

Exploring the Financial Dimensions of E-commerce Development in Asia's Landlocked Developing Countries (LLDCs)

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Abstract

This research aims to examine the financial aspects of cross-border e-commerce in LLDCs through the application of the Technology-Organization-Environment (TOE) Framework. By utilizing this framework, we will explore how technology, organizational characteristics, and environmental factors impact the financial performance and success of cross-border e-commerce ventures in LLDCs. The findings of this study will provide valuable insights for policymakers and organizations seeking to enhance their financial outcomes in the cross-border e-commerce landscape of LLDCs.

Keywords: e-commerce development, financial dimensions, Landlocked Developing Countries (LLDCs), digital infrastructure, financial inclusion, taxation policies, payment systems, funding mechanisms

1. Introduction

Landlocked Developing Countries (LLDCs) are nations that lack direct access to the sea and face unique geographical and logistical challenges due to their landlocked nature. These countries are often situated in remote regions, surrounded by transit countries, which can impede their connectivity and hinder trade and economic development. According to the United Nations classification, there are 32 LLDCs in the world.

Cross-border e-commerce has emerged as a significant driver of economic growth and development, particularly for Landlocked Developing Countries (LLDCs). These countries, geographically constrained and often situated in remote regions, face unique challenges in accessing global markets and maximizing their trade potential. However, the advent of cross-border e-commerce has opened up new opportunities for LLDCs to overcome these geographical constraints and foster economic development.

LLDCs, by their very nature, lack direct access to seaports and are heavily reliant on transit countries to facilitate trade. This reliance on transit routes adds complexities and costs to the movement of goods, impeding trade flows and economic integration. Moreover, limited physical infrastructure and geographical barriers further hinder the participation of LLDCs in global trade. These challenges have traditionally restricted their access to international markets, limiting their export potential and impeding economic growth.

In this context, cross-border e-commerce has emerged as a transformative tool for LLDCs. By leveraging digital technologies and online platforms, LLDCs can now engage in direct trade with global markets, bypassing traditional trade barriers. The significance of cross-border e-commerce lies in its ability to eliminate territorial boundaries, connect buyers and sellers from different corners of the world, and provide new opportunities for businesses

Through cross-border e-commerce, LLDCs can expand their market reach, tap into global consumer demand, and diversify their export base. This digital pathway allows LLDCs to participate in international trade without relying solely on extensive physical infrastructure or proximity to global marketplaces. Instead, they can leverage the power of technology and digital platforms to showcase their products, connect with customers, and facilitate seamless transactions.

Moreover, cross-border e-commerce offers a level playing field for LLDCs, enabling them to compete globally based on the quality and value of their products rather than their geographical location. This presents a unique opportunity for LLDCs to overcome the historical disadvantages associated with their landlocked status and drive inclusive economic growth.

By embracing cross-border e-commerce, LLDCs can enhance their export competitiveness, attract foreign direct investment, promote entrepreneurship and innovation, create employment opportunities, and ultimately improve the standard of

living for their populations. However, to fully realize the potential of cross-border e-commerce, LLDCs need to address various challenges related to digital infrastructure, financial inclusion, taxation policies, payment systems, and funding mechanisms.

The primary objective of this research is to assess the financial aspects of cross-border e-commerce in Landlocked Developing Countries (LLDCs) using the Technology-Organization-Environment (TOE) Framework. The TOE Framework provides a comprehensive lens through which to examine the adoption and diffusion of technological innovations within organizations, considering the key factors of technology, organizational characteristics, and environmental factors. By applying this framework to the context of cross-border e-commerce in LLDCs, we aim to gain insights into the financial performance and success of these ventures.

Specifically, the research seeks to achieve the following objectives:

- Analyze the technological infrastructure supporting cross-border e-commerce in LLDCs,
- Investigate the organizational characteristics that influence the financial performance of cross-border e-commerce ventures in LLDCs.
- Explore the environmental factors, including legal and regulatory frameworks, trade policies, taxation policies, and market conditions, that shape the financial landscape of cross-border e-commerce in LLDCs.
- Examine the interplay between technology, organizational characteristics, and environmental factors, and their combined effect on the financial success of cross-border e-commerce ventures in LLDCs.

By achieving these objectives, this research aims to contribute to the understanding of the financial aspects of cross-border e-commerce in LLDCs, providing valuable insights for policymakers, organizations, and stakeholders. The findings and recommendations will inform the development of targeted strategies and policies to enhance the financial performance and maximize the economic benefits of cross-border e-commerce in LLDCs. Ultimately, this research aims to support the sustainable economic growth and integration of LLDCs into the global digital economy.

2. Literature Review

2.1 Cross-border e-commerce

Numerous studies have highlighted the significance of cross-border e-commerce for developing countries, as it offers a pathway to overcome geographical constraints and foster economic development.

One key area of research focuses on the economic implications of cross-border e-commerce. Several studies have found that cross-border e-commerce has the potential to enhance export performance (Cassia & Magno, 2022) and facilitate market entry (Deng & Wang, 2016; C. Wang, 2021) for businesses in both developed and developing countries. For instance, researchers have highlighted how digital platforms and online marketplaces

enable small and medium-sized enterprises (SMEs) to reach a global customer base(Jin & Hurd, 2018), overcome geographical barriers, and increase export ability and performance(Kim, 2020). Additionally, cross-border e-commerce has been shown to contribute to job creation(Fan, 2019; Kawa & Zdrenka, 2016), innovation(Ni, 2022; Y. Wang, Jia, Schoenherr, & Gong, 2018), and economic growth by fostering entrepreneurship and expanding market opportunities.

Consumer behavior is another important aspect explored in cross-border e-commerce research. Studies have examined factors influencing consumer preferences and decision-making when engaging in cross-border online shopping. These factors include trust, perceived risk(Paul, 2003), product quality(Mou, Ren, Qin, & Kurcz, 2019; F. Wang, Yang, Tso, & Li, 2019), price competitiveness(Huang & Chang, 2019; Xue, Li, & Pei, 2016), and cultural differences(Gomez-Herrera, Martens, & Turlea, 2014; Sinkovics, 2007). Researchers have found that consumers are more likely to engage in cross-border e-commerce when they perceive higher levels of trust and confidence in the online marketplace(Han, Ma, Addo, Liao, & Fang, 2023; Mou, Cohen, Dou, & Zhang, 2017) and when they perceive favorable pricing and product quality compared to local alternatives.

