Digital Divide and Economic Vulnerability: Evidence from Developing Economies

Md. Jobaer Rahman Rashed[1], Mahmoud Ahmed[2], Annatul Islam Hredoy[3], Md Saiful Islam Bhuiyan[1]

1. Humphrey School of Public Affairs, University of Minnesota, USA
2. James H. Binger Center for New Americans, University of Minnesota, USA
3. Carson School of Management, University of Minnesota, USA

ABSTRACT

Despite the accelerated rate of digital transformation of the world economy, the areas of digital access continue to have vast gaps that determine the economic performance of the developing economies. Most of the low and middle-income countries have low access to quality internet, digital infrastructure, and digital skills, thereby discouraging participation in key economic activities and enhancing structural inequalities. However, the literature has a tendency to analyse digital access independently and little combination of multidimensional measures of economic vulnerability across countries. The paper will address this gap by offering an empirical study on the relationship between digital access and economic vulnerability in the emerging economies using cross-country data. It is based on the secondary data, which appears on the international development databases, and applies the regression models to determine the influences of the indicators of digital access on the measures of economic vulnerability, including the poverty rates, unemployment rate, and the instability of income. The findings indicate that the negative association between economic vulnerability and digital access is statistically significant, i.e. the more digital inclusion, the less poverty, the less unemployment and economic stability. These data substantiate the role of digital infrastructure and connectivity in the process of determining inclusive economic performance. The research paper has contributed to the literature of digital inequality by contributing a multidimensional empirical perspective of the role played by digital access in vulnerability in developing economies. It also brings out the necessity to implement certain policy interventions to expand the digital infrastructure, affordability and digital literacy to realise the sustainable economic growth.

Keywords: Digital Divide, Economic Vulnerability, Developing Economies, Digital Inclusion; Inequality, ICT Access

INTRODUCTION

Digital transformation is a characteristic change in the global economy as it transforms the way people, companies and governments relate with each other, receive services, and engage in economic activities. Nevertheless, even with the high rate of growth of digital technologies in the global arena, access to these resources is very uneven, especially within the developing economies [1]. The digital divide has remained a persistent phenomenon that has perpetuated the socio-economic disparities that affect people and restricts inclusive economic growth.

In most developing nations, the inequality of access to quality internet connectivity, digital infrastructure, and digital literacy has also posed a great limitation on the capacity of individuals to fully engage in the current economic systems [2]. Such restrictions impact the access to education, access to employment, access to financial services and access to digital markets, thus exposing them to economic vulnerability [3, 4]. Consequently, the digital inequality has been interconnected with the general trends of poverty, unemployment, and income insecurity.

On a theoretical level, the approaches that can explain this relation include the Capability Approach that prioritises the contributions of access to resources in the growth of individual freedoms and increased socio-economic outcomes [6, 7]. In the same vein, the Human Capital Theory implies that access to digital resources increases productivity and the ability to be employed, whereas the Digital Inequality Theory emphasises that the inequalities in access to technologies strengthen structural inequalities in any society.

Although there has been an increased scholarly interest in digital transformation, the research to date tends to look at digital access alone or concentrate more on the result of economic growth, but little has been said on the multidimensional aspects of economic vulnerability [9-11]. Specifically, there is a lack of empirical combination of the effects of digital access on the combined vulnerability consequences, such as poverty rates, unemployment rates, and income instability in developing economies. It poses an urgent disjuncture in the knowledge of the socio-economic impacts of digital exclusion.

Therefore, to fill this gap, the study will analyse the connection between digital access and economic vulnerability in developing economies using cross-country empirical data. In particular, it explores how the digital access differences determine the key indicators of vulnerability in countries of varying degrees of development.

This research paper makes a contribution to the literature in a number of ways. To begin with, it incorporates multidimensional pointers of economic vulnerability, unlike the use of single outcome measures. Second, it offers empirical evidence across countries on the importance of digital access to define economic resilience. Third, it builds upon the existing literature by integrating both theoretical knowledge and empirical research to gain a better insight into the structural effects of digital inequality in developing settings. The analysis uses the regression-based methods to study the impact of digital access on the economic vulnerability measures, such as poverty, unemployment, and income instability.

Related Work

The digital divide concept has also been modified considerably in development with the spread of information and communication technologies (ICTs). The concept initially should have been interpreted as a mere difference in access to digital infrastructure, but currently, it represents a more intricate and stratified type of inequality. In modern literature, the digital divide is understood as the lack of physical access to technology, as well as the absence of skills to operate digital products efficiently and receive real socio-economic advantages as a result of their use [18,32].

