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DIGITAL TECHNOLOGY AND ECONOMIC GROWTH IN DEVELOPING REGIONS: A COMPARATIVE ANALYSIS OF ASIA, AFRICA, AND LATIN AMERICA

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Abstract

This study examines how digital technology influences economic growth across Asian, African, and Latin American countries using panel data from 2000 to 2018. Economic growth is measured through GDP, while digital development is captured using a Digital Technology Index (DTI), along with macroeconomic stability (MES) and personal remittances (PR) as key control variables. The DTI is constructed through Principal Component Analysis (PCA) based on five indicators: fixed connectivity, mobile connectivity, ICT capital, internet usage, and investment in digital technology. To ensure robust results, four econometric models are estimated. The regional analysis shows that in Asian countries, digital technology has a positive effect on growth, while macroeconomic stability is weakly significant and remittances are strongly positive. In African countries, digital technology remains positive but statistically insignificant, whereas remittances play a significant positive role in driving growth. In Latin American countries, all three variables–digital technology, macroeconomic stability, and remittances–show a positive and statistically significant relationship with economic growth. For the full sample, the Driscoll–Kraay standard error approach is applied to address heteroskedasticity, autocorrelation, and cross-sectional dependence. The results confirm a strong and significant positive impact of digital technology on economic growth. Overall, the findings suggest that digital infrastructure and ICT-related investment play a crucial role in supporting economic performance, particularly when combined with stable macroeconomic conditions and effective use of remittance inflows.

1 INTRODUCTION

Economic growth refers to an increase in a country's output and national income through the production of goods and services. It is closely associated with raising overall economic activity and improving living standards. One of the primary objectives of every country is to achieve and sustain economic growth. In today's digital era, technological advancements have become a key driver of long-term economic development. Digital technologies enhance the quality of life, improve efficiency, and support innovation across various sectors of the economy. They also contribute to technological transformation, which strengthens a country's economic performance. Investment in digital technologies, along with the export of digital goods and services, plays a

significant role in promoting economic growth. Several influential growth theories, including those developed by Evsey Domar (1946), Robert Solow (1956), and Paul Romer (1986), highlight the importance of technological progress as a fundamental driver of economic growth and development.

As far as digital technology is concerned, the word "digital" comes from the Latin word "digitus", which means the old method for counting using different tools through numbers. The digital revolution began around 1980 and is associated with the integration of the Internet with mobile devices, social networking, large data sets, cloud computing, and other practices across different fields. Digital knowledge is primarily defined as the ability to utilise digital technology for communication, access networks, and manage, integrate, and evaluate information to perform a function in a knowledge society.

The relationship between digital technology and economic growth is defined by establishing the impact of its different components on economic growth. First, access to the Internet has enabled people to access a vast proportion of the world's knowledge through websites. Online classes and courses are being conducted to facilitate distance learning for students. Advances in communication have enabled most people to communicate easily and learn directly from different sources. Today, every task regarding household or workplace requires digital proficiency and digital knowledge Cadil and Beranek, 2011)

Currently, the focus is on developing the nation's digital skills, at least at the basic level, because it is increasingly important in the present period, when technology and its benefits are becoming more sophisticated and universal. These advancements improve work efficiency, boosting production levels through automation. Through all these digital advancements, economic growth is appreciated as a whole Muto and Yamano, 2009)

Digital technology has become an important engine of economic growth in Asia, Africa, and Latin America. In Asia, rapid digital advancement has significantly contributed to economic development, with countries such as China and Japan leading digital innovation and ICT adoption. Even in developing economies such as Pakistan and India, digital technologies are creating new opportunities for businesses, improving productivity, and supporting economic transformation despite ongoing economic challenges.

African countries are increasingly embracing digitalisation to promote innovation, entrepreneurship, and public service delivery, although progress varies across countries owing to structural and economic constraints. In Latin America, growing investments in technology, a skilled workforce, and a vibrant start-up ecosystem have accelerated the adoption of emerging digital technologies.

