Bulletin of Business and Economics, 13(3), 649-660
https://bbejournal.com
https://doi.org/10.61506/01.00553

The Role of Digitalization in Bangladesh's Economic Development: A Study of Digital Technologies, Ecommerce and Fintech

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Abstract
The main research purpose of this research study is to understand the influence of Digitalization in the Bangladeshi context, considering digital technologies, e-Commerce and fin tech. The study aims to understand components mentioned above in relation with each other and in relation to economic growth, financial adoption and markets growth. We conducted a research on Bangladesh regarding " The Role of Digitalization in Bangladesh's Economic Development: A Study of Digital Technologies, Ecommerce and Fintech" using data from selected emerging nations. Data was gathered from the National Bank of Bangladesh, covering the period from 2001 to 2022, alongside data from Organizations such as the World Bank, IMF, Asian Development Bank, and Bangladesh Bureau of Statistics provide extensive datasets. This paper focuses on the impact of digitalization, Electronic Commerce (e-Commerce), and Fintech in the enhancement of GDP and Economic growth in Bangladesh. The analysis shows that digitalization is a game changer for the future growth of the economy, which is evidenced by the results of research in the spheres of e-commerce and fintech opportunities. Thus, digitalization appeared to be the most dominant variable, exhibiting a strong and positive rapid growth coefficient in all the models. As a form of connectivity, a means of improving the efficiency of business processes, and a basis for the creation of new technologies it has become an integral part of today's economy. The findings further imply that there is scope to significantly expand digital inputs that exist in Bangladesh and need more investment and policies for further optimization.
Keywords: Digitalization, Economic Development, Digital Technologies, Ecommerce and Fintech

1. Introduction

Digitalization has become the new phenomenon driving transformation in the global economy, unraveling new paradigms to economic growth. In countries like Bangladesh, they are characterized by ability to promote economic growth and inclusion as well as the modernization. This study examines how information and communications technology, e-business, and financial technology can participate in the development of Bangladesh's economy. Bangladesh has seen the growth in its economy in the last decade mainly because its gross domestic product has been growing at an average of more than 6% per year (Islam, Parvin, Milon, & Das, 2023). Such a growth has been supported by digitalization which is evident through increment in internet and mobile user while the government embarked on the "Digital Bangladesh" master plan. The program was developed in 2009 in order to make the country a leading knowledge economy by 2041 through the increased usage of ICTs (Aziz, 2020). Thus, information technology has become central to efficiency improvement and innovation processes. Starting from Smartphones to Cloud, Cloud computing and artificial intelligence, have enhanced connectivity and have enhanced business processes, and have taken the bridge over the Urban Rural Divide (Rahman & Parvin, 2024). For instance, mobile phone subscription in Bangladesh has reached over 180 million, which the country's communication and business (Bangladesh Telecommunication Regulatory Commission, 2022).

Like with many other areas and industries, e-commerce has also significantly shaped consumers' exposure and behavior and helped SMEs to penetrate into new markets. The e-commerce sector which is expected to reach $3 billion by 2023, has emerged as an important sector driving the entrepreneurial momentum and digital connection, including mobile banking, digital payments, and online lending has changed the financial activities of Bangladesh forever (Haque et al., 2023). Mobile financial services like bKash and Nagad have brought the financial services to the door step especially hard to reach areas. Bangladesh Bank revealed that mobile financial transactions amount to nearly BDT 900 billion in 2021 indicating the shift towards the digital regime of finance (M. J. Alam, Hassan, & Ogawa, 2023). Lack of adequate digitization skills, inadequate digital transformation infrastructure facilities, and restrictive rules prevent full-scale digitalization. It is imperative to deal with these problems in order to learn how digital transformation can positively impact the economy for all (Hossen, Abedin, Chowdhury, Islam, & Kabir, 2025). This research explores multifaceted linkages of Dig-Tech, e-business, and fintech and their combined effects on EM development, financial inclusion, and employment opportunities in Bangladesh.

This paper focuses on the impact of digitalization in the economic growth of Bangladesh where the country is aspiring to shift from an agrarian economy to a knowledge-based digital economy (Amin, 2024; Sulehri et al., 2024). This transformation is consistent with the Government of Bangladesh's Digital Bangladesh vision to make digitized technology interventions in all sectors and economy by 2041 (Mollik & Ananna, 2024). It is therefore important to grasp how digital technologies e-commerce and fintechs are creating this shift in order to sustain growth, increase productivity and reduce poverty. Perhaps one of the most successful areas of driving digitalization is the financial sector. With the help of technologies such as mobile banking, digital wallets, a huge number of people who previously did not have access to financial services within the framework of legal agreements got a second chance (Shahbaz et al., 2016; Ordóñez et al., 2024). Such innovations have not only made possible secure and efficient financial processes especially on the area of financial transactions but also helped to decrease income disparity and improve economic inclusion (Paul, Upadhyay, & Dwivedi, 2020). Likewise, the e-commerce platforms have introduced opportunities for SMEs not only to diversify their consumer markets and extend competition to domestic as well as international economies (Putera, Iriani, Julian, Rahman, & Sucianti, 2023). Besides, this research has a high level of policy relevance. In this vein, the research identifies

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the hurdles and possibilities that accompany digitalization to help stakeholders to close infrastructure deficits, enhance the population's digital competency, and create a favorable legal environment for the development of technologies. As much as the study narrows its attention to Bangladesh, it offers a framework that could be applied in other emerging economy countries' digitalization processes thus making it more generalizable (Putera et al., 2023). The main research purpose of this research study is to understand the influence of Digitalization in the Bangladeshi context, considering digital technologies, e-Commerce and fin tech. The study aims to understand components mentioned above in relation with each other and in relation to economic growth, financial adoption and markets growth.

This study is novel in its field, specializing in digitization, electronic business, and financial technology and their effects on Bangladeshi growth. In contrast to prior work in which these domains are analyzed in isolation, this research explores how they interplay in relation to productivity and innovation and in consideration of financial access. In this connection, the research delivers a comprehensive view on how the comparative combination of these elements would shape the prospects of the Bangladeshi economy in the context of digitalization (Sultana, 2024). Another methodological novelty is the fact that this study specifically focuses on the context of Bangladesh. Most of the past studies reflect that, digitalization has its positive effects in developed countries, but this work focus on some issues related to Bangladesh, for instance its socio-economic characteristics, cultural factors and limitation of infrastructure support (Nasution, Rafiki, Lubis, & Rossanty, 2021). Furthermore, the study explores advanced issues such as, digital divides, cyber threats, and weak policies, giving the broad framework of solutions for these issues. Furthermore, the method used in the current research is quantitative with a consideration of qualitative data comprising traits from both paradigms. What arises from it is methodological rigor that allows the findings to be of both theoretical and empirical significance, to the policy maker, industry and academician. The effort to understand mediating factors, including financial access and market access, sets this research apart by explaining how analyzation translates into economic effects.