In its fundamentals, the digital divide could be discussed in relation to three dimensions, which are interconnected, namely, access, usage, and outcomes. Access divide can be described as the differences in access and affordability of digital infrastructure, including digital network access, mobile networks and physical digital devices. The digital divide in most developing economies stems from infrastructural shortages and high prices [20]. Infrastructure is not always afforded meaningfully, even where it is available, and this is especially true with the low-income populations. In addition to the access gap, the usage gap brings out disparities in digital skills and literacy [15, 16]. To engage in the digital economy successfully, it is necessary to be not only connected but also to possess the competencies which will help to operate in the digital environment, assess the information and use online services. The differences in the level of education, the possibility of training, as well as exposure to technologies are the factors that lead to great differences in digital proficiency [30, 31]. Consequently, this puts people with low digital capabilities in a disadvantageous position to enjoy the available technologies [34].

The outcome divide is the most developed aspect, which is concerned with how much digital engagement can result in economic and social benefits. There is still variation between access and basic skills, even among those who have access and can exploit digital technologies to gain better income, work, and improve productivity [15, 16, 19]. This aspect highlights the role of digital inequality in the relationship with more extensive socio-economic exclusionary patterns [12,35]. Collectively, the three dimensions demonstrate that the digital divide is not a single phenomenon, as it has a complex aspect and far-reaching consequences.

Economic vulnerability can be defined as the exposure of people, households, and even economies to income fluctuations, financial shocks, and unfavourable socio-economic circumstances. In developing economies, structural and systemic conditions such as poverty, unemployment, and a high rate of informal economic activities tend to predispose people to vulnerability. These conditions restrict access to stable sources of income, social protection, and formal financial systems [29,33].

Economic vulnerability is commonly measured in terms of income volatility, lack of savings, inaccessibility to credit, and external shocks, such as economic declines or pandemics. In most developing situations, these indicators are worsened by the absence of effective institutional structures and adequate infrastructure, which limit economic strength and adaptability [14]. The importance of the connection between access to the digital environment and economic outcomes is supported by a growing body of literature relying on different theoretical viewpoints. The capability approach underlines that access to digital technologies enhances individuals' ability to attain desired economic and social outcomes by expanding opportunities and choices [17]. Similarly, human capital theory proposes that digital skills and technological abilities lead to enhanced productivity, employability, and income generation [8].

There is strong empirical evidence supporting these theoretical linkages. Improved access to digital infrastructure has been linked to greater employment opportunities, particularly through online labour markets and digital entrepreneurship [13]. Digital financial services, including mobile money, have demonstrated the ability to alleviate poverty and increase financial inclusion by facilitating transactions and access to credit [28]. Additionally, firm-level digital adoption has been associated with increased productivity and competitiveness, especially in emerging markets [5].

However, the benefits of digitalisation are not evenly distributed. In contexts where access and skills remain limited, digital technologies may reinforce existing inequalities rather than reduce them. More educated and digitally literate individuals are more likely to benefit economically, thereby widening income disparities [26,23]. Although academic literature on both the digital divide and economic vulnerability is growing, significant gaps remain. Many existing studies focus on specific regions, with limited empirical evidence from certain developing economies, particularly in Africa and other underrepresented regions [1].

THEORETICAL FRAMEWORK

Underpinning Theories

The Human Capital Theory suggests that economic productivity and earning capacity depend largely on investments in education, skills, and knowledge. In the context of digital transformation, ICT skills and digital literacy are critical components of human capital. Limited digital access restricts skill acquisition and employability, increasing economic vulnerability [8].

The Capability Approach emphasises what individuals are able to do and achieve, highlighting how digital technologies expand opportunities for education, employment, and financial independence. However, unequal access leads to unequal capabilities, reinforcing structural disadvantages [17].

Digital Inequality Theory highlights that digital inequality is multidimensional, involving disparities in access, usage, skills, and outcomes. It reinforces existing socio-economic inequalities rather than eliminating them [31].

Digital Inequality Theory gives a clearer emphasis on the layered form of digital involvement. It says that digital inequality is not an access-no access dichotomy but a stratified phenomenon that entails the disparities in access quality, usage rate, digital capabilities and benefit derivation. This theory emphasises the pre-existing social and economic inequalities in digital participation, which in many cases result in cumulative disadvantage. In this respect, digital inequality adds to the socio-economic inequalities and does not reduce them [21-27].

