support services. B2C is the most popular model of e-commerce and entails direct transactions from business to consumers. It is used in online retail sales (Tian et al., 2018). Examples of B2C include Kenya railways, airline companies, supermarkets, hotels, Jumia, Kilimall, Glovo and Copia. C2C involves transactions among consumers through third party platforms e.g. eBay. TikTok and Instagram have recently contributed to the growth of C2C transactions (Muhammad et al., 2022). C2B involves individuals offering products and services to businesses. Take Upwork, for example, where professionals showcase their skills and experience through profiles, listing their services along with pricing. Businesses can then browse these services on the platform and contact the professionals.

The 1800s, the early 1900s, and the post-1980s each signify pivotal moments in the evolution of technology in modern human history, commonly referred to as the first, second, and third Industrial Revolutions (Yoshino, 2021). The first Industrial Revolution was characterized by the transformation of many agrarian societies into industrial urban centers. The second Industrial Revolution revolved around the advent of oil, electricity, and the mass production of machinery, including automobiles. The third Industrial Revolution marked the beginning of the digital age, with the rise of the internet, computing, and information technology taking center stage.

According to Chong et al. (2023), the world is witnessing the emergence of a fourth industrial revolution, characterized by advanced technologies deeply integrated into our society. Central to this "4IR" are the Internet of Things (IoT), Artificial Intelligence (AI), Virtual Reality (VR), machine learning, and big data analytics. Unlike earlier machines designed to perform single tasks, 4IR technologies can communicate with humans, interact with other devices and programs, and create seamless integration between the digital and physical worlds. As intelligent automation becomes standard, the role of human beings in almost every industry is evolving.

In commerce, businesses are emulating the characteristics of 4IR technology, driving this transition. Just as digital devices build networks between themselves and humans, companies are doing the same. Volkova et al. (2021) note that the era of quickly turning a profit by offering a single, narrow service is over. Modern

businesses are expected to market online, manage digital product listings, oversee the entire order lifecycle from placement to delivery including inventory management and order tracking, accept electronic payments, partner with logistics providers for timely deliveries, and gather and analyze customer feedback and purchasing patterns to improve their offerings. Additionally, businesses are expanding into related industries to comprehensively meet consumer needs.

It is easy to assume that the rise of e-commerce is driving brick-and-mortar businesses out of the market. However, several studies (Mohdhar and Shaalan, 2021; Njoroge, 2021; Chong et al., 2023) reveal a more complex reality. Rather than pushing the market in a single direction, the trend is dual. Brick-and-mortar businesses are increasingly adopting e-commerce strategies, while online-only companies are recognizing the need for physical spaces.

When people are given the opportunity to hear, see, and feel, they are more likely to buy. Agostinho (2020) notes that the sense of touch plays a crucial role in the sales process. When shoppers can physically experience a product, such as feeling the texture of high-heeled shoes or sitting in a warm, comfortable chair in a store, they are significantly more likely to make a purchase compared to merely seeing these products online. This tactile experience has been one of the major limitations of e-commerce. However, the advent of 4IR technologies, such as Virtual Reality (VR), promises to revolutionize this aspect by simulating a tactile experience. VR can create immersive shopping environments where consumers can virtually interact with products, bridging the gap between physical and digital retail experiences and potentially boosting online sales by providing a more tangible sense of the products.

As Njoroge (2021) notes, one of the most daunting challenges any startup e-commerce business faces, regardless of the market, is finding a way to compete with established giants like Amazon, Alibaba, and, in Kenya, Jumia. Few areas remain unaffected by the influence of these big brands. To sharpen their competitive edge, smaller businesses are increasingly turning to artificial intelligence. According to a survey by IPSOS (2024), 60 percent of online retailers in the 17 sampled countries plan to invest in AI by 2027. This investment in AI is expected to enhance various aspects of their operations, from personalized customer experiences to efficient inventory management, helping them to better compete with larger, more established companies.

A key competitive advantage in business is the ability to offer personalized services and products (Chebichiy and Odhiambo, 2020). One of the most effective ways to achieve this is by employing technology that can emulate human interaction, such as chatbots and voicebots. Generative AI can provide a "personal touch" without the significant resource expenditure required to hire staff for these roles. AI not only mimics human interactions but also uses advanced algorithms to create personalized recommendations for individual buyers based on their previous behaviors and preferences. By predicting customer needs before they even begin searching, stores can sell more goods more quickly.

With the continuous changes brought about by 4IR, the level of uncertainty in the business landscape continues to rise. For Kenya to remain competitive in the long

run, e-commerce players need forecasts about mid- and long-term developments to inform their strategic decisions. A foresight study on the plausible futures at the intersection of 4IR and e-commerce meets the needs of e-commerce stakeholders by encouraging 'out-of-the-box' thinking and revealing currently unseen trends. This study aimed to assess the status of e-commerce in Kenya, identify the key drivers of its adoption, and explore its future within the context of 4IR. The goal is not to predict the exact future of e-commerce but to explore a variety of potential outcomes. This approach will help e-commerce industry actors develop strategies to identify opportunities and threats, enabling them to make informed decisions.

The study is structured into six comprehensive parts: introduction, stylized facts, literature review, methodology, results, and conclusions with policy recommendations. The introduction sets the stage by outlining the study's objectives and scope. The section on stylized facts (Status of e-commerce) provides a detailed overview of the current state and key trends in e-commerce. The literature review synthesizes existing research and theoretical frameworks relevant to e-commerce and 4IR. The methodology section describes the research design, data collection, and analytical techniques employed in the study. The results section presents the findings derived from the analysis, while the conclusions and policy recommendations offer insights and actionable strategies based on the study's outcomes, aimed at guiding future decisions and practices.

2.   Status of E-commerce in Kenya

Data from the Kenya population and housing census (2019) shows that 40.6 percent of Kenyans had internet access majority through their phones. E-commerce in Kenya is still in its early stages, with mobile commerce being the primary driver. Over the past years, the value of mobile commerce transactions has seen a significant rise, growing from Ksh 1.7 trillion in 2016 to Ksh 9.3 trillion in 2020 (KIPPRA,2021). According to Statista (2024), a German data and business intelligence organization, Kenya ranks third in e-commerce market penetration in Africa at 46.7 percent. Egypt leads with a 55.4 percent penetration, followed by South Africa at 49.4 percent. This marks an improvement from Kenya's previous fourth position as ranked by the United Nations Conference on Trade and Development in 2020.

In Kenya, electronics and media products hold the largest share of the e-commerce segment at 41 percent, followed closely by fashion at 31 percent. The largest group of online shoppers in Kenya consisted of individuals aged 25 to 34 years, comprising 43 percent of the total share. Following closely, e-commerce shoppers aged 35 to 44 years constituted the second largest group, accounting for 32 percent of the total share, while those aged 15 to 24 years ranked third, as illustrated in Figure 1.1. Statista, projects that Kenya's e-commerce revenue will reach approximately 5.2 trillion Kenya shillings by 2027 from 615 billion Kenya shillings in 2023.

However, several factors hinder the growth of e-commerce in the country; a national addressing system is crucial for the growth of e-commerce in Kenya, where currently only certain addresses, primarily business offices and institutions in major towns, can get delivery to their door. Individual consumers are often relegated to using pick-up stations due to the absence of a comprehensive national address system (Njoroge, 2021). Implementing a well-structured addressing framework would facilitate seamless door-to-door delivery services, expanding the reach of e-commerce businesses to a broader customer base.

The cost of one gigabyte of mobile internet in Kenya averages 0.59 US dollars (Statista (2024). In comparison, the same quantity costs 0.39 $ in Nigeria, 0.40 $ in Ghana, and a mere 0.02 $ in Israel. Additionally, Kenyans experience an average connection speed of 21.78 megabytes per second (Mbps) for dial-up internet. This is slower than in Nigeria, where the speed averages 26.48 Mbps, in Ghana where it reaches 31.94 Mbps, and significantly lower than in Israel, where the average speed is 40.16 Mbps. These disparities highlight the need for improved affordability and speed of internet services in Kenya to foster digital inclusivity and enhance the country's competitive edge in the digital economy.

Figure 2.1: E-commerce and Internet users by age
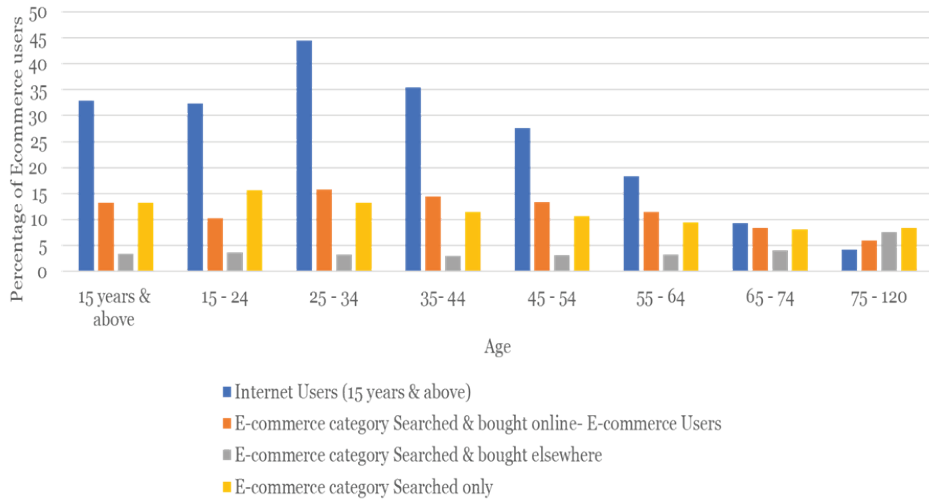
Source: KNBS (2019)

2.1 Firms Engaged in E-commerce

In Kenya, a joint National ICT survey conducted in 2016 shows that 39 percent of private enterprises used e-commerce for conducting their businesses. The highest proportion of firms engaged in e-commerce were those in information and communication at 63 percent while the lowest were in mining and quarrying at 13 percent as illustrated in figure 1.2. Studies show that e-commerce usage in the country accelerated during the COVID -19 period (KIPPRA,2021). With the lock down of major towns, most businesses including supermarkets and hotels resorted to online selling to boost their sales (UNCTAD,2022).