2. Literature Review

2.1. Economic Development

Bangladesh is among the most explored states of the third world country due to the spectacular growth of the economy from a low income to the lower-middle income. In the last few decades, Bangladesh's economic growth rate, poverty alleviation as well as progress in the overall human development has been phenomenal (Osmani, 2021). However, problems like infrastructural shortcoming, income disparity and environmental susceptibility are still issues for research. Bangladesh has registered steady GDP growth rate, more than 6% annually since 2010 and the projection standards for several years ahead also look positive. This has been due to several factors namely cogent performance of the manufacturing sub-sector, specifically the Ready-Made Garments (RMG) sub-sector as constitutes over 80% of the exports of the country (Jahan, 2022). Further, foreign workers' remittance also has been another major source for enhancing the foreign exchange reserves, as well as consumption expenditure in Bangladesh from Bangladeshi expatriate. (Mujeri & Mujeri, 2020)supported the idea that Bangladesh's economy highly depends on labour built-in industries and low paid employees, and thus may cause some issues in the future. Some argue that moving to a less dependence on the oil sector, with greater attention to sectors supporting knowledge economy and digital technologies would improve economic vulnerability.

China's experience in its early stage of socioeconomic transformation from an agrarian country to a second-largest economy in the world is enriching. The three major strategies that have inspired this change include industrialization, export promotion, and infrastructure construction (Titumir, 2021). SEZs have registered great success in terms of sourcing FDI, encouraging innovation and offering employment opportunities. Digitization has also been an important factor of success the growing importance of digitalization and Digital economy has also been an important part of the success of china. Alibaba, and other have greatly transformed e-commerce, fintech to such extend that small businesses get markets and customers all over the globe. This digital ecosystem has helped in creating economic opportunities by eliminating the chances of shutting out new comers (Hossain, 2020). Bangladesh may learn from China example how to advance technology for development but applying the Chinese model for Bangladesh socio-economic realities. India's IT services & remittances can be compared with Bangladesh where its economic growth looks similar. This meant that when India began liberalizing its economy, specializing in technology in the 1990s the country was set for a take-off. Schemes such as Digital India have sought to increase the availability of digital infrastructure facilities, availability of government services and spread of digital awareness (Khatun, Shaon, & Sadekin, 2021). India's experience underscores the value of building up a healthy startup environment. Sustaining of policies that foster innovation and investment in new start-ups, has fostered innovation among technology based companies, thereby, generating employment and economic output as measured by GDP. Adopting a similar approach for Bangladesh could help the country advance towards a more digital economy to deal with issues like the regulatory hurdles that slows down the country's growth. Analyze of backdrop of Vietnam as a development paradigm for Bangladesh is informative, especially in context of export-oriented development path. Vietnam benefits from a favorable geographical location, a pool of qualified workers, and open trade laws to adopt a manufacturing base for electronics, textiles and other products (Titumir & Titumir, 2021). Vietnam has shifted its attention from higher education to elemental and vocational training to improve labor efficiency, thus attracting investors from around the globe. Also, its focus on renewable energy source and very high concentration on sustainable development is in sync with the global shift and provides a model that can work for the inclusive and sustainable development. Bangladesh can do same things to diversify its export basket and to attract more FDI.

In the last few decades Bangladesh stood out to be an example of the best practices in the economic development. The annual GDP per capita growth rate of the Philippines has continuously been above 6% and this is due to aggressive export expansion, remittance income, and huge facility and infrastructure projects (Liu et al., 2023). A ready-made garment (RMG) sector has been establish in this country which over the 80% export proceed and employed millions of workers most of them are women (Ahmed et al., 2020). Further, social security and micro financing has helped to strengthen poverty eradication. Products such as micro finance by Grameen Bank and BRAC has been critical in uplifting rural people especially the women folk in business (Q. Alam, Rahman, & Islam, 2021).

Nonetheless, concern that still remains include; regional disparity, infrastructure deficiency, and poor adaptation to climate change which needs to be addressed (Mujeri & Mujeri, 2021). The role of digitization in the development of this country, namely Bangladesh, is becoming significantly important at present. The actions under the vision that is "Digital Bangladesh" have encouraged e-governance, mobile banking, and entrepreneurship. Mobile payments, such as 'bKash', have solved some of the financial problems and empowered the rural population and those who remain unserved by traditional banks (Hasnath, 2020). However, the schemes face a number of challenges some of which are as follows: Low digital literacy Level of computer literacy still presents a big challenge; Limited access to technology especially in the rural region Need for more advanced technology, Access and ownership of the technology are still big issues in the rural areas.

2.2. Digitalization

Technology adoption in Bangladesh has progressed significantly over the last decade which have been primarily led by the government's efforts as well as private entities. The country has adopted ICT in several fields such as government administration, financial, educational, and health sectors in its vision of achieving whereby it is known as 'Digital Bangladesh (Hasnath, 2020). This literature review covers the components of digitalization process in Bangladesh, its accomplishments and challenges in developing economy, and its comparison with international benchmark. The positive trend of Bangladesh's digital evolution can be traced back to the government's' "Digital Bangladesh" initiative that the current Prime Minister, Sheikh Hasina, conceptualized after assuming power in 2008. The purpose was increasing the effectiveness of governmental activity in delivering services, promote the economic development, and minimize the gap between the level of people's connectivity in the cities and countryside (Mollik & Ananna, 2024). Some of the sub-topics of this agenda involves the following; establishment of ICT facilities, connectivity, e, government, and financial access. Due to the government's drive on increasing broadband options across the country especially to rural areas, there has been progress in the availability and accessibility of internet. The availability of internet in Bangladesh has grown tremendously due to the effort put in place by the government to pump in cash into the development of internet structure: The number of internet users crossed over 100 million by year 2020 as noted by the Bangladesh Telecommunication Regulatory Commission (BTRC, 2020). Such connection has made a very strong foundation for e-business, mobile banking, and even online classes, which highly contributed to the socio-economic lives. The largest fields that have undergone significant transformation in Bangladesh due to digitalization are perhaps the financial sectors spearheaded by mobile money & FinTech (Sultana, 2024). bKash, Rocket, Nagad, etc., have transformed the financial sector where millions of the population have little to no prior banking experience (Putera et al., 2023). Mobile financial services, especially for people in the rural areas especially women have gained Financial inclusion in activities that they never would afford because physical banking amenities and fractional. (Haque et al., 2023) has stated that, digital financial services are an essential tool of achieving financial inclusion and levelling up the basics of VSRG of Bangladeshi society. These services have also proved relevant especially during the influence of COVID-19, whereby customers continued to make payments electronically with no necessity of physical money as most businesses closed down through lock downs. Also, the increased use of mobile money transfer and online remittance services of non-bank financial personalities also have impacted the development of Bangladesh's economy.