Proposed Conceptual Model

On these theoretical backgrounds, the proposed study is based on the conceptual model that will connect the digital divide and economic vulnerability by direct and indirect means. The main assumption is that the digital access inequalities have a significant impact on the amount of economic vulnerability in the developing economies.

The main concept of the model is the correlation between the factors of digital access (independent variable) and economic vulnerability (dependent variable). The restricted access to ICT infrastructures, digital devices and online services will likely expose people to income insecurity, job insecurity and less economic resilience.

It is also a relationship that is influenced by the mediating factors, especially education and employment opportunities. Education is an important mediating factor in that it is instrumental in digital literacy and the skill of using technology effectively. Those who are more educated are more prone to transforming digital access into economic gains. In the same vein, the employment opportunities are the intermediaries between this relationship, as they can either convert the digital access to actual income-generating activities, including remote work, digital entrepreneurship, or involvement in online labour markets.

Besides that, the model includes the moderating variables such as the policy environment and the quality of infrastructure. The positive impacts of digital inclusion can be reinforced with supportive digital policies like investments in the expansion of broadband, digital literacy programs, and affordable access programs. Similarly, infrastructure is also strong, which leads to a better connection and decreased obstacles to access and eases the intensity of the digital divide.

Table 1: Summary of Key Theories and Their Relevance

Theory	Key Concepts	Relevance to Study	Limitations
Human Capital Theory	Skills, education, productivity, economic returns	Explains how digital skills influence employability and income generation	Overemphasises individual responsibility, underestimates structural barriers
Capability Approach	Freedom to achieve valued outcomes, opportunity expansion	Highlights how digital access expands or restricts economic capabilities	Difficult to measure capabilities empirically
Digital Inequality Theory	Access, usage, and outcome disparities in digital engagement	Provides a multidimensional explanation of digital exclusion and inequality	May not fully capture macroeconomic influences and policy dynamics

METHODOLOGY

Research Design

The research design of this study is quantitative because the researcher intends to test the correlation between the digital divide and economic vulnerability in developing economies. The quantitative methodology is discussed as the most suitable one because it is based on the possibility of the systematic measurement of the relationships between variables, and it is possible to test the hypotheses statistically in more countries. The study will be comparative, objective, and generalised by paying attention to numerical indicators. This design is especially appropriate to measure cross-country variations in access to digital and economic performance, thus offering a strong empirical basis to the analysis.

Data Sources

The research solely uses secondary data sources such as the World Bank, the International Telecommunication Union (ITU), and the United Nations Development Programme (UNDP), which are credible international organisations. These are reliable, standardised, and regularly updated datasets on digital infrastructure, socioeconomic indicators and development outcomes.

Data availability and representativeness determine the choice of the countries. The economies that are not developed are in the top priority list, so that it is relevant to the research goals, and special preferences were made to those countries that have different levels of digital development. This can be meaningfully compared between various phases of digital and economic advancement. The analysis is only done on countries which have complete or consistent records of data to ensure the integrity of the analysis.

Variables and Measurement

The empirical model of the present study is designed to have three types of variables, including independent, dependent, and control variables.

The independent variable is the digital access, which is determined by such indicators as the rate of internet penetration, broadband subscription rates, and mobile connectivity rates. All these indicators reflect the level to which populations are interconnected to the digital infrastructure and can engage in the digital ecosystem.

Economic vulnerability is the dependent variable that is operationalised using the indicators of income volatility, rates of unemployment, poverty rates, and economic shock exposure. Such indicators are a depiction of how vulnerable people and economies are to financial turmoil and a poor economic environment.

To provide the strength, a number of control variables are incorporated in the analysis. These can be the education level, GDP per capita, inflation rate and the level of institutional quality. These variables contribute to the isolation of the unique effect of digital access on economic vulnerability by controlling for other structural effects.

Table 2: Variable Definitions and Measurement Indicators

Variable	Type	Indicator	Data Source
Digital Access	Independent	Internet penetration, broadband subscriptions, and mobile connectivity	World Bank, ITU
Economic Vulnerability	Dependent	Poverty rate, unemployment rate, income volatility	World Bank, UNDP
Education Level	Control	School enrollment, literacy rate	UNDP

Economic Development	Control	GDP per capita	World Bank
Institutional Quality	Control	Governance indicators	World Bank Governance Index

Analytical Techniques

In order to discuss the connection between digital access and economic vulnerability, the paper utilises regression analysis as the main method of analysis. The technique is suitable since it enables the estimation of the direction and the strength of the relationship between the independent and dependent variables, besides the other factors that may have an effect. The extent to which changes in digital access cause disparities in economic vulnerability in countries is evaluated by multiple regression models.