Furthermore, studies have delved into the challenges and opportunities faced by businesses and governments in facilitating cross-border e-commerce(A. Liu, Osewe, Shi, Zhen, & Wu, 2022). Regulatory frameworks(Laxman, 2021; Sungho, 2016), logistics and supply chain management(Xia & Liu, 2021; Zhou et al., 2022), customs procedures(X. Liu, Chen, & Cai, 2015; Paudel & Alharthi, 2021), and payment systems(Feng, Jiazhen, & Juliana Kucht, 2017; Zhu, Liu, Han, & Lee, 2020) are among the key areas of investigation. Researchers have identified the importance of streamlined customs procedures, secure and efficient payment systems, and harmonized regulations to foster cross-border e-commerce growth. Moreover, studies have emphasized the role of public-private partnerships(Ahmed & Bieron, 2012; Amarnath Ghosh & Padmakali, 2020), government support(N. Chen & Yang, 2016), and international cooperation(Y. Chen et al., 2022; Feng et al., 2017) in overcoming barriers and creating an enabling environment for cross-border e-commerce. Gurbanova et al point out three challenges BRI countries may meet when doing cross-border e-commerce, under-Developed logistics and transport infrastructure, different economic situation and technology gap(Gurbanova & Wang, 2023). However, despite the existing limitations in infrastructure, policies, and socio-economic conditions, e-commerce holds significant potential for development in developing countries, provided that the necessary barriers are addressed and governments demonstrate the political will to foster widespread adoption(Lawrence & Tar, 2010).

While the existing literature has provided valuable insights into cross-border e-commerce, there are still gaps and areas for further exploration. For example, more research is needed to understand the specific challenges faced by developing countries, particularly least developed countries (LLDCs), in engaging in cross-border e-commerce and to identify tailored strategies and policies to address their unique needs. Additionally,

the impact of emerging technologies, such as block chain and artificial intelligence, on cross-border e-commerce deserves further attention.

Overall, the literature on cross-border e-commerce highlights its transformative potential in driving economic growth, expanding market access, and enhancing consumer choices. Continued research in this field is essential to inform policy development, business strategies, and international cooperation efforts aimed at harnessing the benefits of cross-border e-commerce for sustainable and inclusive economic development.

2.2 TOE framework and cross-border e-commerce in LLDCs

To analysis the e-commerce, the TOE framework are used by some researchers to confirms the importance of strategic benefits, external pressure, and technology and financial resources in e-commerce use(Abdulkarem & Hou, 2021; Gibbs & Kraemer, 2004). TOE framework are also used to constructs an index system about the capability of cross-border e-commerce(Yong-ming, Haohao, Ying, & Hashim, 2021). In addition, the Technology-Organization-Environment (TOE) framework offers a comprehensive perspective for evaluating the challenges and opportunities encountered by developing countries, such as Laos and Thailand, Malaysia(Amornkitvikai, Tham, Harvie, & Buachoom, 2022; Wei-Loon & Nurul Afiqah, 2020; Yue, Hong, Wei, Wen, & Li, 2017).

Most of literature focus on identify the challenge faced by LLDCs, and give relative policy suggestion(CEPAL & Adenauer, 2021; Karimov, Nabieva, & Mustafoev, 2023; UN.ESCAP, 2016). Some literatures give the specific suggestions to improve LLDC's condition. For instance, Shukla et al. propose the utilization of process models in the logistics system of Mongolia to enhance their supply chain networks(Shukla & Radhakrishnan, 2019).

The existing literature on cross-border e-commerce in LLDCs highlights the significance of this emerging trend for economic development and global integration. However, there is a notable gap in the research, particularly in the context of LLDCs, with a limited number of studies focusing on the specific challenges and opportunities faced by these countries. This study aims to address this gap by conducting a comprehensive analysis of the financial aspects of cross-border e-commerce in LLDCs, utilizing the TOE framework as a theoretical lens. By examining the technological, organizational, and environmental factors influencing the financial performance of LLDCs in the realm of e-commerce, this research seeks to contribute to the existing body of knowledge and provide valuable insights for policymakers, researchers, and practitioners in bridging the gap and advancing the understanding of cross-border e-commerce in LLDCs.

3. Theoretical Framework

3.1 E-commerce

E-commerce, short for electronic commerce, refers to the buying and selling of goods and services over the internet. In today's modern digital economy, e-commerce has become an integral part of business operations, transforming the way companies engage with

customers and conduct transactions. It offers a wide range of benefits, including increased market reach, convenience, cost-efficiency, and enhanced customer experiences.

At the core of e-commerce are several key elements that drive its functionality and success. Online transactions form the foundation of e-commerce, enabling buyers and sellers to engage in electronic exchanges of products and services. Digital platforms, such as e-commerce websites and mobile applications, provide the virtual spaces where these transactions take place, facilitating the display, promotion, and purchase of goods and services. Electronic payment systems play a crucial role in enabling secure and seamless financial transactions, allowing customers to make payments electronically and businesses to receive payments online.

While e-commerce encompasses various dimensions, the financial aspect plays a critical role in its development and sustainability. Payment systems, including digital wallets, credit/debit cards, and online banking, are vital for facilitating secure and efficient financial transactions in the e-commerce ecosystem. Taxation policies are essential in regulating e-commerce activities, ensuring compliance, and generating revenue for governments. Funding mechanisms, such as venture capital and government initiatives, support the growth and expansion of e-commerce ventures. Additionally, financial inclusion, which refers to providing accessible and affordable financial services to individuals and businesses, plays a significant role in promoting equitable participation in the e-commerce sector.

Understanding and addressing the financial dimensions of e-commerce is essential for policymakers, businesses, and stakeholders involved in the development of LLDCs' e-commerce sectors. By focusing on payment systems, taxation policies, funding mechanisms, and financial inclusion, LLDCs can create an enabling environment that fosters e-commerce growth, stimulates economic development, and enhances digital inclusion within their economies. Through targeted strategies and interventions, LLDCs can harness the full potential of e-commerce and leverage its financial benefits for the benefit of their societies.

3.2 Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment (TOE) Framework is a widely used conceptual model that helps analyze the adoption and diffusion of technological innovations within organizations. It considers three key components: technology, organization, and environment. These components interact and influence each other, shaping the outcomes and performance of technological initiatives.

3.2.1 Applicability of the TOE Framework to Financial Analysis

When applied to the financial analysis of cross-border e-commerce in LLDCs, the TOE Framework provides a comprehensive lens through which to understand the financial aspects of these ventures.

- **Technology:** This component focuses on the technological infrastructure supporting cross-border e-commerce in LLDCs. It examines the availability and quality of internet connectivity, digital payment systems, and e-commerce platforms. Technological advancements play a crucial role in facilitating financial transactions, improving efficiency, and reducing costs in cross-border e-commerce.
- **Organization:** The organizational component of the TOE Framework explores the characteristics and capabilities of local businesses engaging in cross-border e-commerce. It considers factors such as organizational structure, resources, and managerial capabilities. Financial aspects related to organizational factors may include investment in technology, financial management practices, and access to funding and financial resources.
- **Environment:** The environmental component encompasses the external factors that influence the financial landscape of cross-border e-commerce in LLDCs. This includes legal and regulatory frameworks, market conditions, competitive dynamics, and cultural factors. Financial aspects related to the environment may involve taxation policies, trade regulations, consumer trust, and the overall economic climate.