2.3. Ecommerce

The Bangladeshi market has emerged onto the international e-commerce scene in the last decade driven by developments in communications technology, improved internet connectivity, and the ubiquity of mobile phones. Modern communication technology is relatively novel in the country and thus, has been warmly welcomed and adopted in Bangladesh; particularly, the e-commerce sector has been a leading industry in the economic growth process of Bangladesh (Jahan, 2022). This literature review describes the development, trends, driving forces, issues, and prospects of e-commerce in Bangladesh. The concept of buying goods and services online has increasing concern in Bangladesh with the emergence of accounts like clickBD, Bdshop, and pickaboo in middle of 2000s (Putera et al., 2023). These platforms offered consumers open access to many diverse products and services and these highly effective platforms led to the emergence of further development of such platforms. The BASIS, the Bangladesh's Association of Software and Information services, has found that this sector has been growing consistently for the last five years with the annual growth rate of over 20%. By 2020, the market has turned into a billion-dollar business (M. J. Alam et al., 2023). The ever growing e-commerce market in Bangladesh has been cleared by the availability of cheap smartphones, improved internet connection or accessibility, introduction of 3g and 4g technology. Internet use in Bangladesh escalated over one hundred million in the year 2020, equivalent to 62% of the total population and the number of broad mobile phone users and smartphone users also growing swiftly (Kamruzzaman, 2024). This has promoted the idea of e-commerce since consumers of both the urban and rural areas have resorted to shopping online. The COVID-19 also enhanced the uptake of e-commerce since the physical retailers had to close due to restrictions during the pandemic, thereby forcing customers to e-commerce.

Some major characteristics that have catalyzed e-commerce in Bangladesh to become a very important part of the country's digital economy are discussed below. The sources of growth for e-commerce have included affordable smartphones and better internet connectivity (Rahman & Parvin, 2024). ITU listed that mobile internet subscription increased by 60% in Bangladesh during the period from 2017 to 2020. As it is possible to shop on ecommerce platforms using hand-held devices, more customers including the rural ones have adopted online shopping. The advance in network quality for instance the emergence of 4G service has enhanced the development of online transactions (Aziz, 2020). Bangladesh's large young and ever-growing technology friendly population could not be ruled out while discussing the growth of e- commerce. The youth makes up 40% of the population and thus transforms easily to shift to new technologies such as online shopping (Hossen et al., 2025). It can be evidenced that young consumers in Bangladesh do not only are consumers for e-commerce platforms but also promoters and actors, creating new digital ventures and using e-commerce platforms for their business purposes (Hossain et al., 2021).

New generations of digital payment systems like bKash, Nagad, Rocket have played a crucial role in ensuring safety and effectiveness for the use of online shopping. Such mobile banking services, through which people are able to transfer money, pay for purchases in stores, etc., using mobile phones, have contributed to the development of digital money transactions for consumers who used to work with cash only (Kamruzzaman, 2024). The formation of these firms has enhanced employment creation while

also enhancing the efficiency of the e-commerce facilities in fulfilling the needs of the consumers. The Bangladesh Freight Forwarders Association has reported in 2021 that their growth has been at 30% from e-commerce delivery which is evidence of the improvement of logistics solutions.

Nevertheless, e-commerce is facing some issues in Bangladesh which are limiting its progress at a fast pace of growth in the country. Although people's internet connection is growing, many still lack the ICT skills necessary for its use, especially people from rural areas (Jahan, 2022). Half the users do not possess the necessary skills that enable the use of e-commerce sites. At present, the Bangladesh Bureau of Statistics have shown that only 37% of the total adults in Bangladesh are digitally literate, which to certain extent affects directly the utilization e-commerce for reaching all the segment of society (Putera et al., 2023). In addition, the problems of SMEs, who struggle to adapt to the digital environment and maximize the benefits from the internet are a problem that slows down the development of the digital economy. Despite bKash and Nagad being in operation, COD continues to be the most sought after payment option by a number of people (M. J. Alam et al., 2023). It can also be a hindrance to the development of e-commerce because it complicates logistic and hinders payment processes with techniques such as COD. Also, low levels of security, fear of being fraud, and uncertainty in online payment also hinder the consumers from fully adopting online payment systems (Amin, 2024). Although delivery systems have advanced there are still issues with distribution especially in rural areas, Moreover. This has been accompanied by poor road networks, inadequate warehousing and holds up in customs formalities. These prerequisites of e-commerce, therefore, present infrastructure tasks that will have to be reconstructed if growth is to meet increased consumer demand and provide efficient supply lines (Rahman & Parvin, 2024). The legal regulation of e-commerce in Bangladesh is still in progress. Some of the enduring questions of the nation's laws include taxation, consumer protection laws, and products regulations, where the government has not established the more coherent set of rules. Lacking legal guidelines, various companies and especially global e-shops experience legal vagueness concerning their activity and admissibility.

2.4. Fintech

The industry of providing financial technology services in Bangladesh has been progressing massively over the last decade mainly because of the developments made in digital financial operations, mobile banking and payments. This literature review aims at discussing the development of fintech in Bangladesh, factors causing its growth, its relevance to financial inclusion and challenges facing this sector (Aziz, 2020). The first was launched in 2010 by BRAC Bank jointly with Vodafone mobile telecommunications company through which people of Bangladesh can easily transfer money, pay bills or perform financial transaction through mobile phones itself and bKash became market leader mobile financial service in Bangladesh and soon other mobile financial services like Nagad, Rocket and Ucash also appeared. Mobile money service indicated by the figure of secretly has registered tremendous growth as per Bangladesh (Hossen et al., 2025) news facility with billions of US dollars transacted every year through mobile money platform. Bangladesh has become one of the leading countries by having 10+ mobile money accounts by mid of 2020 which reveals that people of Bangladesh have embraced mobile banking services (Kamruzzaman, 2024). The mobile financial services have grown tremendously in the last few years to offer banking services to millions of customers who cannot access traditional banking facilities; particularly in the rural areas.