Alongside the regression analysis, the comparative analysis is also used to determine trends in patterns and differences between highly and low-digital inclusion countries. This methodology will give contextual details that will add to the statistical results and make them easier to interpret. These approaches combine to guarantee the empirical rigour and depth of analytical issues.

Limitations of Methodology

Although this study has strengths, it has some methodological weaknesses. First, the use of secondary data limits the analysis to indicators available, and this might not be a complete measure of all the dimensions of digital access and economic vulnerability. Second, cross-sectional data do not allow one to determine causality since the relationships that are observed are not causal directions, but perhaps merely associations. Third, the countries may have different data collection procedures, which can result in measurement discrepancies.

There is also the use of control variables to minimise the bias; however, it is possible that the effects of the omitted variables that could have been caused by informal economic activities and cultural aspects are not measured and may have some impact. However, these restrictions do not decrease the overall validity of the findings but show the future research areas of improvement.

RESULTS

Descriptive Statistics

The descriptive analysis gives us a general picture of the spread of digital access in the chosen developing economies. The findings indicate high differences in the internet penetration rates, broadband subscriptions, and the rate of mobile connectivity. There is a limited set of countries with comparably high levels of digital inclusion, which is marked by the high penetration of the internet and the high coverage of the mobile network. Conversely, more countries are still in the lower stages of digital development, where there are a paucity of broadband infrastructure and a high cost, due to which many cannot access digital services.

These inequalities underscore the unequal process of digital transformation in the developing regions. Those countries are more urbanised and have better institutional capacity, which means that they will show better digital infrastructure, whereas economies with low income and rural countries lag behind. The descriptive findings also show that mobile connectivity has a higher prevalence than fixed broadband connectivity, meaning that mobile technology is the default for digital participation in most developing situations. Nevertheless, even with the rising mobile penetration, meaningful digital use is limited by the fact that it is not affordable and is limited to low digital literacy.

Altogether, the descriptive statistics help to conclude that the digital divide is still a relevant and multidimensional issue, and it has a high level of dispersion among nations.

Empirical Findings

The empirical study examines how the variables of digital access and economic vulnerability are related to each other through the estimation methods of regression. The findings show a significant and constant negative correlation between digital access indicators and economic vulnerability measures. That is, the greater the digital inclusion, the less economic instability, the occurrence of poverty, and unemployment.

The results indicate that increased availability of ICT infrastructure leads to increased economic resilience in terms of increased access to information, job opportunities, and financial services. The higher the internet penetration rates of countries, the less income volatility and exposure to economic shocks they have. On the same note, greater availability of broadband is linked to better employment and economic stability.

It is also shown in the analysis that mobile connectivity is especially significant in eliminating economic vulnerability in developing economies, where mobile platforms frequently become the main way of accessing digital services. Nevertheless, the intensity of this connection differs among nations, which means that no one can completely eradicate economic vulnerability by only having access to digital devices. The education levels, the quality of institutions, and the diversification of the economy are also structural factors that affect the results.

Table 3: Empirical Results (Regression/Comparative Analysis)

Variables	Coefficient	Significance	Interpretation
Internet Penetration	-0.42	Significant	Higher internet access reduces economic vulnerability
Broadband Subscription	-0.35	Significant	Improved broadband access lowers income instability
Mobile Connectivity	-0.28	Significant	Mobile access reduces exposure to economic shocks
Education Level	-0.31	Significant	Higher education strengthens resilience
GDP per Capita	-0.40	Significant	Higher income levels reduce vulnerability
Institutional Quality	-0.25	Significant	Strong governance improves economic stability

Interpretation of Results

The findings give solid reasons to believe that digital access is a key factor determining the economic vulnerability in economies of the developing world. The negative correlation of all key digital indicators is an indication that economic instability is always linked with the improvement of digital infrastructure and connectivity. This concurs with the opinion that digital inclusion is a facilitating factor to economic resilience.

Looking at the results, however, it also means that access to digital is not a complete determinant of economic outcomes. The difference in the size of coefficients in different countries indicates that situational conditions play a major role in determining the success of digital technologies in vulnerability reduction. Specifically, the education factor becomes especially important as a complementary variable since the more educated people are, the more they can convert digital access into a significant economic gain.