3.2.2 Relating TOE Components to Financial Aspects

Technological advancements in internet connectivity and digital payment systems (Technology) can enhance the speed, security, and cost-effectiveness of financial transactions in cross-border e-commerce. They enable businesses to offer various payment options to customers, improving financial inclusion and expanding market reach.

Organizational factors, such as financial management practices, access to funding, and investment in technology (Organization), directly impact the financial performance of cross-border e-commerce ventures. Efficient financial management, including cash flow management, risk assessment, and financial reporting, contributes to sustainable growth and profitability.

Environmental factors, including taxation policies, trade regulations, and market conditions (Environment), significantly influence the financial landscape of cross-border e-commerce. Favorable tax policies, streamlined customs procedures, and supportive business environments can attract investments, enhance competitiveness, and boost financial outcomes.

By considering the interplay between technology, organization, and environment, the TOE Framework provides a comprehensive understanding of the financial aspects of cross-border e-commerce in LLDCs. It enables researchers and practitioners to identify the key drivers and barriers to financial performance, develop strategies to optimize financial outcomes, and promote sustainable growth in this sector.

4. Methodology

Due to the unavailability of precise e-commerce sales data for LLDCs, the statistical analysis in this research will be omitted. However, the research will still provide valuable insights through a theoretical analysis of the financial aspects of e-commerce in LLDCs. The research will employ a theoretical framework to analyze the financial aspects of e-commerce in LLDCs. This approach will draw on existing literature, theories, and conceptual models to examine the relationship between e-commerce and financial outcomes. Furthermore, this research will also include case studies and best practices from LLDCs and other similar contexts to provide real-world examples and practical insights into the financial implications of e-commerce. These case studies will be derived from published reports, industry studies, and reputable sources.

In this study, we also employ the Technology-Organization-Environment (TOE) model as the analytical framework in our methodology. The TOE model provides a comprehensive lens through which we can examine the complex interactions between technological factors, organizational characteristics, and environmental influences on the financial performance of businesses in Asia LLDCs. This model allows us to delve into the intricate dynamics between technology adoption, organizational capabilities, and the external factors that shape the e-commerce landscape in LLDCs.

5. Application of the TOE Framework to Cross-Border E-commerce in LLDCs

5.1 Technological Infrastructure

5.1.1 Payment Systems

We will examine the technological infrastructure available for cross-border e-commerce in LLDCs. This includes assessing the availability and quality of internet connectivity, the prevalence of mobile devices and digital platforms, and the integration of e-commerce technologies. We will analyze how these technological factors impact financial performance, such as the ability to reach a wider customer base, streamline operations, and enhance efficiency.

Table 1. Asia e-commerce payment methods 2021, by share of transaction volume

Digital / mobile wallet	69%
Credit card / charge card	13%
Debit card	8%
Bank transfer	5%
Buy now pay later	1%
Cash on delivery	3%
Direct Debit	NA
PrePay	NA
Other	1%
Pre-paid card	NA
PostPay	1%

Sources: Worldpay

Table 1 provides an overview of the e-commerce payment methods in Asia in 2021, based on the share of transaction volume. Due to the popularity and the

domination of digital/mobile wallets in Asia, policymakers in Asia LLDCs can leverage this trend by creating an enabling environment, implementing supportive regulations, fostering collaboration among stakeholders, and promoting financial literacy to maximize the potential of digital/mobile wallets and drive economic growth in the region.

5.2 Organizational Characteristics

The organizational characteristics of LLDCs play a crucial role in shaping the financial outcomes of cross-border e-commerce. We will investigate the financial resources available to e-commerce businesses, including access to funding, investment opportunities, and financial support mechanisms. Additionally, we will analyze the human capital within LLDCs, examining the skills, expertise, and capabilities of entrepreneurs and e-commerce professionals. Furthermore, we will explore strategic partnerships and collaborations that contribute to financial success in cross-border e-commerce.

5.3 Environmental Factors

LLDCs operate within specific environmental contexts that can influence the financial aspects of cross-border e-commerce. We will assess the legal and regulatory frameworks governing e-commerce activities, including taxation policies, customs regulations, and consumer protection laws. Moreover, we will analyze market conditions, such as competition, market size, and consumer behavior, to understand how these factors impact financial performance. Additionally, we will consider socio-cultural factors, including trust, cultural norms, and language barriers, and their implications for financial success.

6. Findings and Analysis

6.1 Technological Analysis

Table1. Technology Infrastructure Indicators in Asia LLDCs (latest data)

Region	Mobile cellular subscriptions (per 100 people)2021	Fixed broadband subscriptions (per 100 people)2021	Secure Internet servers (per 1 million people)2020	Account ownership at a financial institution or with a mobile-money-service provider (% of population ages 15+)
Afghanistan	56.554	0.066	34.947	9.65
Armenia	128.961	16.718	620.542	55.35
Azerbaijan	104.887	19.932	299.312	NA
Bhutan	100.067	0.357	682.195	NA
Kazakhstan	127.476	14.344	3307.427	81.11
Kyrgyzstan	130.381	4.427	421.131	45.09
Laos	64.955	2.030	52.4633	37.32
Mongolia	140.012	11.365	1726.296	98.46
Nepal	127.228	4.228	207.709	54
Tajikistan	118.809	0.061	92.212	39.49
Turkmenistan	98.625	0.157	45.756	NA
Uzbekistan	102.897	21.998	468.683	44.13
World	107.311	16.919	11416.303	76.2

Source: World Bank

6.1.1 Technology Infrastructure

This table reflects that the variations across Asia LLDCs, there is progress in terms of technology infrastructure and financial inclusion. Higher mobile cellular subscriptions, fixed broadband subscriptions, and secure internet servers contribute to the potential for increased e-commerce and digital financial services. Additionally, countries like Mongolia and Kazakhstan demonstrate a high mobile cellular subscription rate and relatively good fixed broadband penetration. The presence of secure internet servers is significantly high, reflecting a strong technological foundation. The country also demonstrates a high account ownership rate at financial institutions or mobile-money-service providers, indicating a relatively advanced level of financial inclusion.

6.1.2 Payment systems

Payment systems are also crucial for facilitating secure and efficient e-commerce transactions in LLDCs. The payment systems landscape in LLDCs (Landlocked Developing Countries) is diverse and encompasses various methods of conducting financial transactions. Table 2 provides a summary of the current payment systems utilized in LLDCs, highlighting the different platforms and services available to individuals and businesses.