Figure 2.2: Firms engaged in E-commerce
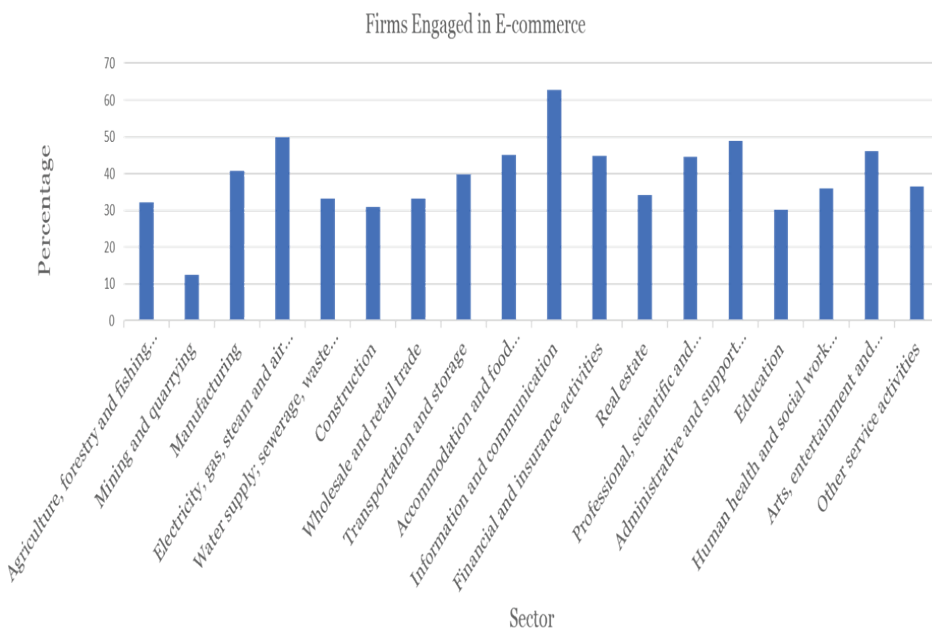
Source: KNBS(2016) -ICT Enterprise Survey

2.2 E-commerce Readiness

The study conducted a trend analysis on the status of ecommerce in Kenya and the country's readiness for e-commerce. UNCTAD pillars of e-trade for all initiative were utilised to assess readiness. They include ICT infrastructure, trade facilitation and trade logistics, payment solutions, e-commerce skills development, legal and regulatory framework, and access to financing. This approach gave a snapshot of where we are as a country and areas that need to be enhanced to improve ecommerce adoption and use.

2.2.1   ICT Infrastructure and Use

ICT is an essential requirement for e-commerce to thrive since its activities are predominantly performed online. Accessibility, quality and affordability of internet are therefore key factors to be considered to ensure full adoption of e-commerce by all Kenyans. Internet subscriptions in the country have shown an upward trend in the country overtime. The internet subscriptions doubled from 23,929,657 in 2015 to 48,805,982 in 2022 with 471 total internet service providers from 221 in the same periods (CA,2023). This trend indicates the potential for e-commerce growth in the country.

Figure 2.3: Total Fixed Wireless Internet Subscriptions
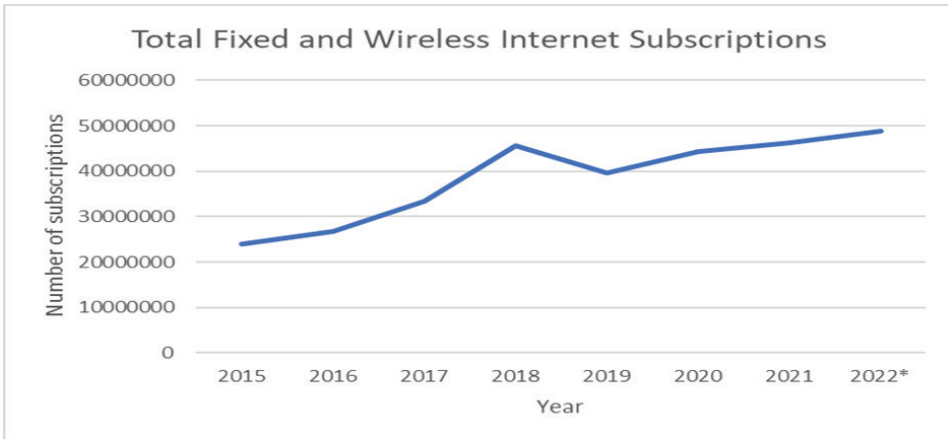
Source: CA (2023)

An analysis of internet use by county shows that counties in urban areas have the highest internet usage led by Nairobi, Kiambu, Nakuru and Mombasa counties while counties in rural areas such as Tana River, Lamu, Samburu, Marsabit, Isiolo and West Pokot with less than 50,000 users have the least internet usage (KNBS,2019). The number of internet users is an indicator of potential ecommerce users in a country. The low numbers recorded in rural areas further explain the low uptake of e-commerce in these regions. Figure 1.4 shows the number of internet users per county.

Studies have shown that mobile commerce fuels e-commerce in the country (UNCTAD,2020). The number of mobile users is another indicator for e-commerce adoption and use. Data from the 2019 census further illustrates the disparities in mobile phone penetration across counties. Counties that had earlier show high internet penetration also had the highest mobile phone penetration while those with the least internet penetration also had low mobile phone penetration with Lamu, Tana River, Isiolo and Samburu registering less than one hundred thousand mobile phone owners. However, the overall mobile penetration in the country has increased over time with 66.7 million mobile subscribers as at December,2023 (CA, 2024). Out of this number ,50.3 percent own smartphones which have the features required for ecommerce transactions. Figure 1.5 shows mobile phone ownership by county.

Figure 2.4: Number of Internet Users per County
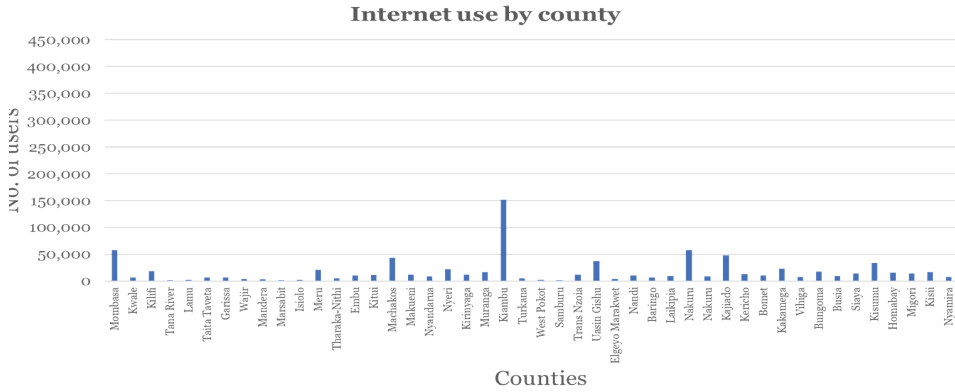
Source: KNBS (2019)

Figure 2.5: Mobile Phone Ownership by County
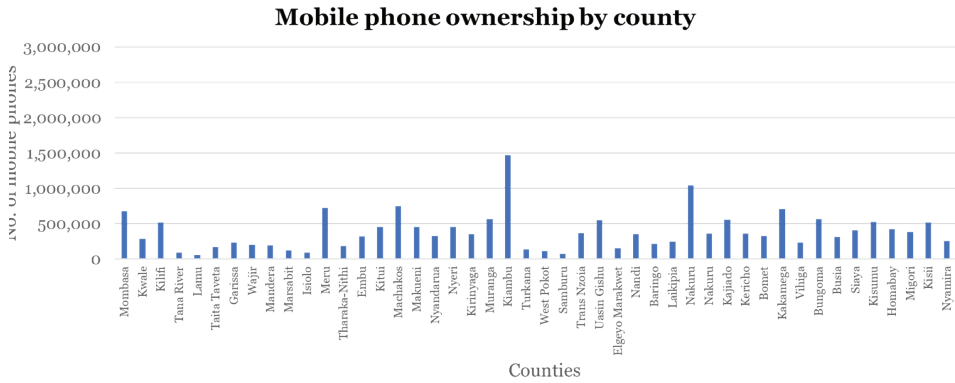
Source: KNBS (2019)

Figure 2.6: E-commerce user by County

E-Commerce users by county
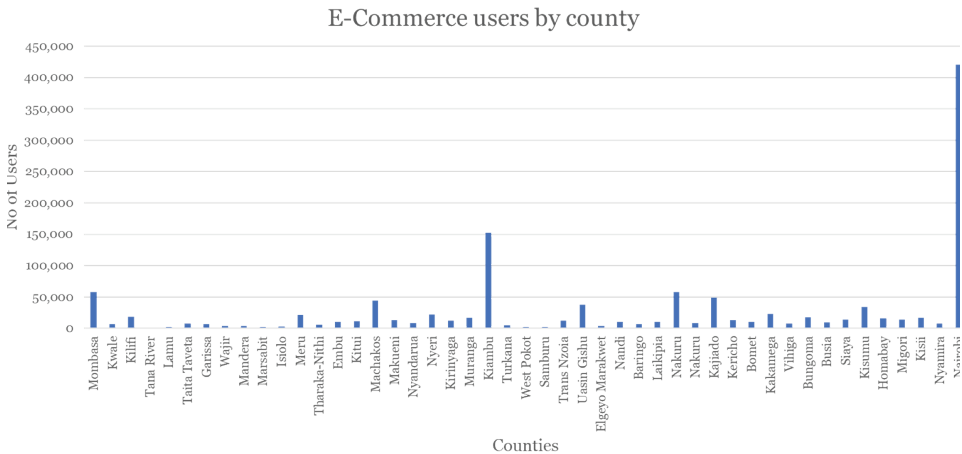
Source: KNBS (2019)

Many e-commerce users were found in urban towns of Nairobi, Kiambu, Nakuru and Mombasa indicating the need for awareness and sensitization in rural areas and other urban towns to increase its adoption. The data also shows a trend where e-commerce usage was almost equivalent to internet usage and mobile phone ownership across the counties. This further reinforces that internet connectivity and mobile phone usage are necessary ICT metrics for advancing e-commerce adoption in the country.

2.2.2 Trade Logistics

Kenya boasts of good transport and logistics infrastructure ranging from airports, seaports, roads and railway. These are essential for delivery of goods and services across all regions of the country. However, there are disparities in the road network condition between these regions, as some are impassable, hindering delivery to such regions. Some of the infrastructure such as railway line also does not reach all regions of the country as the standard gauge railway line currently runs from Mombasa to Nairobi with an extension to Naivasha port which joins the metre gauge railway to the Kisumu port. The government has made efforts to encourage transportation of cargo through rail as an alternative means of delivery from road transport.

Other modes of delivery of parcels and goods include the use of courier services and postal services. There are 622 postal offices and 1030 private courier outlets as of 2022 (KNBS, 2023). If well managed, these could serve as last mile delivery points for goods thereby facilitating the reach of e-commerce services to underserved areas.

The National Addressing Bill 2021 seeks to establish several key components: the National Addressing Council, the National Addressing Framework, the Office of

the Registrar of Addresses, and the County Addressing Coordination Committee. It aims to provide a legal framework for coordinating addressing activities and related purposes. Currently, the bill is awaiting its third reading, having undergone public participation and amendments by the designated committee.

The National Addressing System will facilitate the naming and numbering of streets and properties, along with coding them for easy identification and location. Under the Nairobi Metropolitans Service Improvement project, funded by the World Bank, a physical addressing framework was implemented for Nairobi City, Kiambu Town, Thika Town, and Machakos Town (Guma and Monstadt, 2021).