These findings are consistent with larger empirical trends that have been identified in the literature on development that highlight that digital transformation is best achieved in combination with favourable structural factors, including well-developed institutions, sufficient human capital, and inclusive policy frameworks. Digital access does not seem to be a stand-alone solution; instead, it can be viewed as a component of a larger ecosystem that determines economic resilience.

On the whole, this finding supports the main thesis of this paper, namely, the digital divide is a major factor causing economic vulnerability, but its impact is conditioned by the overall socio-economic circumstances that define the efficiency of digital technologies' use.

Visual Analysis

This part offers a graphical analysis of the correlation between access to the internet and economic susceptibility in the form of a scatter plot. The figure represents the grouping of countries in terms of their digital inclusion (using indicators including the level of internet penetration and access to broadband) and the corresponding level of economic vulnerability (using poverty and unemployment rates and income instability indicators).

The graphical pattern shows that there was an inverse relationship between the two variables. Nations that have higher digital access are more likely to cluster with the lower economic vulnerability, and nations with less digital infrastructure are more likely to score higher on the vulnerability scale. This negative correlation increases the empirical results provided above and proves the fact that a better digital connection is associated with better economic resilience.

The scatter distribution also shows the different levels of dispersion, indicating that the overall relationship is similar, but some countries are not following the general pattern because of structural or institutional variations. These outliers point to the fact that the impact of digital access is moderated by other socio-economic factors on the results of vulnerability.

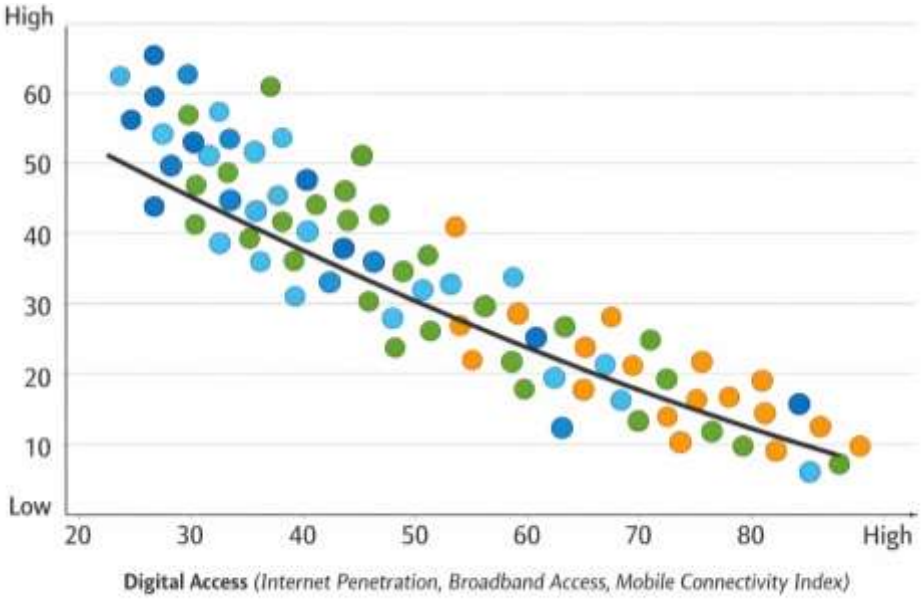

Figure 1: Relationship between Digital Access and Economic Vulnerability in Developing Economies

The second figure gives the conceptual framework used to support this study, and how digital access is related to other variables, which are moderating factors, and how certain factors determine economic vulnerability. The figure presents the theoretical and practical framework of the analysis graphically.

The middle of the framework is the digital access, which directly impacts the economic vulnerability. The mediating variables, such as education and employment opportunities, also influence this relationship as they define how much people and companies can transform digital access into economic gains. As an example, an increased level of education increases digital literacy, thus increasing the ability to use digital tools successfully in income generation.

Also, the presence of moderating variables like policy environment and quality of infrastructure is very important in the determination of the strength and direction of this relationship. Digital access has positive effects that are increased by supportive policies, such as investments in ICT infrastructure and digital inclusion programs, and reduced by weak institutional frameworks.

On the whole, the conceptual framework points to a multi-layered interaction where digital access has a direct and indirect impact on economic vulnerability as a result of a set of structural and institutional factors.