Table 2. Summary of current Payment Systems in LLDC

Payment Systems	
Mobile Money	HelloCash(Ethiopia); Mpamba(Malawi); M-Paisa(Afghanistan); MTN Mobile Money(Uganda)
Bank Transfers	
Cash on Delivery (COD)	
Prepaid Cards/Vouchers	Telecom top-up cards; prepaid debit cards
Mobile Wallets	EcoCash(Zimbabwe); MyCash(Malawi); MTN Mobile Money and Airtel Money(Rwanda); Khalti(Nepal)
Remittance Services	Prabhu Money Transfer(Nepal),; HelloCash(Ethiopia); WorldRemit(Uganda); Western Union, MoneyGram, and Mukuru(Malawi)

One prominent payment system in LLDCs is mobile money, which enables users to conduct transactions using their mobile devices. These platforms provide convenient and accessible ways for users to transfer money, make payments, and access financial services. Bank transfers allowing individuals and businesses to transfer funds between bank accounts. Cash on delivery (COD) is another prevalent payment method, particularly in areas with limited access to formal financial services. Prepaid cards and vouchers, such as telecom top-up cards and prepaid debit cards, offer alternative payment options for individuals who prefer prepaid solutions. Mobile wallets have gained popularity in LLDCs, with local or global platforms. These mobile wallet services provide users with digital wallets to store money, make payments, and access additional financial services. Remittance services are essential for LLDCs, given the significant inflow of remittances from abroad. Providers local, and global remittance giants like Western Union, MoneyGram, offer secure and efficient channels for individuals to receive money from overseas.

6.1.3 Evaluation of Digital Infrastructure

In assessing the level of digital infrastructure in Landlocked Developing Countries (LLDCs), the Technology Adoption Model (TAM), which proposed by Fred Davis in 1989(Davis, 1989), can provide a valuable framework for understanding the factors influencing the adoption and usage of internet connectivity and e-commerce platforms. Various scholars have used this framework to assess the adoption of emerging technologies, such as e-commerce, online shopping(Butt, Tabassam, Chaudhry, & Nusair, 2016).

- Perceived Usefulness

In LLDCs such as Mongolia, the development and utilization of digital infrastructure have significantly contributed to the growth of e-commerce. For example, the introduction of reliable and affordable internet connectivity in urban and rural areas has enabled entrepreneurs to establish online businesses and reach a global customer base.

The success of "Mongolian Cashmere," an e-commerce platform that connects local cashmere producers with international buyers. The platform's perceived usefulness lies in its ability to streamline the supply chain, facilitate transactions, and provide access to a broader market, resulting in increased profitability and economic growth for the cashmere industry.

- Perceived Ease of Use

The perceived ease of use of digital infrastructure can be exemplified by the case of Armenia. The Armenian government has implemented initiatives to enhance digital literacy and promote the use of e-commerce platforms among small and medium-sized enterprises (SMEs). As a result, businesses like "Armenian Crafts," a platform showcasing traditional Armenian handicrafts, have experienced increased adoption. The platform's user-friendly interface, secure payment systems, and support services have made it easy for artisans to showcase their products, attract customers, and expand their businesses. The perceived ease of use has played a crucial role in the success of such e-commerce platforms in Armenia.

- Infrastructure Availability and Reliability

The availability and reliability of digital infrastructure are essential for fostering e-commerce growth in LLDCs. In Laos, the government has invested in improving internet connectivity and expanding broadband services to remote areas. This investment has contributed to the growth of e-commerce platforms like "LaoFreshMarket," an online marketplace for locally produced agricultural products. The availability of reliable internet services and efficient logistics networks has enabled farmers and producers to sell their goods directly to consumers, eliminating intermediaries and increasing their profit margins. The improved infrastructure has played a vital role in connecting rural communities with urban markets, stimulating economic activity, and reducing geographical barriers.

- Digital Divide

The digital divide continues to be a challenge in LLDCs like Kyrgyzstan. However, initiatives are being undertaken to bridge the gap and ensure equitable access to digital infrastructure. A notable example is the "Digital Village" project, which aims to provide internet access and digital skills training to underserved communities. By partnering with local NGOs and businesses, the project has empowered residents to leverage digital technologies for e-commerce activities. For instance, artisans in remote villages now have the opportunity to sell their handicrafts through online platforms, increasing their market reach and income. The project has demonstrated the importance of addressing the digital divide to promote inclusive e-commerce growth.

6.1.4 Integration of e-commerce technologies case

In this part, we can deepen our understanding of e-commerce technologies integration by analyzing successful case studies. These case studies provide insights into how LLDCs

have successfully integrated e-commerce technologies to achieve business growth and economic development.

One real case that demonstrates the integration of e-commerce technologies in LLDCs is the example of the "e-MART" initiative in Mongolia. E-MART is an online platform that connects rural producers with urban consumers, overcoming geographical barriers and facilitating trade. The initiative aims to promote the adoption of e-commerce technologies and digital platforms to enhance market access for small-scale farmers and producers in remote areas of Mongolia.

Through the e-MART platform, farmers and producers can showcase their products online, reaching a wider customer base beyond their local markets. The platform provides them with a digital storefront where they can list their products, provide descriptions and images, and set prices. Consumers, on the other hand, can browse through the e-MART website or mobile app, select the desired products, and make online purchases.

To support the integration of e-commerce technologies, the e-MART initiative provides training and capacity building programs for farmers and producers on topics such as digital marketing, product photography, and online sales strategies. They also offer logistical support for product delivery, ensuring that products are transported from rural areas to urban centers efficiently and safely.

The e-MART initiative has been successful in promoting e-commerce adoption and digital trade in Mongolia. It has enabled rural producers to expand their customer base, increase sales, and access new market opportunities. The integration of e-commerce technologies through platforms like e-MART has not only improved the financial performance of farmers and producers but has also contributed to the overall economic development of rural communities.

6.2 Organizational Analysis

In analyzing the organizational factors in Asia LLDCs, we consider several key aspects based on real data and case studies. These factors shed light on the organizational capabilities and characteristics that influence the adoption and integration of e-commerce technologies.

6.2.1 Entrepreneurial Ecosystem

- Techstars Mongolia

Techstars Mongolia is a renowned accelerator program and a notable example of successful entrepreneurship and innovation support in Mongolia. The program aims to foster the growth of startups and provide them with resources, mentorship, and networking opportunities to scale their businesses. Techstars connects startups with experienced mentors who provide guidance and industry insights. Moreover, through this program, startups gain access to a vast network of investors, industry experts, and potential partners. This program also provide training and workshops to startups with the knowledge and skills needed to succeed in their respective

industries. The Demo Day hold by Techstars provides a platform for startups to showcase their innovations and attract potential investors for further growth.

However, on the one hand, while Techstars Mongolia provides access to funding networks, startups in Mongolia may still face challenges in securing sufficient funding to support their growth. Limited investment capital and risk aversion among investors can hinder the scalability of startups. On the other hand, Mongolia's relatively small market size can present challenges for startups looking to achieve rapid growth.