A national addressing system is crucial for supporting e-commerce growth, as it simplifies the process of last-mile delivery, including the use of advanced technologies like drones to deliver goods directly to customers' addresses (Ronoh, 2022). Currently, only a few properties in urban areas can receive door deliveries; most e-commerce customers must rely on pickup and drop-off points for their orders.

2.2.3 Payment Services

There has been immense growth in payment services in the country following increased use of mobile money services as a payment method. The country has over 38 million mobile money subscriptions (CA,2023) e-commerce platforms in Kenya accept both card and mobile money payments. However, concerns on security from fraud and card skimming still pose as a major challenge affecting trust of consumers on online platforms (Criveanu, 2023). The cost of mobile money transactions also limit use of e-commerce transactions as excise duty for mobile money transaction currently stands at 15 percent coupled with a digital tax of 1.5 percent on the gross transaction value for online businesses which took effect in 2021 (KNBS, 2022).

2.2.4 E-commerce Skills Development

Several skills are required in the ecommerce ecosystem ranging from marketing, branding, photography, videography, editing, graphic design, data analytics, logistics and cybersecurity (UNCTAD,2021). There is a shortage of skilled personnel for ecommerce due to skills mismatch in the market. Small scale traders who require e-commerce to boost their sales lack the necessary skills required to trade online thus locking them out from accessing wider markets for their products both locally and internationally.

The government has implemented several programmes to improve digital skills in the country such as Ajira digital, Jitume in Konza technopolis and the Presidential Digital Talent Programme which are crucial in developing digital skills for ecommerce to thrive (Kenya Ministry of Information, Communications, and The Digital Economy, 2024). However, a survey by UNCTAD 2021 revealed that 67

percent of Kenyans were not aware of the programmes related to e-commerce skills development.

2.3   Kenya's Institutional Legal and Policy Framework for E-commerce

2.3.1   E-commerce facilitation

The absence of an e-commerce law in Kenya has exacerbated the slow adoption and use of ecommerce platforms. The inability of consumers to find recourse to their disputes due to lacking regulations has created mistrust in online purchases thus curtailing the growth of e-commerce.

A supportive legal framework is essential for addressing various challenges in e-commerce including consumer protection, data privacy, cybersecurity, intellectual property rights, and cross-border transactions. Adam et al., (2020) emphasize that clear regulations can foster trust among consumers, reduce transactional risks, and enhance the overall efficiency of e-commerce operations. Additionally, a well-structured legal environment encourages innovation and investment, thereby stimulating economic growth. Kenya has several policies and frameworks in place to support and facilitate Ecommerce though they have failed to address the unique needs of ecommerce users.

 The Kenya Information and Communication Act (2012) was enacted to facilitate electronic commerce and eliminate barriers to electronic commerce such as those resulting from uncertainties over writing and signature requirements and promote public confidence in integrity and reliability of electronic transactions. It also provides for the development of sound frameworks to minimize the incidence of fraud in e-commerce and facilitate investigations and prosecution of cybercrime offences. The act acknowledges validity and enforceability of contracts that are formed through electronic messages.

 While it has been instrumental in shaping the digital landscape in Kenya, it harbors significant shortcomings in effectively facilitating the growth of e-commerce. The Act addresses certain aspects of electronic transactions, but it lacks comprehensive provisions tailored specifically to the complexities of e-commerce. For instance, The Act fails to sufficiently address emerging challenges such as facilitation of cross-border e-commerce transactions, hindering the full realization of Kenya's e-commerce potential. Thus, there is a pressing need for legislative reforms that align with the evolving dynamics of online commerce, ensuring a supportive legal environment conducive to sustainable e-commerce growth in Kenya.

The National Electronic Single Window System (2022) was established to serve as a single-entry point for people involved in trade and one of its functions is to facilitate electronic transactions in trade and reduce legal and operational barriers to electronic transactions. This act led to the formation of Kentrade whose function was to develop, manage, and promote interchange of electronic data for facilitation of trade. The system allows traders to submit information and documents including licenses, permits, certificates and cargo clearance in a single

platform for imports and exports removing logistic and transport hindrances resulting from overlapping regulations. While the platform has eased the process of cargo clearance, ecommerce firms still face logistics and delivery challenges such as tracking of their goods for cross-border transactions as most are done through courier services.

Digital business is one of the pillars of the digital economy blueprint (2019) where it seeks to develop a robust marketplace for digital trade, digital financial services, and digital content. This is to be achieved through increased quality of financial inclusion, fair competition, resilient data infrastructure, advanced consumer protection and greater regional integration (MoICT,2019). It advocates for e-commerce growth both nationally and within the region which requires a robust legal framework to foster an enabling environment where all citizens and businesses can conduct their trade fairly.

The National E-commerce Strategy (2023) seeks to provide an enabling environment for the development of trusted e-commerce services accessible to and used by all Kenyans. It focuses on ensuring that e-commerce reaches the disadvantaged groups such as people with disability for convenience, women and youth who may lack digital skills and access to financial incentives together with businesses in rural areas.

With the strategy's implementation, the government hopes to increase adoption of e-commerce by businesses which will expand the reach of goods and services sold and reduce operational costs. Time taken between order and delivery is expected to also reduce and confidence in the use and security of e-commerce platforms by consumers increased. The strategy acknowledges that there is need to review existing trade and ICT laws and regulations to accommodate e-commerce transactions and meet international standards required to spur its growth in Kenya.

2.3.2 Consumer Protection and Data Privacy

The consumer protection act gives provisions for the protection of consumers from all forms of unfair trade practices including deceptive, misleading, unfair, or fraudulent conduct and encourages fair and ethical competition. The act mentions considerations for using appropriate foreign and international law, conventions, declarations, and protocols when applying it implying that it can be used in handling issues on consumer protection by multinational companies. However, the act does not provide for clear dispute resolution mechanisms when dealing with sellers from a different jurisdiction. The competition authority of Kenya is mandated to enforce this act by resolving disputes, protecting consumers, and encouraging creation of consumer bodies. However, this only applies to licensees of the authority hence e-commerce customers do not benefit from it. The act also needs to be enhanced to provide mechanisms for handling issues of misleading information on products or services, fraud, and complaint resolution.

The Data Protection Act (2019) was enacted to regulate processing of personal data, protect privacy of individuals, and provide data subjects with rights and

remedies to protect their data from processing that is not in accordance with the act. The act gives provisions for a framework for the processing of personal data with a focus on security precautions, purpose limitation, transparency, and data minimization. It seeks to give people authority over their data by granting them access and rectification rights. This act also specifies duties for data processors and controllers and established a Data Commissioner to monitor and enforce compliance. The Act marks a significant stride towards safeguarding individuals' data privacy rights in the digital era, yet it presents notable shortcomings in its capacity to effectively foster e-commerce growth. Mukiri-Smith and Leenes, (2021) notes that compliance requirements under the Act may impose burdensome obligations on small and medium-sized e-commerce enterprises, potentially stifling innovation and hindering market entry.

3.   Literature Review

3.1   Definitions and Categorization of E-commerce

Although the term e-commerce emerged in the early 1990s (Haryanti and Subriadi, 2020), there remains no universally agreed-upon definition for electronic commerce. Multiple definitions exist, reflecting the interdisciplinary nature of e-commerce and its rapid evolution across various domains. Terbeck, (2014), notes that by nature e-commerce spans fields such as computer science, marketing, finance, management information systems, consumer behaviour, and economics making it difficult for a universal definition. On the other hand, e-commerce operates in an ever-changing landscape, incorporating new sectors of the economy and emerging technologies, making it challenging to establish a fixed definition (Brehm, 2019).

Broad definitions range from "any form of economic activity conducted via electronic connections" (Laudon and Traver, 2020) to "the buying and selling of goods or services over the internet," including pre- and post-sale activities (Mohdhar and Shaalan, 2021), a similar definition is given by the International Business Machines Corporation (2006) which defined e-commerce as a part of e-business that includes the act of selling products and services on the internet. This study adopts the broader definition proposed by Mohdhar and Shaalan (2021).

Joshi and Dumbre, (2017) categorized e-commerce based on the type of participants in the transaction which include: business-to-business (B2B), business-to-consumer (B2C), consumer-to business (C2B), and consumer-to-consumer (C2C). B2C is also called "e-tailing" (Laudon and Traver, 2020) and has the highest popularity due to strong advertising of existing B2C players.

3.2   Theoretical Literature Review

The study was guided by the Unified Theory of Acceptance and Usage of Technology (UTAUT). The UTAUT was developed by Venkatesh and others in 2003(UTAUT1) and an extension of the original in 2012(UTAUT2) to additionally include factors relevant to the consumer market. This theory was developed from a combination of eight previous models namely theory of reasoned action, theory of planned behaviour, diffusion innovation theory, model of personal computer use, motivational model, technology acceptance model, social cognitive theory and combined theory of planned behaviour and technology acceptance model.

The theory states that the usage of a technology is determined by behavioural intention. It assumes that the probability of adopting a technology is dependent on four aspects, that is, performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al.,2003). Performance expectancy refers to an individual's belief that the use of a technology will improve their work performance, effort expectancy on the other hand refers to perceived use of a technology by an individual. Social influence is defined by the individual's perception of how other people believe it is important for them to use

the technology while facilitating conditions refer to the extent of an individual's belief that there exists technical and infrastructure support in an organisation to facilitate use of the technology.

The UTAUT and its extended version (UTAUT2) provide a robust framework for guiding this study, particularly in the context of the 4IR. UTAUT posits that the likelihood of adopting new technology is influenced by four key factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. As the study explores the intersection of 4IR and e-commerce, UTAUT's comprehensive approach helps researchers understand how these factors drive consumer behavior in increasingly digital marketplaces. Performance expectancy, which highlights the benefits consumers anticipate from e-commerce platforms, is crucial as advancements in AI, big data, and IoT improve personalized shopping experiences and operational efficiency. Effort expectancy underscores the importance of user-friendly interfaces, which become even more critical as technological complexity increases with 4IR innovations. Social influence captures the growing impact of social media and peer reviews on purchasing decisions, while facilitating conditions emphasize the necessity for reliable digital infrastructure and support systems, aligning with the technological backbone of 4IR. By integrating insights from UTAUT, researchers can better build future scenarios of e-commerce considering the influence of 4IR technologies.

3.3   Empirical Literature Review

3.3.1   Technology

The future remains uncertain and often unpredictable, with technological advancements playing a significant role in shaping the pace of societal change. As such, there is a growing need for all stakeholders to navigate this uncertainty and change effectively (Jiang et al., 2017). Institutions strive to anticipate future developments and their economic and policy implications, recognizing that emerging technologies can disrupt entire business ecosystems across both public and private sectors (Sharma et al., 2019).