Besides mobile financial services other technological breakthroughs in the light of Fintech include: digital wallet, P2P lending, crowdfunding and digital insurance. The availability of digital wallet for a user as a mean of keeping and transferring of cash digitally has also enhanced the use of Financial Services (Jahan, 2022). In addition, the advent of the digital lending application such as Shachild and Cashwaala have also helped the individual and small business who are locked out of the conventional lending services. The effect of novelty has also been seen to be fueled by the COVID-19 pandemic as well. Some of these adjustments include closure of most physical bank branches, restrictions to mobility during lock downs, consumers and businesses therefore had to resort to digital means for all their financial needs (Putera et al., 2023). Thus, cases such as the fintech platforms witnessed more users and traffic of transactions that also underlined how digital financial services are important for Bangladesh. It is observed that the usage of mobile phone has increased dramatically in Bangladesh more than 170 million mobile phone subscriptions (M. J. Alam et al., 2023)The high penetration of mobile phones and the recent rapid growth in mobile internet access are crucial for the support of affordable Fintech services. Mobile financial services including bKash, Nagad, Rocket, etc., bring the financial solutions available through mobile handsets in the form of money transferring, bill payment, and digital buying. The government of Bangladesh has been supportive to developments in the fintech through several measures (Amin, 2024). The financial technology industry in Bangladesh mainly started after the initiation of the "Digital Bangladesh" program in 2009. Bangladesh Bank has come up with the first regulatory guidelines over mobile financial services in 2011 to give legal support for the development of fintech companies. The government has gone further to support financial inclusion and develop fintech as a solution for the provision of financial services to the hard to reach communities.

Also, the central bank of Bangladesh, Bangladesh Bank has played its part in establishing the right environment for mobile financial services by coming up with suitable polices and regulations including issues liked to consumers' protection, security level of the transaction and money laundering (Rahman & Parvin, 2024). These efforts have helped to build confidence in the fintech services that are important to the uptake of the services. Bangladesh has also adopted financial inclusion as a focal point of the advancement of the fintech Companies. As of World Bank (2020), nearly 60% of the population of Bangladesh was unbanked or financially excluded from using conventional banking systems before mobile banking. Mobile financial services have filled this void to ensure garden individuals have an opportunity to transact, borrow and save digitally. Many people are using mobile phones in effecting financial transactions leaving the informal financial channels hence promoting economic citizenship (Aziz, 2020). Fintech has also grown due to the development of new methods in payment systems which are in the digital platform. Mobile money services for example bKash, Nagad, and Upay has been on the rise because of the absolute convenience, availability, and functionality in reaching out and transacting with customers not necessarily with a bank account (Hossen et al., 2025). It is through such platforms that individuals can buy goods and services, transact affairs by sending or receiving cash, or even receiving remittances from overseas. Improved use of electronic commerce and other digital-related businesses has also created pressure towards the use of technology-based financial platforms (Kamruzzaman, 2024). While penetration of the mobile phone is high today, the issue of illiteracy still

comes out strongly in as much as the digital divide is concerned. Although fintech has brought about a revolution in financial services, many people, especially those in the rural regions, are not able to master everything as required to operate the various platforms as required. Secondly, the Internet connection is still not adequately developed in some areas, which also predictions the outcome of digital financial services (Jahan, 2022). Mobile network coverage and penetration are generally high across the country but, since internet speeds, especially in rural areas, can be relatively slow, there are inherent problems in app usage. As the use of digital financial transactions has gained popularity there are issues of security and fraud. Hacking, phishing, fake IDs and other related online fears are some of the issues that both the users and providers of fintech related services are in a danger of facing (Putera et al., 2023). However, there are still issues of trust in the system despite the improvements made by the fintech companies, there is still adoption of security measures like the two factors' authentications and encryption. Lack of knowledge about good security practice online also add to these problems. Even though the government has tried to make a legal environment for fintech, there are some weaknesses in legal defender and regulation (M. J. Alam et al., 2023). Dramatically change has characterized fintech sector and fresh problems arise one of which is the regulation of digital lending and P2P lending. As such, to safeguard consumers and sustain the growth of the entire fintech segment in Bangladesh, a robust legal framework containing the answers to these new concerns is acutely indispensable (Amin, 2024). The second problem which fintech startups can find in Bangladesh is the lack of funds for early development. Another challenge which has been realized in the fintech market is that despite the growing interest by venture capitalists and other private investors there exists a problem of access to capital needed most especially for growth (Rahman & Parvin, 2024). This is so much the case with start-ups and businesses which have no connection to traditional funding sources. The identified sources of funds show that fintech startups could become constrained in expanding their businesses and approaching more customers with limited financing.

3. Methodology

We conducted a research on Bangladesh regarding " The Role of Digitalization in Bangladesh's Economic Development: A Study of Digital Technologies, Ecommerce and Fintech" using data from selected emerging nations. In order to expand the basis of receipt and minimize the error in data measurement, we used a stable and accurate source of information. In this context, it becomes necessary to identify the right variables to measure the effect of these integrations. Data was gathered from the National Bank of Bangladesh, covering the period from 2001 to 2022, alongside data from Organizations such as the World Bank, IMF, Asian Development Bank, and Bangladesh Bureau of Statistics provide extensive datasets related to " The Role of Digitalization in Bangladesh's Economic Development: A Study of Digital Technologies, Ecommerce and Fintech."

3.1. Data Analysis

We conducted robustness checks, Descriptive statistics, pairwise correlation tests, linear regression.

3.2. Model Specification

The main objective of this study is to investigate the relationship encapsulated by " The Role of Digitalization in Bangladesh's Economic Development: A Study of Digital Technologies, Ecommerce and Fintech "Our focus is on exploring the causal relationships between specific variables within this context. To achieve this, we developed panel data regression models to examine The Role of Digitalization in Bangladesh's Economic Development. These models allow us to represent all the relationships between independent and dependent variables within the regression equations:

Economic Development Model

$$ED = \beta 0 + \beta 1DT + \beta 2EC + \beta 3FT + \epsilon \text{.....1}$$

$$ED = \beta 0 + \beta 1DT + \beta 2EC + \beta 3FT + \beta 4POP + \beta 5EDU + \beta 6INF + \epsilon \text{.....2}$$

Where:

Where:

ED: Economic Development
DT: Digitalization
EC: E-Commerce
FT: Fintech
$\boldsymbol{\beta 0}$: Intercept
$\boldsymbol{\beta 1, \beta 2, \beta 3, \beta 4, \beta 5, \beta 6}$**:** Coefficient of independent and dependent variable
εit: Error term.