- Bhutan Innovation and Technology Centre

The Bhutan Innovation and Technology Centre (BITC) is another notable initiative that promotes innovation and technology development in Bhutan. Established with the aim of fostering a culture of innovation and entrepreneurship, BITC provides a platform for startups, entrepreneurs, and innovators to collaborate, learn, and grow. BITC offers a dedicated space for startups and entrepreneurs to work, collaborate, and access resources. They also organizes various capacity building programs, workshops, and training sessions to enhance the entrepreneurial skills and knowledge of aspiring entrepreneurs. Moreover, BITC facilitates access to funding opportunities by connecting startups with potential investors, venture capitalists, and government funding schemes.

Moreover, BITC are engaged in exploring paths to overcome the challenge from landlocked situation, such as encouraging startups to explore regional and international markets for growth opportunities; advocate for favorable regulatory environments, incentives for entrepreneurship, and simplified procedures for business registration and licensing; encourages collaboration and knowledge sharing among startups, academic institutions, and government agencies.

6.2.2 Industry Collaborations

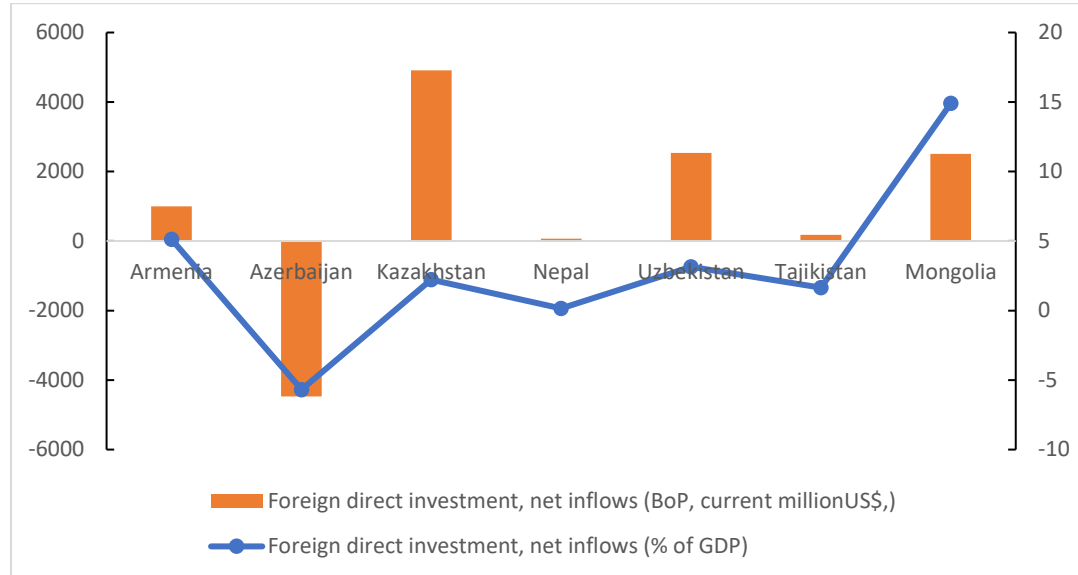
- University–industry partnerships (UIPs) in Kazakhstan

In Kazakhstan, UIPs have been instrumental in promoting collaboration between universities and industries across various sectors. This case study explores a specific partnership between University and technology company, This partnership facilitated the transfer of cutting-edge AI research and knowledge from the university to the industry. While industry professionals provided real-world insights and challenges. The UIP also enabled joint research projects between University and company. Moreover, this partnership enhanced the employability and contributed to a skilled workforce in the technology field. More importantly, the collaboration facilitated the commercialization of research outcomes.

However, the challenge faced in this partnership is also complex. Firstly, It is difficult to clearly define the objectives and expectations of the UIP to align the interests of both academia and industry. Secondly, tailor the collaboration models to

suit the specific needs and capabilities of both academia and industry. Moreover, building trust and maintaining open lines of communication between the university and industry partners are essential for the success of UIPs.

Figure1. Foreign direct investment, net inflows in available Asia LLDCs in 2022



Sources: World Bank

This chart shows that FDI net inflows in Asia LLDCs vary across countries and years. Some countries experience positive FDI net inflows, indicating an inflow of foreign investment into their economies. The fact that Kazakhstan shows higher FDI inflows compared to Mongolia, but lower FDI as a percentage of GDP Environmental Analysis suggests that while both countries attract foreign investment, the impact of foreign investment on their respective economies may vary. Kazakhstan's larger economy may have a more diverse set of sectors and investment opportunities, resulting in a lower FDI-to-GDP ratio. On the other hand, Mongolia's smaller economy may be more reliant on foreign investment to drive economic growth, leading to a higher FDI-to-GDP ratio. Notably, Azerbaijan show a negative FDI net inflows in 2022, which suggests that foreign investors are withdrawing their investments or divesting from projects within Azerbaijan. Policymakers in Azerbaijan may need to assess and address the challenges that hinder foreign investment, such as improving the business environment, strengthening investor protection laws, promoting transparency, and providing incentives to attract foreign investors.

7. Environmental factors

In the context of LLDCs in Asia, several environmental factors play a crucial role in shaping the business environment and influencing the success of e-commerce ventures.

7.1 Legal and Regulatory Frameworks

Effective legal and regulatory frameworks are essential to ensure trust, consumer protection, and fair competition in e-commerce. LLDCs need robust legislation and regulations that address areas such as data protection, privacy, electronic transactions, and intellectual property rights. For example, countries like Bhutan and Kazakhstan have implemented specific e-commerce laws and regulations to govern online transactions and protect consumer rights. These efforts foster a secure and reliable e-commerce environment, instilling confidence among consumers and businesses.

7.2 Infrastructure Development

Adequate infrastructure, including reliable internet connectivity, logistics networks, and digital payment systems, is vital for the growth of e-commerce in LLDCs. Improving internet infrastructure, particularly in rural and remote areas, is a priority to ensure broader access to online platforms. Countries like Mongolia and Kyrgyzstan have made significant investments in expanding broadband coverage and upgrading their digital infrastructure, enabling greater connectivity and facilitating e-commerce activities.

7.3 Financial Inclusion

Financial inclusion plays a critical role in promoting e-commerce adoption and growth. Access to formal financial services, such as banking and mobile money, allows individuals and businesses to participate more effectively in online transactions. LLDCs have made efforts to enhance financial inclusion through initiatives like mobile banking and microfinance services. For instance, Uzbekistan has implemented mobile banking platforms that provide convenient and secure financial services to underserved populations. These efforts enable a wider segment of the population to engage in e-commerce activities and benefit from the digital economy.

7.3.1 Assessment of Financial Inclusion

The "3A" framework, also known as the Accessibility, Affordability, and Appropriateness framework, is a widely recognized and utilized model in the field of financial inclusion. This framework provides a comprehensive lens through which to analyze the current condition of LLDCs from various angles. By applying this model, we aim to assess the accessibility, affordability, and appropriateness of financial services in LLDCs, shedding light on the challenges and opportunities in promoting financial inclusion.