In the evolving global economy, technological advancements are fueling the growth of e-commerce worldwide, driving economic development. In their foresight study on the futures of blockchain technology in e-commerce in Kuala Lumpur and Selangor, Malaysia Jie and Shafi, (2022), found out that the rapid implementation and adoption of technologies like Blockchain, Internet of Things (IoT), Artificial Intelligence (AI), Robotics, 3D printing, and Virtual Reality (VR) are reshaping the e-commerce. These new technologies are marking the onset of the fourth industrial revolution (4IR) and have already proven their value across sectors such as marketing, healthcare, finance, and education and are now revolutionizing e-commerce operations (Al-Tit, 2020).

The rise of 4IR technologies introduces new paradigms for e-commerce, with AI poised to replace a significant portion of customer service roles by 2029 according to Nodirovna and Sharif (2024) who in their study on e-commerce trends shaping the future of retail industry, found out that leading e-commerce

companies like Alibaba and Amazon are harnessing AI for tasks such as sentiment analysis, chatbot development, personalized product recommendations, and big data processing. A survey conducted by IPSOS (2024) revealed that 40 percent of online consumers across 17 countries utilize AI-powered tools like chatbots to explore products and services.

The internet's advent was instrumental in the inception of e-commerce, and its continued accessibility continues to shape its adoption (Mintel, 2020). The clearest evidence of this is the increased volume of commerce around the globe among different countries using the internet compared with business transactions conducted without the internet. The Internet's role can be identified from the fact that it makes business transactions more efficient in terms of speed and accuracy (Ballestar, 2021). A study by Rahman and Dekkati, (2024) determined four drivers of e-commerce: internet accessibility, smartphone adoption, AI adoption and logistics and supply chain management. Furthermore, seven factors that support the adoption of e-commerce by SMEs in China were identified by Song et al., (2023) in their study on e-commerce adoption in farmer entrepreneurship: internet infrastructure, government support, competition, consumer preference, organization readiness and knowledge of e-commerce. Zumstein and Kotowski, (2020) while examining the drivers of e-commerce in Europe, found that internet access, an enhanced digital secure payment system, and an increase in mobile devices as well as changes in customers' lifestyle were the key factors that enabled growth of e-commerce.

3.3.2   Competition and Consumer Preference

The increasingly intense competition within the retail landscape of Kenya emerges as a prominent catalyst for the adoption of e-commerce, as underscored by Chebichiy and Odhiambo (2020) who in their study on challenges and opportunities of e-Commerce in Kenya, highlighted how heightened competitive pressures prompt SMEs entrenched in traditional retail formats, such as supermarkets and convenience stores, to adopt innovative e-commerce strategies to boost sales. Echoing this sentiment, a consumer survey conducted by KPMG (2020) notes that convenience and timesaving as primary motivators for online purchases. Furthermore, the survey findings explain the shift from conventional in-store shopping which is currently perceived negatively by some consumers. Particularly, individuals constrained by time, such as working couples with children or those with physical disabilities, gravitate towards e-commerce for its time saving. Concurrently, a study on factors affecting e-commerce adoption among small and medium enterprises (SMEs) in developing countries by Kimana, (2020) found out the younger demographic aged between 17 and 28 exhibits a pronounced preference for e-commerce, largely driven by its inherent convenience.

Customer satisfaction surveys underscore price comparison as another key driving force, as highlighted by research from Ronoh (2022), KPMG (2020), and Kimana (2020). The study by Ronoh (2022), emphasizes how consumers increasingly rely on online platforms to compare prices across multiple retailers effortlessly,

enabling them to identify the most cost-effective options. This trend is further amplified by the accessibility and transparency afforded by digital platforms, as noted by Volkova, et al. (2021), which empowers consumers to conduct comprehensive price analyses in real-time. Moreover, a study by Mohdhar and Shaalan, (2021) on the future of e-commerce systems, highlight the significant influence of price differentials on consumer behavior, with competitive pricing strategies often serving as a key determinant in driving online purchase intentions.

Consequently, knowledge of competitor's prices becomes invaluable for e-commerce enterprises, who often utilize this intelligence to implement markdown pricing tactics, offering significant opportunities for profit enhancement (Goyal et al., 2019). The e-commerce space provides an ideal arena for such pricing strategies, as retailers can capitalize on cost-effective tools to meticulously monitor supply and demand dynamics, while the minimal overhead costs enable swift responses through frequent price adjustments (Aseh et al., 2021; Mintel, 2020). This heightened frequency of price changes further amplifies the potential for profit gains derived from employing sophisticated markdown strategies (Mintel, 2020).

3.3.3   Environmental Sustainability

The world has witnessed a surge in the occurrence of extreme weather and climate events, including rising temperatures in traditionally cold regions, heightened occurrences of hot weather extremes, sea-level elevation, and increased instances of heavy precipitation leading to floods in certain areas. These climate-related extremes are primarily attributed to increased greenhouse gas emissions. Sarkar, (2023) in his study on environmental sustainability under e-Commerce concludes that as societal awareness regarding environmental issues grows, businesses are adapting their practices to address these concerns and e-commerce enterprises, in particular, are striving to fulfill their environmental responsibilities by implementing measures such as pollution reduction, sustainable delivery methods, eco-friendly product packaging, fostering customer consciousness, and promoting product recycling initiatives.

Owing to their intricate structure, Song et al., (2023) notes that supply chains are particularly susceptible to disruptions stemming from natural disasters, extreme weather phenomena, and the impacts of climate change. Green innovation stands out as a crucial component in the realm of environmental protection and sustainability. Sarkar, (2023) also found out that e-commerce enterprises are increasingly embracing green last-mile delivery strategies, which involve integrating sustainable environmental practices into the process of product delivery to consumers. This approach encompasses various initiatives, including the reduction of carbon dioxide emissions from delivery vehicles and the optimization of delivery routes for increased efficiency. According to a report by the UN Environmental Programme (2022) on green logistics, the adoption of electric vehicle (EV) delivery, nighttime or off-peak hour deliveries, and the utilization of value-brand parcel lockers could potentially lead to a 30 percent

reduction in CO_2 emissions, a 30 percent decrease in traffic congestion, and a 25 percent reduction in delivery costs by the year 2030.

The exponential growth of the fast delivery sector has given rise to significant concerns regarding waste and pollution stemming from excessive packaging (Sharma et al., 2022). Many businesses view packaging not only as a functional necessity but also as a component of their marketing strategy, investing in packaging features to enhance the consumer experience (Escursell et al., 2021). However, overpackaging not only compromises environmental sustainability but also impacts supply chain costs (Sarkar, 2023). As awareness of environmental issues and their consequences continues to grow, consumers are increasingly mindful of their consumption choices. Petruzzi (2022) reports a notable increase in the global green packaging market between 2016 and 2021, with recyclable, reusable, and degradable packaging witnessing growth rates of 6.5 percent, 9.96 percent, and 15.5 percent, respectively. Additionally, findings from a European Union survey on environmental awareness (2023) reveal that 70 percent of respondents support measures against plastic packaging, while 72 percent prefer products packaged in an environmentally friendly manner.

New production processes such as 3D printing are gaining popularity in the manufacturing sector and may help reduce transportation and shape new e-commerce models, thereby facilitating more sustainable e-commerce through reduced CO_2 emissions. Other technologies such as autonomous vehicles (AGV) and drones, are envisioned to further improve last-mile operations and accelerate the benefits of sustainable e-commerce value chain (Al-Tit, 2020).

3.3.4   Geoeconomics and Geopolitics in E-commerce

The rapid advancement of ICT technologies has facilitated the "platformization" of infrastructures, as evidenced by examples like Google and Amazon, which have demonstrated how corporate-owned digital platforms are increasingly acquiring characteristics typically associated with publicly controlled infrastructures, such as ubiquity, indispensability, and invisibility. This transformation has introduced new tensions, as highlighted by Criveanu (2023). Subsequent studies within the realm of ICT technologies have further explored the infrastructuralization of digital platforms on a global scale. For instance, Musembi (2024) investigated the infrastructuralization of Mpesa, a prominent mobile payment platform in East Africa, shedding light on its integration into the regional context. Similarly, Shen et al. (2020) analyzed how mobile payment platforms like Alipay and WeChat Pay have evolved into fundamental financial infrastructures in China, highlighting the shifting power dynamics between various stakeholders, including the Chinese government and platform owners.

The emergence of infrastructuralized e-commerce platforms on national, regional, and global scales has sparked intense competition, posing challenges to the growth of e-commerce while simultaneously presenting vast opportunities for fostering cross-border trade (Cohen, 2024). Recognizing the pivotal role of data and e-commerce in the modern economy, concerted efforts have been made to

establish global frameworks for data governance and e-commerce regulation. The initiation of World Trade Organization (WTO) negotiations aimed at establishing universally accepted e-commerce regulations, launched at Davos in 2019 and endorsed by the G20, underscores this endeavor (European Commission, 2019). However, despite strides made in proposing measures to foster trust, international tensions have often impeded progress. For instance, heightened US-China distrust has led to the enactment of stringent data privacy and security laws with rigorous cross-border clearance requirements for "sensitive" data, alongside US restrictions on Chinese e-commerce firms citing national security concerns (Chor and Li, 2024).

The global e-commerce sector confronts the looming toxic blending of geoeconomics and geopolitics within trade and investment policies. With technological advancements driving a quest for supremacy, numerous nations are imposing restrictions on cross-border e-commerce (Hayakawa et al., 2024). Approximately 99 percent of international data flow is facilitated through submarine cables, with satellite relays contributing to the remaining fraction (Mishra, 2024). However, the infrastructure of submarine cables is primarily dominated by China, the US, and France, giving rise to tensions in both geoeconomics and geopolitics within the international internet backbone, which serves as a cornerstone for e-commerce operations.

3.4 Existing E-commerce Foresight Studies

This section reviews existing studies on futures foresight in e-commerce.

E-commerce has witnessed exponential growth over the past few decades, transforming the way businesses operate and consumers shop. However, predicting the future trajectory of this dynamic industry remains a challenging task. In 2014, Terbeck conducted a foresight study utilizing the Delphi method, engaging 61 experts to envision the future of e-commerce over a 10-year horizon. The study findings envisioned four future scenarios.

Scenario 1: Technological Innovation Supported by Citizens and Politics:

Terbeck's study highlights a scenario where technological innovation in e-commerce is embraced and supported by both citizens and political entities. This scenario suggests a future where advancements in technology, such as AI, AR, and IoT, revolutionize the e-commerce landscape, enhancing customer experience, supply chain efficiency, and personalized marketing strategies. Furthermore, government policies and regulations favor innovation, fostering a conducive environment for e-commerce growth on a global scale. This scenario underscores the importance of collaboration between stakeholders to harness the full potential of technological advancements in shaping the future of e-commerce.

Scenario 2: Information Overload Due to Technology Fear by People: Contrary to the optimistic outlook of Scenario 1, Terbeck's study outlines a scenario characterized by information overload fueled by people's fear of technology. In this scenario, concerns regarding data privacy, cybersecurity threats, and algorithmic

bias contribute to a sense of apprehension among consumers, leading to skepticism towards e-commerce platforms. As a result, businesses may face challenges in building trust and maintaining customer loyalty, ultimately hindering the growth of e-commerce. Addressing these fears necessitates proactive measures such as transparent data policies, robust security measures, and ethical AI practices to mitigate potential risks and restore consumer confidence in e-commerce.