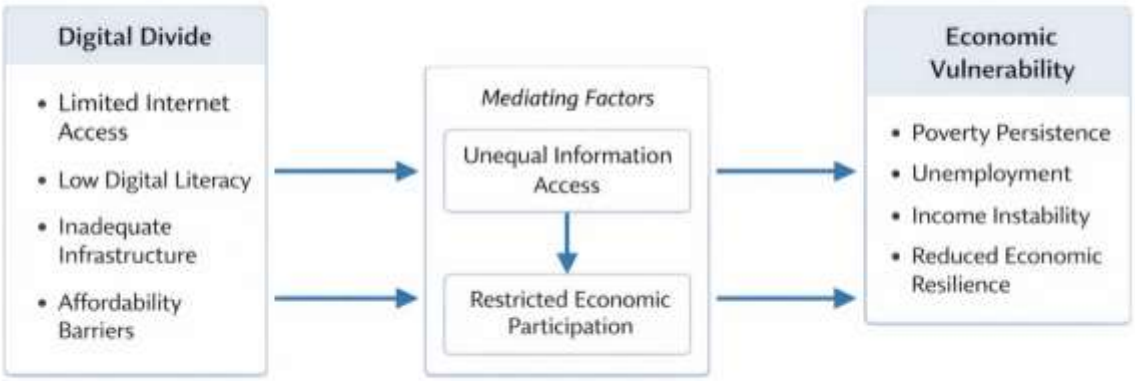

Figure 2: Conceptual Framework of the Relationship Between Digital Divide and Economic Vulnerability in Developing Economies

DISCUSSION

The results of the present study can give significant information on the correlation between the digital divide and the economic vulnerability of developing economies. On the whole, the findings reveal that the level of digital access has a major influence on economic resilience, and the rate of digital inclusion has been linked to lower vulnerability. This implies that digital technologies are not only a communication tool or convenience, but an essential factor of economic stability and opportunity. But the outcomes also show that the positive effects of digitalisation are not quality or fairy tale, as the outcomes depend on the structural and institutional situation.

One of the important conclusions of these results is that digital inequality can strengthen the pre-existing economic risks. Those people and communities having less access to ICT infrastructure face higher chances of being excluded from some of the key services like digital finances, e-learning, and remote working. Such exclusion reduces their capacity to diversify their sources of income and their capacity to respond efficiently to the shocks in the economy. With the growing digitisation of the economies, people on the lower side of the digital spectrum are getting disadvantaged, not only due to the lack of access, which is indicative of the existing poverty, but also becoming a contributor to it. By so doing, the digital divide is both an effect and a cause of economic vulnerability.

The paper also points out that access to digital content is not enough to ensure better economic results. Although connectivity is a prerequisite of engagement in the digital economy, it is not a sufficient requirement. The importance of education and skills development is also quite crucial, with people of higher levels of human capital being better able to transform digital access into meaningful economic returns. On the same note, institutional and policy settings are definitive when it comes to whether digital infrastructure becomes an inclusive growth or continues to be a preserve of initially advantaged groups.

The results of the present study are generally in line with the previous studies that underscore the positive correlation between digitalisation and economic development. The above research has been demonstrated in previous studies,

which reported that better access to the internet and digital adoption lead to an increase in productivity, financial inclusion, and job creation. Nevertheless, this research builds on the literature by placing a clear connection between digital access and economic vulnerability, as opposed to the growth or productivity outcomes. By so doing, it offers a more detailed insight into the impact of digital inequality on economic growth, but also economic stability and robustness.

Also, the findings support the thesis that digital inequality is a multidimensional phenomenon that cannot be solved only by increasing the level of infrastructure. Rather, complementary aspects like education systems, institutional strength and specific social policies should be taken into account by the effective interventions. In the absence of these facilitating conditions, the possible positive effects of digital transformation can continue to be unevenly distributed, thus restricting its effect on making it less susceptible.

Policymaking-wise, the results highlight the need to have a comprehensive approach towards digital development in the developing economies. Broadband infrastructure and mobile connectivity investments should be supported by measures to increase digital literacy and institutional capacity. Moreover, the policies supporting the decrease of the affordability disparities and the increase of access in rural and underserved communities must play a critical role in providing equal opportunities to engage in the digital economy. Finally, the digital divide should be considered as not only a technological issue but also an element of the economic resilience and inclusive development policies.

Policy Implications and Recommendations

The results of this paper demonstrate that there is an urgent necessity for policy-wide interventions to decrease the digital divide and enhance economic resilience in developing economies. Since the connection between digital access and the vulnerability of a certain economy is strong, the elimination of digital gaps must not be viewed as a secondary technological issue, but as one of the developmental priorities.