- Accessibility
Accessibility focuses on the availability and physical proximity of formal financial services to individuals and businesses in LLDCs. In Afghanistan, for example, accessibility is a significant challenge, particularly in rural and remote areas. The low level of formal bank account ownership among adults in Afghanistan underscores the limited access to financial services. However, initiatives such as the Da Afghanistan Bank's National Financial Inclusion Strategy (2020-2024) aim to improve accessibility through the expansion of

branchless banking and mobile money agents, thereby increasing the reach of financial services.

- **Affordability**

Affordability examines the cost associated with accessing and using formal financial services in LLDCs. In Tajikistan, affordability remains a pressing issue, particularly for individuals with low incomes. The cost of the lowest-tier mobile account in Tajikistan is relatively high compared to the income of the poorest 40% of the population. To address this challenge, efforts are underway to promote low-cost and accessible financial products, including mobile wallets and microfinance services. The launch of the National Financial Inclusion Strategy (2022-2026) in Tajikistan, with support from the International Finance Corporation (IFC), aims to facilitate access to financial services for individuals and small businesses ("EU supports Tajikistan's National Financial Inclusion Strategy," 2022).

- **Appropriateness**

Appropriateness focuses on the suitability and relevance of formal financial services for the diverse needs of individuals and businesses in LLDCs. In Mongolia, initiatives have been implemented to enhance the appropriateness of financial services for different population segments. For instance, the Mongolian Sustainable Finance Initiative has supported the development of tailored financial products, such as microfinance loans for small businesses and mobile-based payment solutions for nomadic herders. These efforts aim to address the specific needs and circumstances of different groups, thereby improving the overall appropriateness of financial services.

While access to formal financial services remains limited in some areas, initiatives and strategies are being implemented to enhance accessibility, affordability, and appropriateness. By addressing these gaps, LLDCs can create a more inclusive financial system that benefits all segments of the population, fostering economic growth and development.

8. E-commerce financing challenge

LLDCs face several challenges when it comes to financing the development and growth of e-commerce. Some of the most significant challenges include:

- **Low levels of financial inclusion**

Financial exclusion is a prevalent issue in LLDCs, with large segments of the population lacking access to basic financial services, such as bank accounts, credit, and digital payment methods. This can constrain the growth of e-commerce by limiting the potential customer base and restricting the ability of businesses to engage in online transactions.

- **Lack of investment capital**

LLDCs often struggle to attract investment capital, both domestic and foreign, for e-commerce ventures. Limited access to venture capital, angel investors, and other forms of equity financing can make it challenging for e-commerce startups

to secure the funding needed to launch and scale their businesses. Investors and financial institutions may perceive e-commerce ventures in LLDCs as high-risk due to factors such as political instability, weak regulatory environments, and limited market information. This can further limit access to finance for e-commerce businesses in these countries.

Limited government support: Governments in some LLDCs may lack the resources or expertise to effectively support e-commerce development and financing. Limited public investment in digital infrastructure, weak regulatory frameworks, and a lack of targeted policy interventions can hinder the growth of e-commerce and access to finance in these countries.

- Expensive cross-border trade and remittances

Inefficient customs and border procedures: Inadequate customs and border management practices in LLDCs and their transit neighbors can lead to delays, high costs, and increased bureaucracy. This can further constrain cross-border trade and discourage investment.

Access to trade finance: Businesses in LLDCs may face difficulties in accessing trade finance, which is essential for facilitating cross-border transactions. Limited access to credit, high interest rates, and collateral requirements can impede the growth of trade and hinder economic

High transit costs: Due to their landlocked status, LLDCs depend on neighboring countries' transportation networks and infrastructure to access global markets.

High transit costs, as a result of inadequate infrastructure, customs procedures, and border delays, can impede cross-border trade and make it more expensive for LLDCs to engage in international commerce.

- Taxation challenge

Talked about the finance aspect for a nation, we have to consider the tax, which is the primary source of revenue for governments in LLDCs, enabling them to fund public services, infrastructure projects, and social programs that are essential for economic development and poverty alleviation. Therefore, this section we will talk about the tax and revenue challenge faced by LLDCs.

- Inadequate tax infrastructure

LLDCs may lack the necessary technological infrastructure, resources, and expertise to effectively implement and administer taxes on e-commerce transactions. This can lead to tax evasion, under-reporting of income, and loss of revenue for governments.

- a) Cross-border tax challenges

E-commerce often involves cross-border transactions, which can create complexities in determining the appropriate tax jurisdiction and applicable tax rates. This can result in double taxation or tax avoidance, further reducing the potential tax revenue from e-commerce activities.

- b) Tax policy design and coordination

Designing tax policies that strike a balance between promoting e-commerce growth and ensuring adequate revenue generation can be challenging for LLDCs. Moreover, coordinating tax policies with neighboring countries and transit partners is essential to avoid tax competition and harmonize e-commerce taxation.

c) Informal sector

A significant portion of e-commerce activities in some LLDCs may occur within the informal sector, making it difficult for governments to track and tax these transactions effectively.

9. E-commerce financing Opportunity

Although trade on internet can help LLDC a lot to access global market, but one realistic question is where they can get these fund? Fortunately, with the development of globalization and the maturity of international organizations, LLDCS can obtain funding for the development of e-commerce in a variety of ways. The following part summarized 8 sources of funding. By exploring these funding sources, LLDCs can secure the possible financial resources to develop their e-commerce sector and overcome the challenges they face in the digital economy

9.1 Financing resources

- Government funding: National governments can allocate budgetary resources to develop e-commerce infrastructure, such as improving internet connectivity, payment systems, and logistics networks. They can also create policies and incentives to encourage private sector investments in the e-commerce sector.
- International organizations: LLDCs can seek financial assistance from international organizations like the World Bank, the International Monetary Fund (IMF), and the United Nations Conference on Trade and Development (UNCTAD) for e-commerce development projects.
- Development aid and grants: LLDCs can receive development aid and grants from wealthier countries or international development agencies such as the United States Agency for International Development (USAID), the European Union (EU), and the United Nations Development Programme (UNDP).
- Public-private partnerships (PPPs): Governments can partner with private companies to co-finance e-commerce projects, leveraging the strengths of both public and private sectors in terms of resources, expertise, and technology.
- Foreign direct investment (FDI): LLDCs can attract foreign direct investments from multinational companies and investors interested in tapping into the e-commerce market potential in these countries. Governments can create investor-friendly policies and incentives to attract such investments.
- Venture capital and private equity: Startups and e-commerce businesses in LLDCs can seek funding from venture capital firms and private equity investors who are looking for opportunities in emerging markets.

- Crowdfunding: E-commerce businesses in LLDCs can also explore crowdfunding platforms to raise capital from a large number of individual investors, who contribute small amounts of money in exchange for a stake in the business or a product/service.
- Non-governmental organizations (NGOs) and philanthropic organizations: Some NGOs and philanthropic organizations provide grants and support to projects aimed at promoting digital inclusion and e-commerce development in underprivileged regions, including LLDCs.