Scenario 3: Preservation of Status Quo and Protectionism: Terbeck's study identifies a scenario where the e-commerce landscape remains stagnant, characterized by the preservation of the status quo and rising protectionist measures. This scenario suggests a future where regulatory barriers, trade restrictions, and geopolitical tensions impede cross-border e-commerce activities, limiting market access and hindering global expansion efforts for businesses. Furthermore, entrenched interests and resistance to change perpetuate traditional retail models, undermining the potential benefits of technological advancements. Overcoming protectionist barriers requires collaborative efforts among governments, businesses, and international organizations to promote free trade agreements, streamline customs procedures, and foster a conducive environment for cross-border e-commerce growth.

Scenario 4: Slow Technological Progress but Strong Shifts in Lifestyles: Terbeck's study envisions a scenario characterized by sluggish technological progress but significant shifts in consumer lifestyles. In this scenario, although technological innovation may stagnate, changing consumer preferences, demographics, and socio-cultural trends drive transformative shifts in e-commerce behavior. Consumers prioritize sustainability, social responsibility, and experiential shopping experiences, influencing purchasing decisions and shaping the future of e-commerce. Businesses must adapt by adopting agile strategies, diversifying product offerings, and embracing customer-centric approaches to cater to evolving consumer demands and remain competitive in the dynamic e-commerce landscape.

Terbeck's study offers valuable insights into the future of e-commerce, presenting four distinct scenarios that underscore the complex interplay between technology, society, and regulations. While technological innovation holds immense potential to revolutionize e-commerce, addressing societal concerns, navigating regulatory challenges, and understanding shifting consumer behaviors are crucial for shaping a sustainable and inclusive future for e-commerce on a global scale.

Sharma et al. (2019) conducted a pioneering study on foresight for online shopping behavior, employing scenario analysis methodology to forecast the evolution of consumer behavior in the e-commerce platforms over a ten-year horizon. The study's findings underscore the profound influence of the internet in transforming customer expectations in the realm of online shopping. As consumers increasingly embrace digital platforms for their shopping needs, their expectations regarding product variety, price transparency, personalized recommendations, and seamless purchasing experiences will undergo a paradigm shift.

The study notes that in future the internet will continue to empower consumers with access to vast amounts of information as a result of increased adoption of

artificial intelligence and internet of things, enabling them to make informed purchase decisions, compare prices across multiple retailers, and seek out products that align with their preferences and values. Consequently, businesses must adapt by leveraging technology to deliver tailored and engaging online shopping experiences that meet the evolving expectations of digitally savvy consumers.

Central to Sharma et al. (2019) findings, is the recognition of convenience as the key driver of future e-commerce success. In an increasingly fast-paced and interconnected world, consumers will prioritize convenience above all else when engaging in online shopping activities. This will include various aspects of the shopping process, including browsing, purchasing, payment, delivery, and returns. From streamlined mobile shopping experiences to one-click checkout options and same-day delivery services, convenience-enhancing features will play a pivotal role in attracting and retaining customers in the highly competitive e-commerce landscape. Businesses that will prioritize convenience and optimize their operations to remove friction points in the online shopping journey are poised to thrive in the future e-commerce marketplace.

In their comprehensive investigation into the intersection of blockchain technology and e-commerce, Jie and Shafi (2022) employed scenario analysis as a strategic tool to forecast potential developments over the course of three decades. By analyzing insights gained from 88 expert interviews alongside desktop research, their study envisions four distinctive scenarios, each offering unique insights into the evolving landscape.

The first scenario portrays a future where both awareness of blockchain technology and digitalization within the e-commerce sphere are high, promising a synergistic relationship between technological innovation and market maturity. Conversely, the second scenario envisages a landscape characterized by advanced digitalization but limited awareness and adoption of blockchain technology, signaling potential missed opportunities for transformative change. In the third scenario, both awareness of blockchain technology and digitalization levels are low, posing challenges for technological innovation and hindering the progress of e-commerce. Finally, the fourth scenario presents a context where awareness of blockchain technology is high, but digitalization remains at a nascent stage, suggesting a potential mismatch between technological readiness and market receptivity. Through these scenarios, Jie and Shafi provide valuable insights into the complex interplay between blockchain technology and e-commerce, paving the way for informed decision-making and strategic planning in the digital era.

In their 2014 study on Global E-Tailing, DHL, (2014) employed scenario analysis methodology to forecast the future of retailing and its implications for logistics over a ten-year horizon. Drawing from ethnographic trend scouting in 12 cities and expert interviews, the study developed four future scenarios. Scenario 1 envisioned hybrid consumer behavior in convergent worlds of retailing, highlighting the blurring boundaries between online and offline shopping experiences. Scenario 2 focused on self-presentation in virtual communities, where consumers engage in curated online identities and social interactions influence purchasing decisions. Scenario 3 explored the integration of artificial intelligence in the digital retail

sphere, emphasizing the potential for personalized recommendations and enhanced customer experiences. Finally, Scenario 4 outlined collaborative consumption in a regionalized retailing landscape, were localized initiatives and shared resources shape consumer behaviors and preferences. Through these scenarios, DHL's study provided valuable insights into the evolving dynamics of global e-tailing and its implications for logistics, emphasizing the importance of adaptability and innovation in meeting the evolving needs of the retail industry.

4.   Methodology

The analytical framework outlined in Figure 4.1 provides a structured approach for the study, encompassing several key phases. The study begun with formulation of a research question, followed by the systematic collection of information. This resulted into the identification of dominant external forces, determination of trends, and key projections, culminating in the development of various scenarios. The framework employed tools such as the PESTEL Framework, Delphi method, and impact-uncertainty matrix to ensure a comprehensive analysis.

Figure 4.1 Analytical Framework of the Study
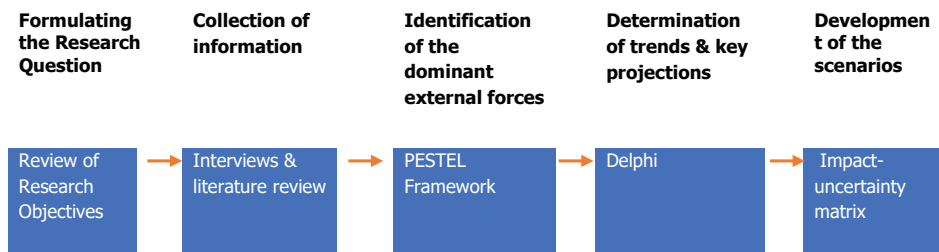
Source: Authors

4.1.1 Scenario planning Process

The study adopted the Schwartz scenario planning process to identify the key drivers of e-commerce and come up with scenarios to address the study objective. Scenarios are intended to show how different assumptions about a set of trends and drivers impact outcomes. As a result, the creation of scenarios is predicated on current and historical patterns, which serve as future indications.

The following steps were employed in the study:

(i)   Formulating the Research Question: The step involves the formulation of a question that focuses on the objective associated with the formation of the scenarios. The study aimed to explore the factors driving the evolution of e-commerce within the framework of the fourth industrial revolution (4IR). Given the substantial uncertainty surrounding the impact of 4IR transformations on e-commerce, the research question was articulated as follows: What are the key driving forces of e-commerce in the context of the fourth industrial revolution?

Following the formulation of the general research question, specific questions were developed to help collect relevant data. From the general question, the following specific questions were developed:

• How do changes in consumer behaviour, influenced by the 4IR, impact the adoption of e-commerce platforms?

- What role do regulatory frameworks and policies play in shaping the adoption of e-commerce within the context of the 4IR?

- How do emerging trends in data analytics and artificial intelligence influence the adoption of e-commerce?

- How does the integration of Internet of Things (IoT) technologies affect the adoption and implementation of e-commerce strategies?

- What are the sociocultural factors influencing the adoption of e-commerce platforms in the era of the 4IR?

- How does 4IR impact supply chain operations?

- What are the implications of cybersecurity threats and data privacy concerns on the adoption of e-commerce?

(ii)   Collection of information: Review of existing literature was conducted to gain insight into the dominant external forces driving adoption of e-commerce. To identify these forces, Schoemaker (2002) suggests the adoption of PESTLE analysis, which delves into political, economic, social, and technological dimensions. A total of 36 industry reports from consulting firms, NGOs, and governmental institutions were collected and scrutinized. The selection criteria for these articles underwent constant iteration. All gathered information was systematically organized within the PESTLE framework. The objective was to uncover the interconnections among these elements, facilitating the identification of trends and critical uncertainties shaping the e-commerce landscape

(iii) Recruitment of Panel Participants. The expert panel was assembled through a process of identification, evaluation, selection, and recruitment of pertinent individuals in the field. The optimal size of a Delphi survey panel varies depending on factors such as research scope, desired diversity within the panel, and the availability of experts, as noted by Drumm et al. (2022). Previous Delphi studies have featured panels ranging from 15 to 35 participants (Niederberger et al., 2021).

For this study, the aim was to gather a panel of 30 experts from the e-commerce sector with diverse stakeholder backgrounds. Heterogeneous panels have been found to yield more accurate estimations due to the reduction of polarization in viewpoints (Drumm et al., 2022). Identification of potential experts was conducted through database searches, networking, and exploration of professional social networks like LinkedIn.

Selection criteria included technical expertise in e-commerce, professional background, and a demonstrated interest in the topic from the following categories: E-commerce firms, payment service providers, e-commerce vendors, e-commerce users and regulatory institutions. Following this process, 30 e-commerce experts were identified and invited to participate in the Delphi survey as indicated in table 4.2.

Table 4. 1 Delphi Panel of Experts

E-commerce Experts	Frequency	Percentage
E-commerce Platform Specialists	3	10
E-commerce platform Designers	1	3.3
Inventory and Supply Chain Management	1	3.3
Customer Service and Support	2	6.7
Data Analysts and Business Intelligence Specialist	2	6.7
Payment Gateway Expert	3	10
Mobile Apps Developer	2	6.7
International Trade Expert	2	6.7
Content and Copywriting Specialist	3	10
AI and Automation Specialist	2	6.7
Drone Specialist	1	3.3
E-commerce Customer	3	10
E-commerce Vendor	3	10
Legal Expert-Commercial Law	2	6.7
Total	30	100

Source: Authors

(iv) Selection of Time Horizon. The time horizon for the projections in this study was ten years, which is not too near or too far to avoid vague findings (Van Notten et al., 2003). To clearly project current trends, ten years is far enough to give meaningful projections. However, it is important to note that the ideal time horizon is specific to the industry , product or market under review (Schaars, 1987. Saffo,2007 suggests looking into the past twice as long as the foresight horizon. Since several E-commerce studies discussed earlier have indicated that modern ecommerce lasts upto 20 years, this study employed a time horizon of ten years in its projections.