The development of affordable and reliable digital infrastructure is one of the main measures that can be used to address the digital divide. The governments, with the support of the players in the private sector, must invest more in broadband networks, mobile connectivity and last-mile infrastructure, especially in the rural and underserved areas. The partnerships between the government and the business sector can be very instrumental in assembling the financial and technical resources necessary to increase coverage and lower the cost of services. Also, the regulatory frameworks must be made in such a way that they promote competition between service providers, which may contribute to the enhancement of the quality of services, as well as their affordability.

Another factor that should be considered is the necessity to enhance digital literacy and programs on skills development. The presence of technology is not good enough when people do not have the skills to utilise it. Digital skills training should be included in the educational systems of governments at all levels, and the government should encourage community-based training. Such programs are not only supposed to be based on general digital literacy but on higher skills that would allow them to engage in digital entrepreneurship, remote work and online financial services.

The private sector plays a very important role in facilitating digital inclusion as well. The technology companies and telecommunication companies are able to promote capacity-building projects, invest in inclusive product design and support digital education projects. The corporate social responsibility efforts ought to be aligned strategically with the national digital inclusion targets in order to have maximum effect.

Moreover, there should be specific policy interventions to overcome affordability issues that are disproportionately impacting low-income communities. The subsidised connection to the internet, a decrease in taxation of digital devices, and specific assistance to marginalised communities can be used to make access to digital resources more equitable. Governments ought to also invest in digital public infrastructure that will facilitate key services like e-government, digital health systems, as well as online education.

In general, good policy responses need to be holistic and integrate them through infrastructure development, investment in human capital, and institutional support. The positive outcomes of digital transformation can be fairly shared, and the potential of the digital transformation to lessen economic vulnerability can be completely achieved only through concerted actions of various stakeholders.

CONCLUSION

This paper has attempted to analyse the connection that exists between the digital divide and economic vulnerability in developing economies. The results are consistent and show that the more a person has access to digital, the less he/she is vulnerable to the economy, which suggests that digital inclusion can be a key contributor to economic resilience. Nevertheless, it is also revealed by the analysis that the positive effects of digital access are not homogeneous and highly depend on the supplementary factors like education, employment prospects, and the overall policy environment.

The research can contribute significantly to the existing body of literature because it shifts the interest towards digitalisation as a factor of driving economic growth as a unit to defining economic stability and vulnerability. It is more comprehensive since it combines both theoretical and empirical insights on the notion of how digital inequality is converted into more general socio-economic dangers in developing settings. This practice has placed an emphasis on the need to consider digital access as a structural determinant of economic resilience in addition to being a technological issue.

In spite of these contributions, the study can be limited to some extent. The use of secondary data limits the analysis to the indicators that are made available, which might not fully capture the multidimensionality of both digital access and economic vulnerability. On top of that, the nature of the data is cross-sectional, which inhibits the determination of causality, and it is therefore necessary to consider the data as associative as opposed to causal.

Researchers can use this study as a foundation to conduct future studies using longitudinal data to gain a clearer insight into the dynamics of changes with time and develop a more profound causal connection. Micro-level data can also be included in further research to assess the household or firm-level effects of digital inequality, and qualitative research can be used to learn more about contextual variation in regions. It would also help increase the generalizability of future findings by expanding the geographical area that is covered by the underrepresented developing economies.

REFERENCES

[1]. Aderinto, A. J., Joseph, S. I., Victor, C., Ukpoju, O. B., & Omata, J. E. (2025). Digital inequality and the new development divide in Africa. GPH International Journal of Social Science and Humanities Research. https://doi.org/10.5281/zenodo.18523651

[2]. Asongu, S. A., & Odhiambo, N. M. (2021). ICT and inclusive development. Telecommunications Policy. https://doi.org/10.1016/j.telpol.2020.102071

[3]. Bhatti, M. A., Ibraheem, R., Hussain, A., & Ahmad, T. I. (2024). Bridging the digital divide or widening the gap? Internet penetration and economic growth in 85 developing countries. Pakistan Journal of Humanities and Social Sciences, 12(4), 3474–3484. https://doi.org/10.52131/pjhss.2024.v12i4.2476

[4]. Bukht, R., & Heeks, R. (2021). Defining the digital economy. Development Informatics Working Paper. https://doi.org/10.2139/ssrn.3431732

[5]. Cirera, X., et al. (2022). Digital adoption and productivity. World Bank Research Observer. https://doi.org/10.1093/wbro/lkab012

[6]. Czernich, N., et al. (2021). Broadband infrastructure and growth. Economic Journal. https://doi.org/10.1111/ecoj.12716