9.2 International agreement

Other than the financial opportunities, there are several realistic opportunities. Through reviewing the current agreements, there are several which can help LLDC to develop their e-commerce business. By participating in these agreements and initiatives, LLDCs can access resources, technical assistance, and capacity-building support to help them develop their e-commerce sector and benefit from the opportunities offered by the digital economy.

- United Nations Conference on Trade and Development (UNCTAD) E-commerce and Law Reform Program: UNCTAD's program provides technical assistance to LLDCs to create a favorable legal and regulatory environment for e-commerce development. This includes support for drafting e-commerce laws, building capacity for policymakers, and sharing best practices.
- The World Trade Organization (WTO) E-commerce Work Programme: Established in 1998, the WTO's Work Programme on Electronic Commerce aims to examine trade-related issues arising from e-commerce, including those relevant to LLDCs. The WTO also provides technical assistance and capacity-building programs to help LLDCs participate in e-commerce negotiations and discussions.
- Enhanced Integrated Framework (EIF): The EIF is a multi-donor program that supports Least Developed Countries (LDCs), including LLDCs, in their efforts to become more active players in the global trading system. The program provides support for trade-related projects, including those related to e-commerce development.
- Aid for Trade Initiative: Launched by the WTO, the Aid for Trade initiative aims to assist developing countries, including LLDCs, in building the necessary infrastructure and capacity to benefit from trade liberalization and global market access, including e-commerce development.
- The United Nations Development Programme (UNDP) Sustainable Development Goals (SDGs): The SDGs, particularly Goal 9 (Industry, Innovation, and Infrastructure) and Goal 17 (Partnerships for the Goals), include targets and indicators related to e-commerce development. These goals encourage the international community to support LLDCs in their efforts to develop their digital economy and e-commerce sector.

- The African Continental Free Trade Area (AfCFTA): The AfCFTA agreement, which covers many African LLDCs, includes provisions to promote e-commerce and digital trade among member countries. This can help create a more integrated and supportive environment for e-commerce development in the region.
- Regional and bilateral agreements: Some regional and bilateral trade agreements include provisions related to e-commerce development and cooperation. These agreements can help LLDCs access resources, knowledge, and market opportunities to develop their e-commerce sector.

10. Case Studies and Best Practices

10.1 Successful tax policy adoption

- Trade and Development Bank of Mongolia

A notable example of successful compliance with PCI DSS in Asia LLDC is the TDB Bank. TDB Bank is one of the leading banks in the country and has demonstrated a strong commitment to maintaining robust security measures in line with PCI DSS requirements in 2020. The bank has implemented comprehensive security controls and measures to protect cardholder data, including encryption technologies, access controls, and regular security assessments.

By achieving compliance with PCI DSS, TDB Bank has established a secure payment environment for its customers, ensuring the confidentiality and integrity of cardholder data. This has contributed to the bank's reputation as a trusted financial institution and has fostered confidence among customers in conducting e-commerce transactions.

Furthermore, TDB Bank's compliance with PCI DSS has enabled it to expand its e-commerce offerings and provide secure payment solutions to its customers. The bank has implemented advanced authentication and encryption mechanisms to protect sensitive information during online transactions, enhancing the overall security and trustworthiness of its e-commerce services.

The success of TDB Bank in achieving and maintaining PCI DSS compliance serves as a positive example for other financial institutions and businesses in Mongolia. It highlights the importance of investing in security measures and adopting best practices to safeguard payment card data. By following TDB Bank's lead, other organizations in Mongolia can enhance their own payment systems' security, protect customer data, and contribute to the growth and development of e-commerce in the country.

- Quality Catalyst

An exemplary case in Kazakhstan is the involvement of Quality Catalyst, one of the leading consulting firms specializing in PCI DSS certification and consulting services. Quality Catalyst has played a pivotal role in promoting PCI DSS compliance among businesses and financial institutions in Kazakhstan. The company has provided extensive guidance and support to organizations seeking to enhance their security measures and achieve PCI DSS certification.

Through its comprehensive consulting services, Quality Catalyst has helped numerous businesses in Kazakhstan establish and maintain a robust security infrastructure in line with PCI DSS requirements. The company assists organizations in implementing essential security controls, conducting vulnerability assessments, and developing risk management strategies. By working closely with businesses, Quality Catalyst ensures that they meet the stringent PCI DSS standards and effectively protect cardholder data.

The contribution of Quality Catalyst to the development of e-commerce in Kazakhstan is noteworthy. By promoting PCI DSS compliance, the company has instilled confidence in consumers, encouraging them to engage in secure online transactions. As a result, businesses in Kazakhstan have witnessed increased customer trust and loyalty, leading to a positive impact on their e-commerce growth and revenue generation.

Moreover, Quality Catalyst's involvement has also raised awareness and understanding of PCI DSS among businesses and financial institutions in Kazakhstan. Through training programs and workshops, the company has educated stakeholders about the importance of PCI DSS compliance and provided guidance on best practices for maintaining a secure payment environment. This has led to an overall improvement in the security posture of the e-commerce ecosystem in the country.

- E-Mart in South Korea

A real-world case that exemplifies the application of the TOE framework(Drazin, 1991) is the success story of E-Mart, a leading retail company in South Korea. E-Mart strategically utilized the TOE framework to guide its e-commerce transformation journey, resulting in significant growth and competitive advantage in the digital marketplace. In terms of technology, E-Mart invested in state-of-the-art e-commerce platforms, mobile applications, and logistics systems. These technological advancements allowed the company to provide a seamless and convenient online shopping experience to customers, enhancing customer satisfaction and loyalty. From an organizational perspective, E-Mart underwent a comprehensive organizational restructuring to align with the e-commerce strategy. The company established dedicated e-commerce teams, implemented agile work processes, and fostered a culture of innovation and adaptability. These organizational changes enabled E-Mart to effectively manage the challenges and opportunities associated with e-commerce adoption.

Furthermore, E-Mart paid close attention to the environmental factors that influenced its e-commerce success. The company closely monitored customer preferences and market trends, ensuring that its e-commerce offerings were aligned with changing consumer demands. Additionally, E-Mart collaborated with external partners and suppliers to enhance its logistics capabilities and ensure timely delivery of online orders. By applying the TOE framework, E-Mart successfully navigated the complexities of technology adoption in the e-commerce landscape. The company's strategic alignment of technology, organizational factors, and the external

environment allowed it to gain a competitive edge in the market and achieve sustainable growth in the digital era.

10.2 Successful country strategy

- Bhutan

The government of Bhutan has recognized e-commerce as a key driver of economic growth and has taken steps to promote its development. In 2020, the Bhutan Agricultural Market Information System (AMIS) was established to facilitate online trade and connect local producers with domestic and international markets. The government has also provided training and support to entrepreneurs to enhance their digital skills and adopt e-commerce practices.