(v) Execution of Delphi Survey. For the Delphi survey, the study utilized an online questionnaire that presented the 18 projections and asked the experts to evaluate them according to their estimated probability of occurrence, and their impact, for a 10-year projection. The probability of occurrence and impact were measured on a 5-point Likert scale (ranging from 1= 'strongly disagree' to 5 = 'strongly agree' and 1 = 'very low' to 5 = 'very high' impact). After collecting the responses, results were analyzed by calculating mean, standard deviation, outliers, and interquartile range measures. The interquartile range measure specifically shows whether consensus among participants was reached for a projection by calculating the dispersion from the median (Sekaran and Bougie, 2013). It measures the difference between the upper and lower quartiles, and thus represents

the middle 50% of observations (Drumm, et al., 2022). Projections with an interquartile range of 2 or less indicated that consensus was reached on the probaility of occurence (von der Gracht and Darkow, 2010). Projections with an impact of 3 or higher were considered to be relevant and important for the study.

 The results from analysis of Delphi projections were used to create scenarios on probability of occurrence and impact on e-commerce by 2035.

vi.   Development of the scenarios. To ensure distinct representations of different future visions, a decision was made to employ a heuristic approach in the form of a 2x2 matrix for scenario development. The aim was not to formulate "good" or "bad" scenarios, but rather those grounded in plausibility. Four scenarios are the logical outcomes for a 2x2 matrix (Schwartz,1991). Drawing from the projections presented in the Delphi survey and analysis of the responses, a cluster plot was used to identify the projections with the highest average impact and probability of occurrence. The outcome was utilized to come up with plausible scenarios for e-commerce. Each outcome presents an individual scenario, each to be assessed independently of the others. The results from the Delphi survey were used to develop scenarios in an impact uncertainty matrix.

5.   Results

This section presents a detailed analysis of the data collected, highlighting the key trends, dominant external forces, and significant projections identified. Through a combination of literature reviews, and the application of the PESTLE framework, Delphi method, and impact-uncertainty matrix, the study develops plausible scenarios that address the research objectives.

5.1   PESTLE Analysis of Key Drivers of E-commerce

The PESTLE analysis of key drivers of e-commerce offers a comprehensive examination of the political, economic, social, technological, legal, and environmental dimensions influencing the sector. A total of 36 industry reports sourced from consulting firms, , academia and governmental institutions were analysed and results are presented in table 5.1.

Table 5.1: PESTLE analysis of key drivers of E-commerce

Drivers	Variables	Indicators
Political	• Geopolitical relationships and tensions • Trend analysis of global governance	• Diplomatic Relations • Trade Relations • Alliances and Treaties • Territorial Disputes • Sanctions
Economic	• Investment in infrastructure • Trend analysis of supply chain Efficiency • Trend analysis of digital Payment Systems • Competition	• Internet penetration and connectivity • Mobile network connectivity • Logistics and transportation infrastructure • Payment infrastructure e.g digital wallets • Brand Reputation and Trust • Number of Competitors

Social	• Analysis of Population Growth • Changing Consumer behavior • Trend analysis of influencer marketing	• Population Census • Personalization and recommendations • Subscription services • Social media use
Technological	• Analysis of Digital Literacy • Smart phone usage in e-commerce • Internet of Things, Artificial Intelligence and Blockchain technology • Trend analysis of Cybersecurity	• Awareness of e-commerce platforms • Effective use of shopping applications • Adoption rates of new technologies • Security awareness • Number of cyberattacks on e-commerce platforms
Legal	• Identification of consumer Protection • Government policy and regulatory framework	• Transparent return and refund policies • Privacy policy and data protection
Environmental	• Climate Change • Visioning sustainable value chains	• Carbon footprint • Adoption of Circular economy principles • Green packaging and shipping practices

Source: Authors

5.2   Delphi Survey

Table 5.2 shows the final outcomes of the Delphi survey, showcasing the interquartile range, mean, and standard deviation for the estimated probability of occurrence, alongside the mean for estimated firm and societal impact for each projection. These results pertain specifically to the consensus observed in Delphi Round 1. Consistent with prior research, an interquartile range of 2.0 or lower signals consensus achievement for a given projection (Niederberger et al., 2021). The participants were able to reach consensus in all the 18 projections after Round 1. The highest consensus was met for projections in e-commerce technologies : projection 3 (By 2035, every tenth privately purchased product is a file for 3D printers), projection 5 (In 2035, biometric technologies will have completely replaced traditional payment systems), projection 6 (In 2035, more than 75% of

all sold food products and apparel will contain tiny sensors) and projection 7 (In 2035, cash as means of payment in retail stores will disappear completely due to adoption of digital). Another projection with interquartile range of 2 was on regulation; projection 14 (In ten years, data protection laws will be very weakened and thus enable a more intelligent and extensive data analysis).

Typically, the Delphi method involves multiple iterative rounds of data collection and feedback, aiming to converge towards a collective agreement among experts (Drumm, et al., 2022). However, when consensus is reached in the initial round, it suggests a high degree of alignment among participants. Furthermore, in this study, experts were drawn from 14 sub-categories, making it remarkable to achieve consensus in one Delphi round. This early consensus underscores the robustness of the identification of the 18 projections from the literature review.

Table 5. 2: Descriptive Analysis of the Delphi Projection

Projection	IQR	Mean percentage	SD	Impact
E-commerce Technologies Projections by 2035				
In 2035, more than 75% of all B2C orders are placed on mobile devices.	1	88.00	.858	4.34
In 2035, artificial intelligence personal assistants will proactively recommend highly relevant products	1	78.67	1.242	3.34
By 2035, every tenth privately purchased product is a file for 3D printers	2	62.00	1.042	3.48
In 10 years, more than 50% of consumers will use augmented reality technologies to shop everywhere	1	74.00	1.015	3.31
In 2035, biometric technologies will have completely replaced traditional payment systems	2	75.33	1.367	4.34
In 2035, more than 75% of all sold food products and apparel will contain tiny sensors	2	71.33	1.215	2.86
In 2035, cash as means of payment in retail stores will disappear completely due to adoption of digital	2	80.67	1.066	3.38
Parcel delivery by drones will be standard by 2035 for the last mile of the supply chain.	1	75.33	1.055	3.66
Social-Economic Projections by 2035				
In 2035, more than 50 percent of the population will no longer shop at supermarkets due to time pressure and convenience of online shopping	1	74.67	.988	4.11

An increase in population will cause a significant increase of online purchasing volume in ten years	1	86.67	.702	4.41
In 10 years, the labor market will meet the demand for e-commerce professionals and Big Data specialists	1	84.00	.761	3.76
In 2035, there will be significant increase in internet users, reaching 72 percent of the population	1	84.67	.961	3.10
Political Projections by 2035				
In 2035, globally accepted rules apply to all consumers and traders, so that there will be no regulatory differences between national and international transactions	1	70.00	.900	3.34
In ten years, data protection laws will be very weakened and thus enable a more intelligent and extensive data analysis	2	54.67	1.135	3.69
In ten years, political initiatives will breed ground for digital innovation triggering a technology-friendly climate	1	62.00	1.075	3.49
Environment and Sustainability Projections by 2035				
In 2035, green supply chains will apply, where every step from manufacturing to delivery minimizes carbon footprint and environmental impact	1	72.67	.964	3.28
In the next 10 years, e-commerce will see the rise of circular economy models	0	77.33	.819	3.69
In the next 10 years, e-commerce will witness the emergence of innovative eco-friendly packaging solutions	1	83.33	.664	3.74

5.3   Desired and Possible Outcomes in E-commerce

The study further did a scenario cluster plot of the average probability of occurrence and impact for all the 18 projections. All the projections except projection 6 (In 2035, more than 75% of all sold food products and apparel will contain tiny sensors) had an impact higher than 3.0 showing the relevance of these projections on e-commerce adoption and use. All projections where consensus was reached had a probability of occurrence of over 50%. Figure 5.3 shows the scenario cluster developed from analysis of the projections.

Figure 5.1: Scenario Cluster Plot of the Average Probability of Occurrence and Impact
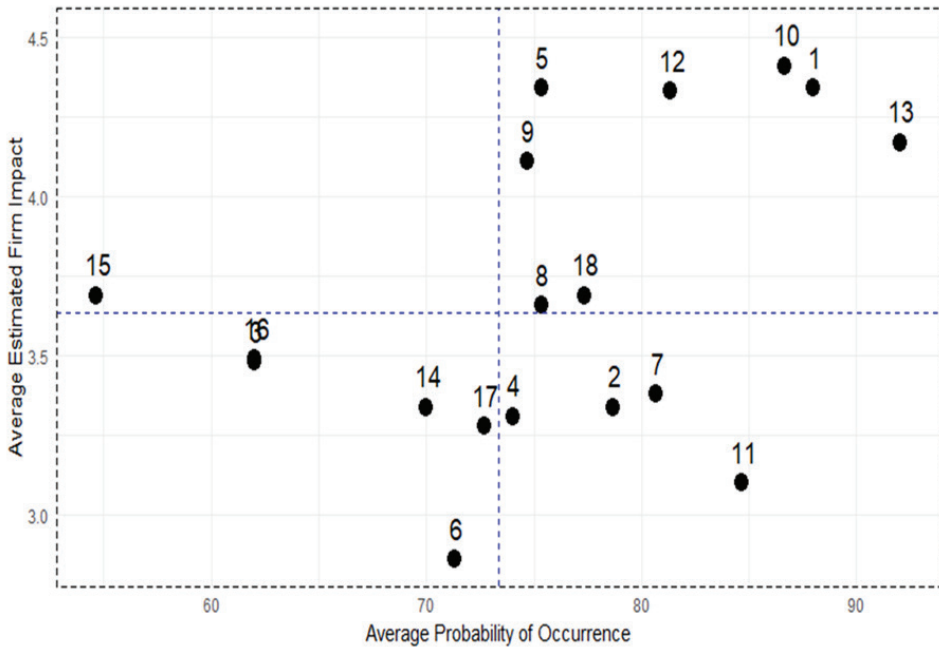
Source: Delphi Survey Results

To develop the most probable scenario, the study used projection numbers 10,1 and 13 which had the highest impact and probability of occurrence as shown in figure 5.4. Projection 10: An increase in population will cause a significant increase of online purchasing volume in ten years; Projection 1: In 2035, more than 75% of all B2C orders are placed on mobile devices and Projection 13: In 2035, globally accepted rules apply to all consumers and traders, so that there will be no regulatory differences between national and international transactions.

Figure 5.2: Impact-Certainty Matrix

High Impact

Government good-will
- Political support towards digital initiatives triggering tech friendly environment.
- Governments implements policies to promote digital literacy and skills development.
- Government invests in internet and digital infrastructure.
- Promotion of cross-border e-commerce agreements.
- Development of joint e-commerce initiatives.

Hybrid (e-commerce "+" traditional)
- Globally accepted regulations
- High online purchase volumes
- Agency model e-commerce for delivery
- Increased smart mobile phones adoption.
- Increased internet coverage and access.
- Enabling environment backed by strong policy &regulatory framework.
- Drone delivery.