4. Results

4.1. Descriptive Analysis

The descriptive statistics therefore give the reader a general picture of the variables in the study, namely; GDP (economic development), digital technologies (DT), e-commerce (EC), and fintech (FT). The values of GDP reflecting the level of development of the economy vary between 1.34 to 1.79, average score equaled 8.60, and finally, the standard deviation of the given set of values is equal to 5.70. This means the existent of a high level of variability or economic dispersion, hence implying that there is a variation and hence inequality in the values of economic productivity in the observations. It shows that the data of GDP distribution has a slight positive skewness (0.248), which means that there is a small amount of data higher than the 75% quantile and all of these values are higher than the median; Thus, this distribution is platykurtic, as the 'excess kurtosis' is less than zero (-1.267). As for the values of DT (digital technologies), the share ranges between 8.00 – 38.00, though and a standard deviation of 8.34, which can be considered moderate. This means that the observed data do not have many extreme or outlying values, and the level of digital technology adoption is relatively similar within observations – the values equal to −0.125 for skewness and −0.556 for kurtosis, respectively. In case of e-commerce (EC), the range of values is between 24.78 and 53.87, mean value stands 43.04 and standard deviation is calculated as 8.45. The negative skewness (-0.900) means that the majority of the data values are larger than the mean,

which also means that the base of e-commerce is relatively more developed. There is no relative peakedness or flatness and no extreme outliers, which means that the kurtosis coefficient is quite close to the normal value of 0 (-0.077). FT or Fintech again show a maximum value of 112,465 and minimum of 7,784 with an average value of 47,773.13. The variation coefficient is also high (44,439,82) indicating high variability in the degree to which observations have adopted fintech. The skewness coefficient of 0.302, slightly greater than zero, points to the fact that there is a longer tail towards high values whereas the kurtosis coefficient of −1. 887 shows that the distribution is highly platykurtic. At large, the descriptive analysis reveals significant dispersion in economic development and the use of fintech, a stable and high level of digital technology use, and a relatively developed e-commerce market. Such results serve as a basis for future studies of the examined relationships with the identified variables.

Table: 1 Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
GDP	23	1.34E +12	1.79E +13	8.6040E +12	5.70253E +12	.248	.481	-1.267	.935
DT	23	8.00	38.00	23.5217	8.33868	-.125	.481	-.556	.935
EC	23	24.78	53.87	43.0410	8.44770	-.900	.481	-.077	.935
FT	23	7784.00	112465.00	47773.1304	44439.81812	.302	.481	-1.887	.935
Valid N (listwise)	23								

4.2. Correlation

Table 2: Correlation

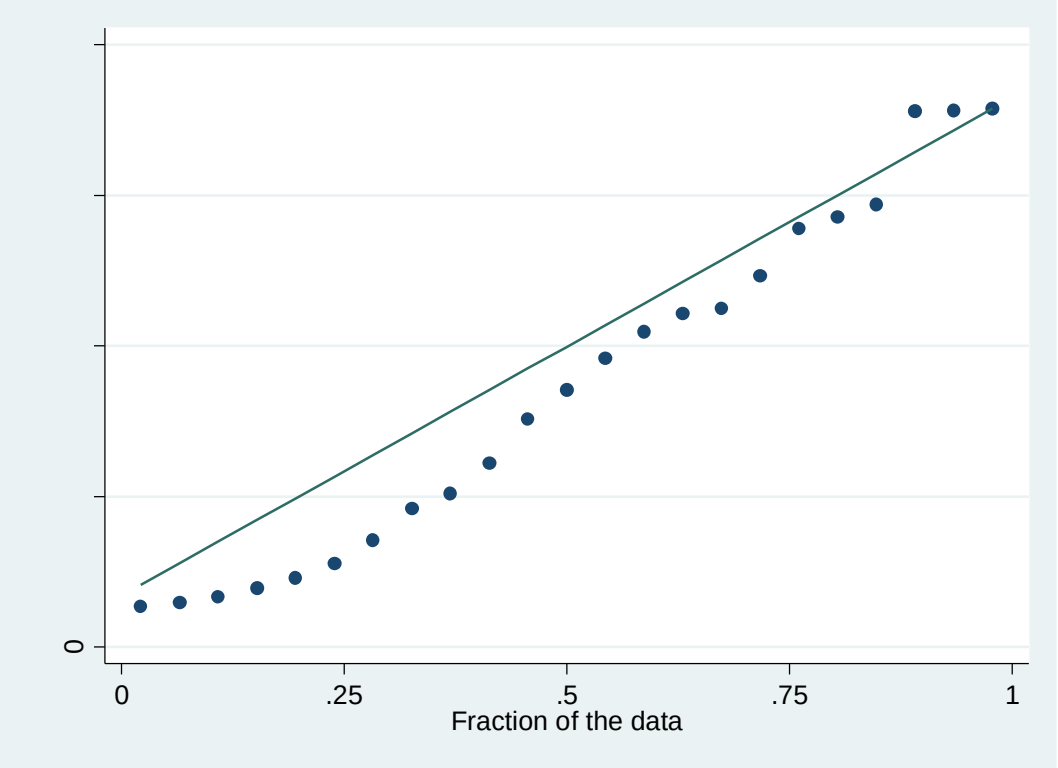
Variables	(1)	(2)	(3)	(4)
(1) GDPGrowth	1.000			
(2) Digitalization	0.990	1.000		
(3) E-commerce	-0.927	-0.940	1.000	
(4) Fintech	0.873	0.815	-0.783	1.000