- Kazakhstan

The Kazakhstan government launched the Digital Kazakhstan program, which aims to transform the country into a digitally advanced nation. As part of this program, initiatives have been implemented to support the development of e-commerce, including the establishment of the "e-commerce roadmap" to guide policies and regulations. The government has also supported the creation of e-commerce platforms, provided training programs for SMEs, and developed digital payment systems. Furthermore, in order to attract foreign investment, they officially lifted restrictions on foreign ownership of telecommunications companies in 2022. According to the International Telecommunication Union, the Internet penetration rate in Kazakhstan is estimated to be close to 86% by 2022(ITA, 2022).

- Mongolia

The Mongolian government has recognized the potential of e-commerce for economic diversification and reducing dependence on traditional sectors. Initiatives like the "Digital Mongolia 2020" program focus on expanding digital infrastructure, improving e-commerce platforms, and providing training to entrepreneurs. The government has also established the "e-Mongolia" platform to facilitate online transactions and cross-border e-commerce.

- Nepal

The government of Nepal has recognized the potential of e-commerce for economic growth and poverty reduction. Policies and initiatives like the "Digital Nepal Framework" and the "Nepal Information and Communication Technology Strategy" focus on promoting digital entrepreneurship, improving connectivity, and enhancing financial inclusion. The government has also introduced regulations to facilitate cross-border e-commerce and encourage domestic e-commerce platforms. As per the Nepal Telecommunications Authority, the total broadband penetration in Nepal is 126.72% as of mid-February 2022(Bajracharya, 2022).

- Rwanda

Rwanda has made substantial progress in developing its e-commerce sector. The government has invested in improving digital infrastructure, including widespread internet access and 4G networks. Rwanda has also established a supportive legal and regulatory framework for e-commerce, which has helped build trust in online transactions. The country has partnered with global e-commerce companies like Alibaba, which launched its Electronic World Trade Platform (eWTP) in Rwanda, aiming to facilitate cross-border trade for Rwandan businesses. Local e-commerce platforms such as Vuba Vuba and Get It have also emerged, providing online shopping and delivery services within the country.

11. Conclusion and Policy implication

11.1 Conclusion

Through comprehensive analysis of LLDC case, financial factors, organizational factors, and environmental factors, several key findings emerge.

The availability of technological infrastructure, such as internet connectivity and mobile penetration, does not guarantee immediate financial success in LLDCs. While these factors are important, their impact is mediated by other contextual factors, such as organizational capabilities and the regulatory environment.

Moreover, we find that LLDCs primarily rely on traditional financing mechanisms for e-commerce ventures. Instead, we think innovative financing models, such as crowdfunding platforms and public-private partnerships, are gaining traction and providing viable alternatives for funding e-commerce startups in LLDCs.

This research uncovers the crucial role of environmental factors, including legal and regulatory frameworks, market conditions, and consumer trust, in shaping the financial performance of e-commerce in LLDCs. These factors interact with technological and organizational elements to create a complex and dynamic ecosystem that significantly influences the success or failure of e-commerce initiatives.

However, the availability of data, particularly specific to LLDCs, remains a challenge, which has affected the depth of analysis. Furthermore, the research focused primarily on a financial perspective, and other aspects of e-commerce, such as social and cultural factors, could be explored in future studies.

To further advance the understanding of e-commerce in LLDCs from a financial perspective, future research should consider the following areas for exploration:

- a) Conducting country-specific studies to understand the unique challenges and opportunities faced by each LLDC in developing their e-commerce sectors. This can provide more targeted recommendations and strategies for fostering financial growth.

- b) Comparing the financial performance of LLDCs with non-LLDCs in the region to identify any distinctive patterns or factors that contribute to e-commerce success in LLDCs.

11.2 Policy implications

Based on the finding, we come up with several policy implications for LLDC policymakers, aiming to foster the development of e-commerce and maximize its potential for economic growth and financial inclusion.

- a) **Creating an Enabling Regulatory Environment**

LLDC policymakers should prioritize the development of comprehensive regulatory frameworks that balance consumer protection and business innovation. These frameworks should address issues related to data privacy, cybersecurity, online payment systems, and consumer rights. By providing a clear and conducive regulatory environment, LLDCs can instill confidence among e-commerce businesses and consumers, fostering trust and facilitating the growth of the sector.

- b) **Promoting Digital Infrastructure Development**

Recognizing the vital role of digital infrastructure, LLDC policymakers should invest in improving internet connectivity, expanding mobile network coverage, and enhancing broadband penetration. This includes investing in rural connectivity and underserved areas to ensure equitable access to digital services. By strengthening the digital infrastructure, LLDCs can facilitate seamless e-commerce transactions, enhance customer reach, and enable businesses to leverage emerging technologies.

Table 3 provides an overview of the advantages and challenges associated with applying innovative payment methods in LLDCs (Landlocked Developing Countries). These payment methods offer promising opportunities for transforming the way financial transactions are conducted.

Payment Method	Advantages	Challenge
Biometric Payments	-Utilizes biometric traits for secure authentication -Enhances convenience and security in transactions	- Infrastructure and integration - Data privacy and security - User acceptance
Blockchain-Based Payments	-Decentralized and transparent transactions -Reduced costs increases transaction speed -Enhances security and trust in cross-border payments	- Regulatory frameworks - Scalability and speed
QR Code Payments	-Simplifies transactions -Reduces reliance on physical cards or cash -Supports small businesses and local economies	- Technological infrastructure - Merchant adoption - User familiarity

Table 3. Advantages and challenges in applying innovative Payment Method in LLDC

d) Enhancing Financial Inclusion

LLDC policymakers should prioritize financial inclusion initiatives, ensuring that marginalized populations and underserved communities have access to financial services and digital payment solutions. This can be achieved by promoting mobile banking, facilitating the establishment of agent networks, and encouraging the adoption of innovative payment systems. By expanding financial inclusion, LLDCs can empower individuals and small businesses to participate in e-commerce, drive economic growth, and reduce the digital divide.

e) Supporting Entrepreneurship and SME Development

Recognizing the crucial role of entrepreneurship and small and medium-sized enterprises (SMEs) in e-commerce, LLDC policymakers should implement targeted support programs and incentives. This includes providing access to financing, business development services, and training programs to enhance digital skills and entrepreneurship capabilities. By nurturing a vibrant entrepreneurial ecosystem, LLDCs can stimulate innovation, job creation, and economic diversification.

f) Fostering Cross-Sector Collaboration

LLDC policymakers should facilitate collaboration between academia, industry, and government agencies to drive innovation and knowledge transfer. This can be achieved through the establishment of innovation hubs, technology parks, and incubation centers that bring together researchers, entrepreneurs, and industry

experts. By fostering cross-sector collaboration, LLDCs can leverage academic expertise, industry experience, and government support to develop tailored solutions and drive the adoption of e-commerce technologies.

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