Low certainty

High certainty

Eco-friendly E-commerce
- Strict environmental regulations
- Increase in circular economy.
- Adoption of green supply chains
- Increased consumer awareness of environmental sustainability.
- New production processes such as 3D printing.
- Increased adoption of green packaging.

4IR Driven E-commerce
- AI powered e-commerce
- Internet of Things (IoT) Integration
- Augmented Reality (AR) and Virtual Reality (VR) Experiences
- Blockchain-enabled Trust and Transparency
- Enhances internet infrastructure
- Adoption of digital payment platforms

Low Impact

Source: Authors

Scenario A: Government good-will

In Scenario A: Government goodwill envisions a scenario where the Kenyan government takes a proactive role in fostering a technology-friendly environment, crucial for the widespread adoption of e-commerce. The government has demonstrated its commitment to digital innovation by launching initiatives such as the Digital Superhighway Project. This ambitious project, rolled out in 2023, becomes the cornerstone of e-commerce in the country by laying down requisite internet infrastructure which in turn facilitates the creation of public Wi-Fi hotspots and Digital Village Smart Hubs across Kenya. This expansion will bridge the digital divide between urban and rural areas, ensuring more inclusive internet access, which is a fundamental prerequisite for e-commerce growth.

While urban areas show higher internet usage, rural counties lag, primarily due to poor infrastructure and higher costs. By enhancing the quality and affordability

of internet services, through the digital superhighway, the project drives e-commerce adoption across the entire country. The successful implementation of Digital Superhighway Project creates an environment where e-commerce can thrive, benefiting from improved connectivity and streamlined interactions with government services.

Smartphone penetration is another critical factor in the e-commerce ecosystem, as mobile devices are often the primary means of accessing online services in Kenya. However, the high cost of smartphones has been a significant barrier to broader adoption. To address this, the Kenyan government, through a public-private partnership, has established the East Africa Device Assembly Kenya Limited in Athi River. This facility is expected to manufacture affordable, locally assembled smartphones, making these devices more accessible to the Kenyan population. By lowering the cost barrier, the government is enabling more citizens to participate in the digital economy, thereby boosting e-commerce activities.

The successful growth of e-commerce also hinges on the availability of a skilled workforce capable of managing various aspects of the digital economy. Scenario A anticipates that the government will actively support the acquisition of necessary skills in areas such as marketing, branding, photography, videography, editing, graphic design, data analytics, logistics, and cybersecurity. Kenya has already taken significant steps in this direction through programs like Ajira Digital, Jitume in Konza Technopolis, and the Presidential Digital Talent Programme. These initiatives are crucial in developing a pool of skilled professionals who can drive the e-commerce sector forward.

Current analysis indicates that Kenya is already on the path to Scenario A: Government goodwill. The government's proactive approach in driving digital innovation and improving internet infrastructure is a testament to its commitment to fostering a thriving e-commerce environment. By implementing comprehensive strategies to enhance digital skills and making technology more accessible, the government is laying the groundwork for a robust e-commerce ecosystem. These efforts are not only bridging the digital divide but also creating a more inclusive digital economy where all Kenyans can benefit from the opportunities presented by e-commerce.

Scenario B: Hybrid E-commerce

Scenario B: Hybrid E-commerce envisions a future where the boundaries between online and offline retail blur, creating a seamless shopping experience that leverages both physical and digital spaces. By 2035, every purchase will involve the internet, marking a significant shift from the days when retail managers distinctly separated online and offline sales. In Kenya, this hybrid model will be facilitated by the widespread use of smartphones. As of 2023, there were 66.1 million mobile (SIM) subscriptions in the country, with 32.6 million of these being smartphones. This number is expected to grow as technology advances and consumer preferences continue to favour the convenience and enhanced features of smartphones. Mobile devices will thus remain the primary means for accessing online services, driving the integration of e-commerce into everyday shopping experiences.

A key driver of this hybrid e-commerce scenario is the increasing internet coverage and access. Internet subscriptions in Kenya more than doubled from 23.9 million in 2015 to 48.8 million in 2022, a trend likely to continue with the implementation of the Digital Superhighway project. This project aims to further enhance internet accessibility, thereby supporting the growth of hybrid e-commerce. With more people connected to the internet, the potential customer base for online and offline retailers expands, creating new opportunities for businesses to reach consumers through both digital and physical channels.

In response to heightened industry competition, many Kenyan retailers have diversified their business models to include online sales. This trend is expected to intensify over the next decade, encouraging partnerships between large e-commerce firms, IT companies, and traditional retailers. Such collaborations will result in the creation of industry-specific e-commerce service stations. For example, in market settings, these stations can recruit multiple vendors to post their goods online, expanding their customer reach. These service stations, operated by tech-savvy youth who previously worked as sales agents or brokers, will manage the online postings and facilitate deliveries. This approach creates a comprehensive e-commerce ecosystem, generates employment, and increases profits for market vendors who might lack the digital skills to sell online independently.

The hybrid e-commerce model will also extend to rural and remote areas through the adoption of the agency model. Local retail shops will be onboarded onto e-commerce platforms to serve as last-mile delivery centers. These shops, run by individuals with established relationships within their communities, will encourage the use of e-commerce platforms. By integrating online and offline operations, these local retailers can help their communities sell agricultural produce and other goods to broader markets, thereby increasing incomes and spurring rural development. This approach builds consumer trust by combining the convenience of online shopping with the familiarity of traditional trade methods.

Observing more advanced e-commerce economies, such as China with over 80 percent e-commerce penetration, provides valuable insights into this hybrid model. In China, traditional retailing has not been replaced by e-commerce; instead, physical retailers have adopted online sales channels while maintaining their brick-and-mortar presence. Similarly, e-commerce-only companies are now partnering with physical retailers to enhance their sales. This dual approach leverages the strengths of both online and offline shopping, providing a holistic retail experience that meets diverse consumer needs.

Scenario C: 4IR Driven E-commerce

Scenario C: 4IR Driven E-commerce envisions a future where the adoption of Fourth Industrial Revolution (4IR) technologies revolutionizes the e-commerce landscape in Kenya. In this scenario, advanced technologies such as artificial intelligence (AI), augmented and virtual reality (AR/VR), and digital payment solutions replace traditional methods, driving widespread e-commerce adoption. AI algorithms analyze customer preferences to deliver personalized shopping experiences, while AR/VR technologies offer immersive, seamless virtual shopping environments. The shift towards digital payment solutions, such as M-Pesa,

signifies a move away from cash, facilitating quicker and more secure transactions. This technological integration not only enhances customer satisfaction but also sets the stage for a transformative e-commerce ecosystem.

In scenario C, the global competitive landscape and cost pressures compel retailers and producers to adopt automation, replacing human personnel with efficient, cost-effective machines capable of operating 24/7. This shift is part of a broader economic transformation supported by political initiatives aimed at transitioning from a service-based economy to a technology-driven "silicon society." Citizens have embraced this change, overcame technological anxiety and increasingly sought innovations that simplify and enhance their digital lifestyles. In this accelerated environment, time has become the most valuable resource, and 4IR technologies enable consumers to save time and enjoy more personalized shopping experiences.

In Scenario C, every commercial transaction integrates seamlessly into the digital ecosystem. Purchase information is automatically added to the customer's preference profile, enabling AI to deliver personalized advertisements and pricing based on individual consumption behavior. VR technologies offer users the ability to shop anytime and anywhere, breaking down traditional barriers to access. Digital personal assistants, accessible through various devices like cars, smartphones, or holographic displays, provide personalized recommendations and save user's time. While these assistants enhance the shopping experience, critics argue that they can create a filter bubble, limiting users' exposure to a broader range of options.

The dominance of online shopping in this new era makes traditional supermarkets largely obsolete. Three critical factors will drive the supremacy of e-commerce in Scenario C. First, the challenge of last-mile delivery must be addressed. The advancement of drone technology is expected to fill this gap, providing efficient delivery solutions, particularly in rural areas. Drones, already used in Kenya's health sector for delivering blood and vaccines, are anticipated to become standard delivery channels by 2035 as the technology matures. Second, the spread of digital services is crucial. Over 5,000 government services are currently available online, with plans to digitize all services by 2027. Similarly, 39 percent of private enterprises have already transitioned all their services online, as indicated by a 2016 National ICT survey. Third, the digital dependence and massive personalization enabled by 4IR technologies create a lock-in effect for buyers, reinforcing their preference for online shopping.

As the 4IR driven e-commerce scenario unfolds, the comprehensive adoption of advanced technologies will redefine retail in Kenya. The integration of AI, AR/ VR, and digital payment solutions will enhance customer experiences, making shopping more convenient, personalized, and efficient. Automation and drone technology will address logistical challenges, particularly in last-mile delivery, ensuring that even remote areas benefit from the e-commerce boom. The widespread availability of digital services will further support this transformation, making it easier for consumers and businesses to engage in e-commerce. Ultimately, Scenario C presents a future where e-commerce is not just a part of

the economy but a dominant force driving economic growth and improving the quality of life for Kenyans.

Scenario D: Eco-friendly E-commerce

Scenario D: Eco-friendly e-commerce envisions a future where the e-commerce industry is transformed by the urgent need to address climate change and environmental sustainability. The increasing frequency of extreme weather events, such as rising temperatures, hot weather extremes, sea-level rise, and heavy precipitation leading to floods, will push governments to enforce stringent environmental regulations. An example of such regulatory action is Kenya's 2017 law banning single-use plastic bags. The Paris climate conference (COP28) in December 2023 marked a significant milestone, signaling a global commitment to ending the fossil fuel era with deep emissions cuts and increased financing for sustainable practices. In this scenario, e-commerce will be compelled to adopt green last-mile delivery strategies, incorporating sustainable practices to minimize carbon footprints and optimize delivery efficiency.

As environmental awareness grows, consumers will become increasingly conscious of their consumption choices, favoring environmentally friendly products and practices. This shift in consumer behavior will drive e-commerce businesses to adopt eco-friendly business models. Companies will focus on reducing their environmental impact by implementing green logistics, such as using electric or hybrid delivery vehicles, optimizing delivery routes, and employing packaging made from recyclable or biodegradable materials. These initiatives will not only reduce carbon dioxide emissions but also enhance the overall sustainability of the e-commerce supply chain.

The rise of the circular economy will further influence e-commerce models and business practices. In a circular economy, products are designed for longevity, reuse, and recycling, which reduces waste and resource consumption. E-commerce businesses will need to adapt by offering products that are durable, repairable, and recyclable. This may include developing take-back programs where customers can return used products for refurbishment or recycling. Such practices will appeal to environmentally conscious consumers and help businesses reduce their environmental impact while fostering customer loyalty.