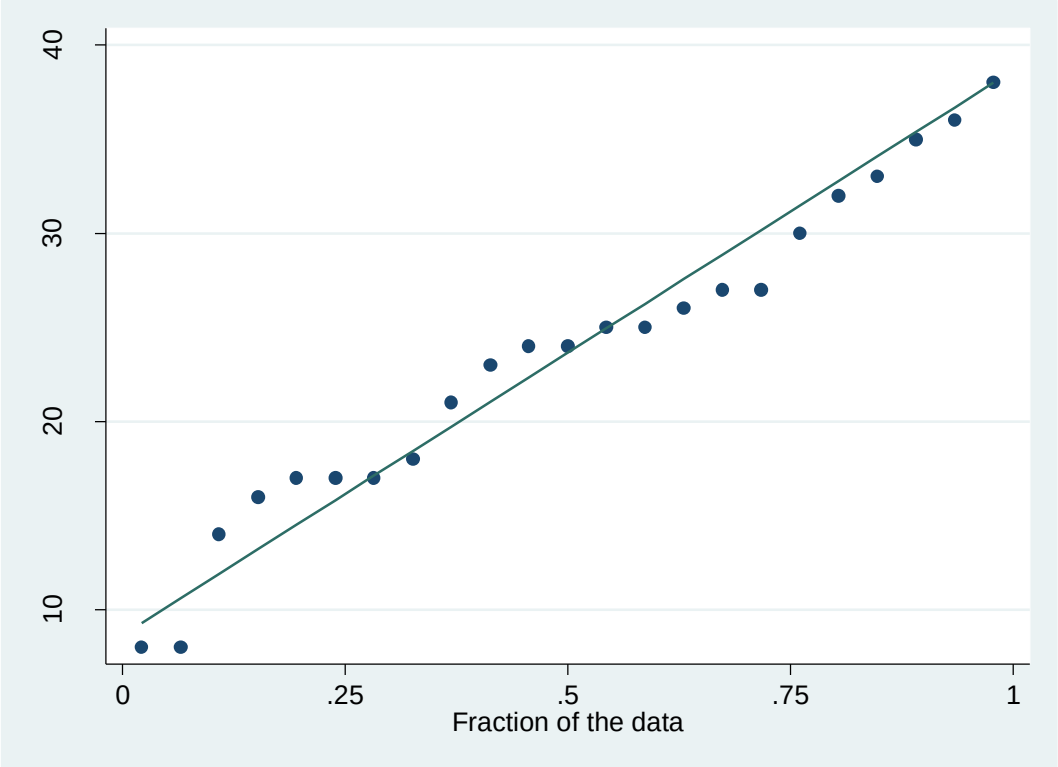
The correlation matrix provides insights into the relationships between the study variables, the favorable economic indicators are GDP growth, digitalization and increase of e-commerce, fintech. It is found that GDP has a good positive relationship with Digitalization having a Pearson correlation coefficient of 0.990 revealing that high levels of Digitalization are related to economic development. This implies that digitalization is a key factor in the economic process and which may enhance efficiency and integration, connection as well as innovation at the economy sectors. Alike, there is a strong positive association between GDP growth and fintech, where fintech was found to have high value of coefficient of correlation 'r' equal to 0.873 thus underlining the role played by financial technology in supporting economic processing through financial intermediation. However, another finding that is rather counter-intuitive is negative and significant relationship between GDP and e-commerce (r= -0.927). Moreover, the coefficients reveal that digitalization and e-commerce and have negative moderate – strong relationship ($r = -0.940$), which indicates that despite of the rising digital infrastructure, their equal growth is not being observed in e-commerce. This mismatch could have been due to factors including; regulatory reforms, low consumership or infrastructural deficits. Conversely, there isanity coefficient between digitalization and fintech (r=0.815) which is strongly positive as expected because digitalization liberally grows with Fintech services. Conversely, e-commerce and fintech are negatively related ($r = -0.783$, $p < 0.01$), which may suggest competition or no cooperation between e-commerce and fintech in the examined environment. In sum, it can be concluded that, on balance, when it comes to economic growth both digitalization and fintech are complementary; however, concerning e-commerce the results imply the pronounced need for careful treatment and further work on easing such negative relations in order to unleash such a potent driver of development. It is imperative that future policy and practice looks to better harness e-commerce for its full economic potential by focusing on cohesion between the two pillars of digitalisation. These relationships lay a groundwork on which further analysis like regression analysis may be performed to confirm these findings and identify cause and effect relationships.

4.3. Panel Regression Results

The regression results will shed light on the nature of relationship between digitalization and GDP controlling for e- commerce and fintech. For e-commerce, the estimated figure which is the coefficient (-9.04) provide a slight negative correlation with GDP which mean that e-commerce may have negligible negative effect on economic growth. But it is not significant so the p-value is fairly large (0.701) and the t is tiny (-0.39). Therefore, the value of the coefficient of simple regression (-0.1837) also confirms that e-commerce has a weak and insignificant effect on the level of GDP within this model. These studies support the proposition that the current level of e-commerce is not strongly contributing to growth, which may be because of issues such as infrastructure constraints, regulatory impediments, or problems unique to this segment. Again, a negative finding of -2848.23 means that fintech has a negative impact with GDP which tends to mean that as the level of activity in the fintech industry rises, the level of economic activity as measured by GDP falls. However, acknowledging this outcome, such a result might be attributed to a transitional nature of the processes disrupting traditional financial services throughout the countries or the varying degrees of fintech implementation. Similarly to the e-commerce impact, the change is non-significant with a p-value equal to 0.153 and relatively low t-value (-1.49).

Nevertheless, the result shows that the impact of place is stronger and has a negative standardized coefficient of - 0.8464 but since it is insignificant, the result has to be interpreted cautiously. Indeed the constant term which is, 216365.3 is statistically significant at p=0.004 thereby implying that there are other factors outside the model that influence the GDP in a big way. So this seems to suggest that while digitalization may boost conGDP through the typical channels which are not controlled for in the analysis including education, quality of infrastructure, or governance effectiveness and efficiency.