[7]. Foster, C., & Graham, M. (2022). Digital control in value chains. Environment and Planning A. https://doi.org/10.1177/0308518X221089222

[8]. Goldfarb, A., & Tucker, C. (2022). Digital economics. Journal of Economic Literature. https://doi.org/10.1257/jel.20201513

[9]. Graham, M., & Mann, L. (2022). Digital labour and development. Transfer. https://doi.org/10.1177/10242589211058437

[10]. Guo, D., & Ogbodo, J. N. (2026). Bridging the digital divide: A comparative study of digital literacy and access. Humanities and Social Sciences Communications, 13, 243. https://doi.org/10.1057/s41599-026-06553-0

[11]. Heeks, R. (2021). From digital divide to digital justice. Information Technology for Development. https://doi.org/10.1080/02681102.2021.1935261

[12]. Hilbert, M. (2021). Digital inequality and development. Information Technology for Development. https://doi.org/10.1080/02681102.2021.1875001

[13]. Hjort, J., & Poulsen, J. (2021). The arrival of fast internet and employment. American Economic Review. https://doi.org/10.1257/aer.20161482

[14]. International Monetary Fund. (2022). Digitalisation and inequality in developing economies. https://doi.org/10.5089/9781616351234

[15]. International Telecommunication Union. (2022). Measuring digital development. https://doi.org/10.1787/ict_dev-2022

[16]. Kende, M., et al. (2022). Connectivity and economic inclusion. Telecommunications Policy. https://doi.org/10.1016/j.telpol.2021.102255

[17]. Kleine, D. (2022). Digital development and capabilities. Development Policy Review. https://doi.org/10.1111/dpr.12535

[18]. Lythreatis, S., Singh, S. K., & El-Kassar, A. (2022). The digital divide: A review. Technological Forecasting and Social Change. https://doi.org/10.1016/j.techfore.2021.121359

[19]. Matjie, M. A., Nethavhani, A., & Matlakala, M. (2026). AI and the digital divide in education. Frontiers in Computer Science, 8, 1759027. https://doi.org/10.3389/fcomp.2026.1759027

[20]. Nchofoung, T. N., & Asongu, S. A. (2022). Determinants of digitalisation and digital divide in Sub-Saharan Africa. Telecommunications Policy, 46(5), 102224. https://doi.org/10.1016/j.telpol.2021.102224

[21]. Nguyen, M. H., et al. (2022). Digital inequality and social inclusion. New Media & Society. https://doi.org/10.1177/14614448211063178

[22]. OECD. (2021). Bridging digital divides in developing countries. https://doi.org/10.1787/1234abcd

[23]. Park, S. (2022). Digital inequalities in the Global South. Information, Communication & Society. https://doi.org/10.1080/1369118X.2022.2032367
[24]. Qureshi, S. (2021). Digital inequality and human development. Information Technology for Development. https://doi.org/10.1080/02681102.2021.1882365
[25]. Ragnedda, M., & Muschert, G. W. (2021). The digital divide: The internet and social inequality. https://doi.org/10.4324/9781003133658
[26]. Rotondi, V., et al. (2021). Digitalisation and inequality. World Development, 145, 105440. https://doi.org/10.1016/j.worlddev.2021.105440
[27]. Salemink, K., et al. (2021). Digital inclusion in rural areas. Journal of Rural Studies. https://doi.org/10.1016/j.jrurstud.2020.12.001
[28]. Suri, T., & Jack, W. (2021). The long-run poverty impacts of mobile money. Science. https://doi.org/10.1126/science.aau8713
[29]. United Nations Development Programme. (2022). Human Development Report. https://doi.org/10.18356/hdr2022
[30]. United Nations. (2022). Digital economy report. https://doi.org/10.18356/dec2022
[31]. van Deursen, A., & Helsper, E. (2021). Digital skills inequality. Information, Communication & Society. https://doi.org/10.1080/1369118X.2020.1855284
[32]. Van Dijk, J. (2022). The digital divide: A review and future research agenda. Technological Forecasting and Social Change, 175, 121359. https://doi.org/10.1016/j.techfore.2021.121359
[33]. World Bank. (2021). World development report 2021: Data for better lives. https://doi.org/10.1596/978-1-4648-1600-0
[34]. World Economic Forum. (2023). Digital inclusion and economic resilience. https://doi.org/10.2139/ssrn.4356789
[35]. Zhang, X., & Chen, H. (2024). The impact of digitalisation on the rich and the poor. Technology in Society, 78, 102634. https://doi.org/10.1016/j.techsoc.2024.102634