Innovative production processes, such as 3D printing, will gain popularity in the manufacturing sector, facilitating more sustainable e-commerce models. 3D printing allows for localized production, reducing the need for long-distance transportation and the associated carbon emissions. By producing goods closer to the point of consumption, businesses can lower their transportation costs and environmental footprint. This technology will enable on-demand production, minimizing overproduction and waste, and allowing for greater customization to meet consumer needs sustainably.

In Scenario D, e-commerce businesses will not only comply with stringent environmental regulations but also proactively lead in adopting sustainable practices. This proactive approach will involve collaboration with governments, environmental organizations, and other stakeholders to develop and implement

green strategies. Businesses that embrace eco-friendly practices will likely gain a competitive advantage, attracting a growing segment of environmentally conscious consumers. Ultimately, the transition to eco-friendly e-commerce will contribute to global efforts to mitigate climate change, promote sustainable development, and ensure a healthier planet for future generations.

5.3 Strategies to Improve E-commerce Adoption in Kenya

Internet Infrastructure

Improving internet infrastructure in Kenya is crucial, as it serves as the backbone of e-commerce. Current analyses reveal significant disparities in internet access between urban and rural areas, exacerbated by high internet costs. Statista (2024) highlights that the cost of one gigabyte of mobile internet in Kenya averages 0.59 US dollars, higher than in Nigeria (0.39 $), Ghana (0.40 $), and Israel (0.02 $). Additionally, Kenyans experience an average connection speed of 21.78 Mbps, lagging behind Nigeria (26.48 Mbps), Ghana (31.94 Mbps), and Israel (40.16 Mbps). These cost and speed issues hinder widespread internet usage and digital inclusivity. The rollout of the digital superhighway project in 2023 aims to address these challenges by enhancing the affordability and speed of internet services, fostering digital inclusivity, and boosting Kenya's competitive edge in the digital economy.

To actualize the digital superhighway project, the government can leverage strategic partnerships with private sector stakeholders. Telecommunications companies like Safaricom, which holds a 42.8 percent market share in internet subscriptions and boasts a 14,000-kilometer fibre optic footprint, are pivotal for the project's success. Collaborating with such entities will extend the reach and reliability of internet services across Kenya. Furthermore, the extensive electricity transmission and distribution network owned by Kenya Power, spanning 160,000 kilometers, can support the necessary infrastructure for public Wi-Fi hotspots and Digital Village Smart Hubs. Partnering with technology providers such as East Africa Device Assembly Kenya Limited will ensure the availability of affordable smartphones and other essential technologies, thereby driving e-commerce accessibility and engagement throughout the country.

Skills Gap

To build a skilled workforce capable of thriving in the digital economy, Kenya's education system must overcome its current infrastructural challenges. While the government has connected 19,000 (95 percent) of primary schools to electricity, only 8,000 (34 percent) have access to computers or digital devices (MoE,2020). This gap significantly hinders effective digital literacy education. To address this, the government may invest not only in internet access but also in equipping schools with essential digital tools. By doing so, students can develop the skills needed for e-commerce and other digital activities from an early age, creating a pipeline of digitally proficient individuals ready to contribute to the e-commerce ecosystem.

Bridging the skills gap will be essential for the success of hybrid e-commerce in Kenya. Innovative services and training programs will be needed to create industry-specific e-commerce service stations. These stations can recruit market vendors and assist them in posting their goods online, effectively expanding their customer base and digital footprint. Training programs should focus on essential e-commerce skills, including digital marketing, inventory management, customer service, and cybersecurity. By equipping market vendors with the necessary skills, these service stations can foster a vibrant e-commerce ecosystem that supports both online and offline retail.

Logistics

Hybrid E-commerce envisions a future where online and offline retail seamlessly merge, creating a comprehensive shopping experience that leverages both physical and digital platforms. The success of this scenario will heavily depend on several key strategies aimed at improving e-commerce adoption and addressing emerging challenges. The Digital Superhighway Project, a crucial initiative by the Kenyan government, will play a significant role in realizing this scenario. By expanding the country's fiber optic network and establishing Digital Village Smart Hubs, this project will enhance internet access and connectivity, particularly in rural areas. These smart villages will be instrumental in promoting the agency model of e-commerce, where local retail shops serve as last-mile delivery centers and e-commerce agents.

To support the widespread adoption of the agency model in e-commerce, there will be a need for specific regulations addressing the unique challenges and opportunities it presents. E-commerce regulations should be designed to ensure that local retail shops can effectively integrate with larger e-commerce platforms, maintaining standards for service quality and customer satisfaction. These regulations should also provide a framework for fair competition, data protection, and consumer rights, ensuring that all stakeholders benefit from the hybrid e-commerce ecosystem. Flexibility in data protection laws, for instance, may be necessary to allow for data mining and analysis, enabling personalized recommendations and enhancing the overall customer experience.

Additionally, drones can address the last-mile delivery challenge, particularly in rural areas. However, the enactment and implementation of the National Addressing Bill (2021) is essential to establish a National Addressing System (NAS), enabling accurate GPS mapping and facilitating drone deliveries.

Environmental Sustainability

Businesses must be aware of the environmental impacts of their operations, and e-commerce companies, in particular, should focus on sustainable practices. One area of significant potential is sustainable transport, where the growth of 3D printing promises to revolutionize the sector by reducing the need for traditional shipping. E-commerce businesses should also adopt green last-mile delivery strategies, which integrate eco-friendly practices into the product delivery process. This includes initiatives to reduce carbon dioxide emissions from delivery vehicles, such as using electric or hybrid vehicles, and optimizing delivery

routes to enhance efficiency and reduce fuel consumption. By implementing these strategies, e-commerce companies can significantly reduce their environmental footprint while still meeting consumer demands.

The concept of a circular economy offers a robust framework for promoting eco-friendly e-commerce practices by focusing on reducing, reusing, and recycling resources throughout the product lifecycle. For e-commerce businesses, this means designing products and packaging with durability and recyclability in mind, facilitating product repair, refurbishment, and remanufacturing to extend product lifespans, and promoting sharing and rental economy models to maximize resource utilization. By adopting circular economy principles, e-commerce companies can minimize waste generation, reduce their environmental impact, and promote sustainable consumption patterns. Furthermore, fostering collaboration and innovation across the e-commerce value chain to develop circular business models, along with incentivizing consumers to make more conscious and responsible purchasing decisions, can drive the transition toward a more sustainable and eco-friendly e-commerce ecosystem.

6. Conclusion and Policy Recommendations

6.1 Conclusion

The study aimed to assess the status of e-commerce in Kenya, identify the key drivers of its adoption, and explore its future within the context of the Fourth Industrial Revolution (4IR). E-commerce, characterized by the buying and selling of goods and services online, is undergoing a significant transformation due to the advent of the Fourth Industrial Revolution (4IR). Technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), Virtual Reality (VR), machine learning, and big data are driving this evolution, facilitating seamless integration between the digital and physical worlds. These advancements are reshaping business operations, making them more efficient and resilient. For e-commerce players to remain competitive, it is essential to anticipate mid- and long-term trends and adapt accordingly.

The study highlights several key factors influencing its adoption and utilization. The quality of internet infrastructure stands out as a critical determinant, serving as the foundation for all e-commerce activities. The widespread adoption of smart mobile phones is equally pivotal, expanding access to e-commerce platforms for a larger portion of the population. Moreover, the development of digital skills is crucial, enabling users to effectively navigate online marketplaces. Efficient trade logistics ensure the reliable and timely delivery of products, while environmental factors, including sustainability practices, are increasingly impacting consumer preferences and behaviors.

Looking ahead, the future of e-commerce in the context of the 4IR holds great promise. As technologies continue to advance, e-commerce platforms will become even more sophisticated, offering enhanced user experiences and greater operational efficiencies. Businesses must continue to invest in robust internet infrastructure, promote digital literacy, and adopt sustainable practices to meet evolving consumer expectations. By doing so, they will be well-positioned to capitalize on the opportunities presented by the 4IR, driving growth and innovation in the e-commerce sector.

6.2 Policy Recommendations

To address these challenges, and capitalize on opportunities presented in the future of e-commerce, the study makes the following policy recommendations:

The legal and regulatory environment for e-commerce in Kenya requires urgent modernization to keep pace with technological advancements. The government can develop a comprehensive e-commerce law to cater for issues that are specific to the sector. This will provide a clear regulatory framework to guide the operation of e-commerce platforms by various actors. The law may focus on areas such as identity registration of sellers to a relevant body, consumer protection regulations ranging from quality of goods to data protection in payment and delivery processes, handling customer complaints and applicability and enforcement of the law to multinational companies and cross border e-commerce. The law could also

consider creating a directorate of e-commerce in the state department for trade to spearhead the development of online commerce in the country. Current laws often fail to adequately support the sector's rapid growth, leading to businesses operating under informal mutual agreements rather than clear legal frameworks. This can result in inconsistencies and uncertainties that hinder e-commerce development. The government may prioritize creating comprehensive e-commerce legislation that addresses key issues such as digital transactions, data protection, and consumer rights. By establishing a robust legal framework, the government can provide a stable environment that fosters trust and encourages investment in the e-commerce sector.

To make Kenya's Digital Superhighway a reality, the government may leverage strategic partnerships between public and private sector stakeholders. For example, collaborations with telecommunications companies like Safaricom, which holds a significant market share and extensive fiber optic network, can be instrumental. By partnering with entities such as Kenya Power for electricity transmission infrastructure and technology providers like the East Africa Device Assembly Kenya Limited, the government can create a synergistic environment that accelerates the deployment of necessary digital infrastructure. These partnerships can streamline the expansion of internet connectivity and digital services across the country, ensuring a robust and resilient digital backbone.

Addressing the digital literacy skills gap is another crucial policy recommendation. The government may consider investing in both internet access and equipping schools with essential digital tools. This dual approach ensures that students not only have access to the internet but also the devices and software needed to develop critical digital skills. By integrating digital literacy into the educational curriculum from an early age, Kenya can cultivate a generation of digitally proficient individuals. This pipeline of talent will be essential for the continued growth and sustainability of the e-commerce ecosystem, as it prepares young people to participate fully in the digital economy.

To support the integration of small-scale businesses into the digital economy, the development of innovative services is essential. The government can facilitate the creation of industry-specific e-commerce service stations that help small vendors market and sell their goods online. These service stations, operated by tech-savvy individuals, can assist vendors with digital marketing, logistics, and customer service, effectively bridging the skills gap. By providing these services, small-scale businesses can overcome barriers to entry in the digital marketplace, expand their customer base, and increase their revenues, thus promoting inclusive economic growth.

Implementing a National Addressing System (NAS) is another critical step for the development of e-commerce. Accurate GPS mapping and the systematic naming and numbering of locations will facilitate efficient logistics and delivery services, including drone deliveries. The enactment and implementation of the National Addressing Bill (2021) will be crucial in this regard. A well-defined NAS will enable precise delivery of goods and services, particularly in remote and underserved areas, enhancing the overall efficiency of the e-commerce supply chain. This

infrastructure will be vital for supporting advanced logistics solutions like drones, which can revolutionize last-mile delivery.

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