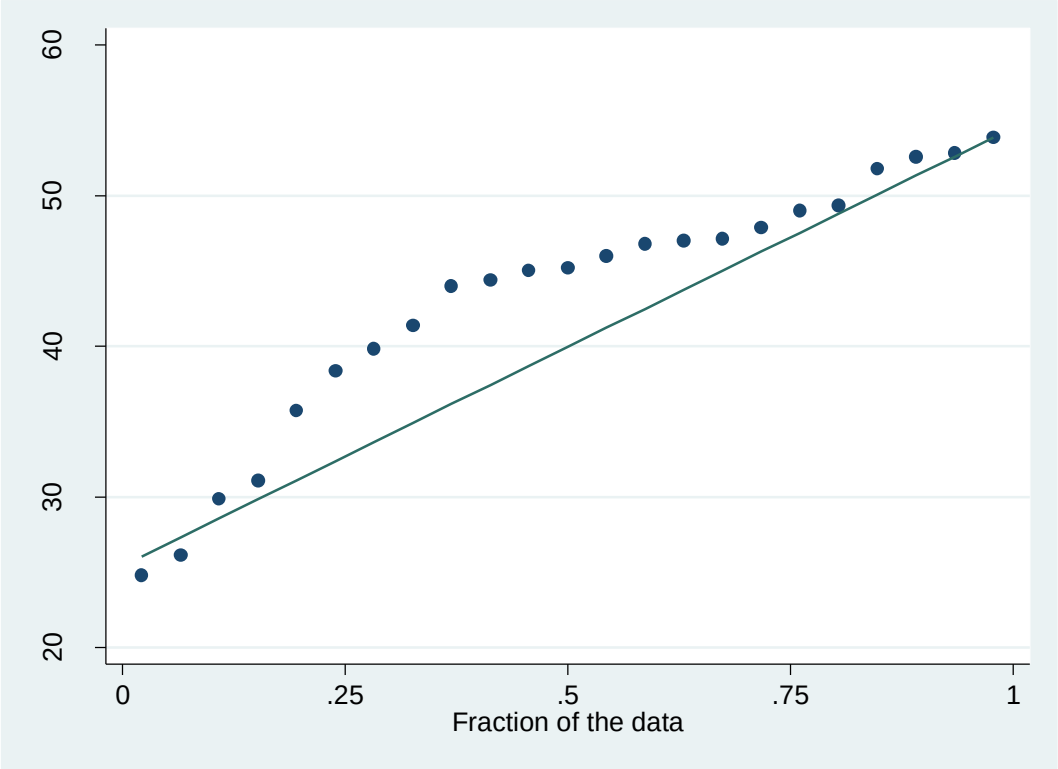


Table 3

Digitalization to GDP	Coef.	Robust Std. Err.	T	P>t	Beta
E-commerce	-9.04e-10	2.32e-09	-0.39	0.701	-.1836802
Fintech	-2848.23	1915.47	-1.49	0.153	-.8463577
_cons	216365.3	65393.69	3.31	0.004	

Table 4

Ecommerce to GDP	Coef.	Robust Std. Err.	T	P>t	Beta
Digitalization	3.07e-11	1.78e-13	5.53	0.000	1.032003
Fintech	1.403323	.1213459	0.37	0.715	.068923
_cons	199.5416	135.3519	1.47	0.156	

The findings present some important insights, especially concerning the impact of digitalization for economic development. Digitalization is proved to have a positive and significant impact on GDP via e-commerce with coefficient (3.07). This outcome suggests that the advanced stages of digitalization play a significant role in small increments of a country's GDP through support and improvement of e-commerce. The findings support all the hypotheses as the t-value is high 5.53 and the p-value is 0.000 to affirm the generalizability of the results. In addition, we found that value added tax – digital services (supporting the development of the digital economy) has a strong positively standardized beta coefficient equal to 1.032. This is in accordance with expectations because digital infrastructure supports e-commerce, communication, and increases organizational productivity leading to economic growth. Fintech has a positive association with GDP through e-commerce as reflected in its coefficient 1.403, t-value of 0.37 and p-value of 0.715 respectively but these values are not significant. By using the standardized beta coefficient, the result indicates a weak and negligible standardized effect of fintech on GDP in this consideration. Thus, although fintech forms a significant segment of the digital economy and provides the missing link in financial inclusiveness, it contributes very little to e-commerce, and therefore GDP through e-commerce could be constrained by similar factors which include; Inadequate uptake by customers and therefore firms and individuals, regulatory requirements or infrastructural constraints that hinder the integration of fintech with e-commerce companies. However using e-commerce as the dependent variable the constant term (199.54) is not statistically significant (p=0.156) meaning that other factors which are not captured in this model also affect GDP. These may include, but not limited to macro-economic factors, customer behavior, product life cycle, regulatory factor which might influence the observed relationship in a round-about-way. In summary, the results presented stress the impact of digitalization for economic growth by focusing on the significance of investing in the relevant digital infrastructure to unlock the full potential of e-commerce. The government and other interest groups need to look forward to dismantling hurdles to adoption and encouraging coordination between these sectors to mutual to improve their contribution towards the economy. Nonetheless, there is a need for more studies on other factors that could with e-commerce affect GDP in order to present a clearer picture of these relations.

Table 5

Fintech to GDP	Coef.	Robust Std. Err.	T	P>t	Beta
Digitalization	3.18e-13	5.56e-12	1.79	0.089	.587535
Ecommerce	-.113163	3.791342	-0.93	0.362	-.3059816
_cons	19.56501	4.356054	4.49	0.000	

The analysis of regression investigates the impact of the level of digitalization, e-commerce, and GDP where Finn technology, or fintech, is assumed to be a dependent variable. The findings form the basis for analyzing the extent of each variable to the outcome. Fintech is found to have the strongest and positive relationship with digitalization by exhibiting a coefficient of 3.18, which will point towards the fact that increased digitalization is likely to positively affect GDP through the usage of fintechs. These beta coefficients range from 0.330 to 0.588, and the average or the standardized beta coefficient is 0.588, establish the fact that digitalization has a moderate influence on GDP through fintech. Nonetheless, the study shows that this relationship is only marginally significant, with a p0 of 0.089, slightly above the conventional alpha of 0.05. This implies that even though Fintechs advancement revolves around digitalization, optimization is slightly constrained by issues of infrastructure deficit or variation in sectors' adoption. On the other hand, the effect of e-commerce on GDP through fintech incumbent is a weak negative relationship of -0.113. This is a surprising result because e-commerce and fintech industries are often considered to belong to related categories. The negative relationship did not come out as significant with its p= 0.362 and t= -0.93, which informs that the effects of e-commerce on the GDP through fintech are insignificant. This is also confirmed by the standardized beta coefficient of −0.306−0.306 where e-commerce has a negative, yet weak influence on GDP through fintech and might be driven by other unknown factors. The constant term shows that the coefficients of other variables not included in this model indicate different effects on GDP through fintech (p = 0.000). This means that other factors regarding the impact of Fintech might be required including; the regulatory policies, financial literacy or the market forces which are also likely to have a significant influence on the contribution of Fintech on the economy. In summary, the results indicate that the growth depends on digitalization and the development of fintech as one of the significant drivers of increasing GDP Therefore, it is crucial to invest in the digital environment as a basis for the further expansion of financial technology services. While there is same similarity between Nigeria and other developing economies whereby e-commerce is moderately correlated with GDP, the weak and statistically insignificant manner in which the two relate through fintech indicates the two sectors maybe To some extent disconnected or may be operational in different capacities: In some cases as competitors. Policy makers should pay attention to way digital sector can contribute to the GDP of the specific country, how electronic commerce and other sectors can develop their cooperation with fintech, and how barriers to fintech adoption can be eliminated, including the regulatory and consumer perception. It is possible to further examine other mediating variables as innovation and digital skills to expand knowledge of how the use of fintech can impact the economic growth.

5. Discussion

The research focuses on the ways the elements that relate to digitalization, e-commerce, and fintech affect such a parameter as GDP in order to learn more about how these parameters positively affect the development of the economy. From the analysis, the authors are able to pinpoint these relationships and identify areas for future research and policy improvement. They have established that digitalization came out as a key determinant of GDP in this study. The regression analysis further shows that there exists a highly significant and positive relationship between digitalization and GDP through its impact of e-commerce as well as the fintech industry. Digitalization is above the significant level to enable economic growth, technology infrastructure ($p<0.05$), and the enabler of online commerce, financial innovation and other related economic activities. The findings that emerged from the analysis were highly consistent in identifying Digitalization as the most influential of the predictors of change in modern Economies, as captured by the Standardized Beta Coefficient. These results are consistent with prior research, which posit the relevance of digital platforms for the advancement of the de/development process, especially in the developing world country such as Bangladesh. Such values like internet, mobile technologies, digital platforms which are some of the today's important prospects for making new investments in the economy are seen as critical means for economic growth.

As possibly expected, e-commerce as a well-established integral part of the electronic economy in the analysed countries demonstrated rather a weak and statistically insignificant correlation with GDP within the models. Some of the coefficients are negative in some regressions pointing to perhaps difficulties that could hamper e-commerce's contribution to the GDP. This may be due to the following factors including; Poor transport systems and networks, The consumers do not have the confidence in the transport system, The transport system limits the payment gateways available. Comparing between the variables, the standardized beta coefficients presented here for e-commerce were relatively low and stable, which demonstrated that e-commerce occupied a small proportion of the impact compared to digitalization. Nonetheless, it is significant not to disregard development potential of e-commerce by its significance as an enabling tool for trade and services in the digital environment. The challenges include increasing transport infrastructure, cutting down bureaucratic red tape to drive this sector, and raising awareness among the consuming population could improve the sector's contribution to the GDP. Fintech institution has had rather inconsistent performance on the correlation with GDP. Although the coefficients indicated positive correlations in some models, most of these findings were not statistically significant. The trend of beta coefficients of Fintech shown a moderate impact toward digitization but a relatively weaker impact when compared with e-commerce. From these findings, it can be implied that fintech's share in the GDP might be near-thwarted by issues like; low fintech penetration, bureaucracy in regulation, and; lack of financial literacy among the population. However, the roles of fintech are not insignificant and are as follows, including financial inclusion and efficient financial transaction for e-commerce and other economic activities. Enhancing the awareness of fintech adoption policies, enhancing the quality of the regulation of fintech activities, and building consumer confidence will lead to superior economic gains of this important segment.

It is important to understand the relations of digitalization with e-commerce and fintech as three rather interconnected factors in order to reveal their combined influence on GDP. Being one of the fundamentals, the process of digitalization might help to build up the critical base of e-commerce and fintech markets. However, the low contribution of e-commerce and fintech to the overall GDP in terms of the roles that these fragile statistical values can play tends to indicate that these sectors do not belong to the broader economy. This strengthens the call for strategic actions to optimize the coupling of digital environments, e-commerce, and fintech.

5.1. Research Implications and Recommendations

The potential of the digitalization in the economic development should be realized through intensification of internet facilities, mobile phone networks, and digital markets. By reducing probable and perceived hindrances of logistics, regulations, and trust, the role of e-commence in the GDP can be improved. There are important policy implications for decision-makers: an overall focus on market openness and the simplification of business processes in the sphere of e-commerce. This includes supporting regulatory improvements, raising consumers' awareness, and the system's ability to incorporate fintech with other digital industries. Measures intended to enhance financial literacy and the provision of an opportunity to apply the gained knowledge will enhance the activity's impact. It is important that there is synergy between e-commerce firms and other players such as fintech firms and developers of digital infrastructure for a smooth functioning economy. The paper brings focus on how digitalization is a driver of GDP in Bangladesh and the opportunities and threats present in e commerce and fintech services. The results underpin the initiative towards policy intercessions and capital to remove the constraints and advance the connected digital economy. The interlinkages of these sectors means that a competitive enabling environment and mutually reinforcing dynamics are achievable for Bangladesh, resulting in sustainable and inclusive economic growth. Future studies should seek to include more variables and moderator variables to give a detailed human understanding of all these correlations.

5.2. Conclusion

This paper focuses on the impact of digitalization, Electronic Commerce (e-Commerce), and Fintech in the enhancement of GDP and Economic growth in Bangladesh. The analysis shows that digitalization is a game changer for the future growth of the economy, which is evidenced by the results of research in the spheres of e-commerce and fintech opportunities. Thus, digitalization appeared to be the most dominant variable, exhibiting a strong and positive rapid growth coefficient in all the models. As a form of connectivity, a means of improving the efficiency of business processes, and a basis for the creation of new technologies it has become an integral part of today's economy. The findings further imply that there is scope to significantly expand digital inputs that exist in Bangladesh and need more investment and policies for further optimization. Thus, despite its role to be one of the strategies of the digital economy's growth, e-commerce demonstrated low and even a negative, statistically insignificant correlation with GDP. Such outcome suggests several possible constraints, namely the lack of appropriate facilities, problems with transportation and organizational support, as well as relatively low customers' trust, which could prevent the sector's development. The improvement of these areas is essential to realize the potential of e-commerce and its impacts for development. As such, fintech similarly had a moderate to positive connection with GDP but mostly reporting insignificant statistical values in some cases. The current study implies that though fintech offers the best solution to financial inclusion and economic integration, it cannot perform optimally due to high non-implementation rates, inadequate regulatory frameworks, and low customer consciousness. Solving these problems will enhance the ways fintech boosts the economy. In a nutshell, this study establishes the interconnectivity between digitalization, e-commerce and fintech as the primary promoters of economic growth. Of course digitalization provides the environment, initial conditions, and development of e-commerce as well as fintech require overcoming many structural and systemic factors. To support development of a strong digital economy, therefore, there is a need for policymakers to encourage the growth of the supporting digital services industry, strengthen the relevant regulation, and facilitate cooperation between them. Specifically, this research fills the literature gap by documenting the experiences and current status of these sectors in Bangladesh in terms of contribution to the country's development. Future studies should explore the moderator variables like digital literacy, innovation and regulations concerning the relationships above to provide a complex picture of the digital economy. If these problems are solved, Bangladesh may develop a better digital environment and ensure sustainable economic development as well.

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