Despite the expanding role of digital technology in these regions, comparative evidence of its contribution to economic growth remains limited. Most previous studies have focused on individual countries and regions. Therefore, this study examines the impact of digital technology on economic growth across selected countries in Asia, Africa, and Latin America, providing a comparative perspective on the role of digitalisation in economic development.

This study aims to achieve the following research objectives:

a) To empirically examine the relationship between digital technology and economic growth using a full-model analysis.

b) To construct the digital technology index by using Principal Component Analysis.

c) To empirically examine the relationship between digital technology and economic growth in Asian countries.

d) To empirically examine the relationship between digital technology and economic growth in African countries.

e) To empirically examine the relationship between digital technology and economic growth in Latin American countries.

This research postulates the following research question:

a) Is there any significant relationship between DTI and GDP in the context of full model analysis?

b) Is there a significant relationship between DTI and GDP among Asian countries?

c) Is there a significant relationship between DTI and GDP in African countries?
d) Is there any significant relationship between DTI and GDP in the case of Latin American countries?
e) Does this study find differences in its results by comparing three groups of countries?

The significance of this study lies in three aspects. First, we found that digital technology has had a significant and positive impact on countries' economic growth. Therefore, it plays a very evocative role in boosting the economy. As for developing countries, we have had and may face an insignificant impact. Developing countries lack adequate investment, management, and working conditions for digital technology, which creates disparities in achieving sustainable, standardised economic growth. This study will help explore various new findings. It examines the importance of digital technology in the new regime, which has not been adequately considered in the context of economic growth, using panel data from Asian, African, and Latin American countries.

Second, this study develops a comprehensive digital technology index using the most relevant indicators, including fixed connectivity, mobile connectivity, ICT capital, ICT investment, and internet service usage. These variables are particularly suited to the objectives of this research and, to the best of our knowledge, have not previously been employed within this analytical framework.

Third, this study uses two appropriate explanatory variables as the best control variables, namely macroeconomic stability and personal remittances, which effectively address this study and strengthen the results that have never been found in any previous study or analysis of Asian, African, and Latin American countries, rather than being observed simultaneously.

This study is organised into five sections. Section 1 presents the background, significance, and objectives of the study, and Section 2 reviews the relevant literature. Section 3 discusses the theoretical framework, trends, data sources, model specifications, and methodology employed for the analysis. Section 4 presents and discusses the empirical results. Section 5 concludes the study and offers policy recommendations for future research. The references are provided in the final section of the paper.

2. LITERATURE REVIEW

Cadil and Beranek (2011) explored the impact of ICT on economic growth by incorporating business cycle effects into a short-run causality analysis across EU countries. This study used panel data for the period 1996-2009 and applied the fixed-effects model. The results indicated that the business cycle may cause a reduction in the ICT investment and production, specifically in a recession, but ICT is the main sector for a serious turnaround in this situation. Moreover, causality is also found among them.

White et al., (2011) examined the impact of ICT diffusion on economic development across 172 countries. This study estimated panel data for the period 2005 using model-based cluster analysis. The results indicated that ICT infrastructure is important, as we found a positive but insignificant impact of ICT on economic growth. The digital global division mainly indicates that the ICT ratio differs across regions, but one thing is clear: as ICT development increases, it positively affects economic growth, with actual results.

Yousefi (2011) examined the impact of ICT on the economic process of mobile expansion in developed and developing countries. This study analysed cross-country data (62 countries) for the period 2000-2006 using the Panel OLS regression model. This paper demonstrates that ICT plays a major role in the growth of high- and upper-middle-income countries, but fails to contribute to the expansion of lower-middle-income countries. Such findings suggest that the degree of investment in ICT is not the only explanation for slow growth in lower-middle-income developing countries, as previously thought.

Katz and Callorda (2018) investigated the effect of digital ecosystem development on economic growth in 73 countries. This study estimated panel data for the period 2004-2015 using a fixed-effects model. The results indicated that there exists a positive and significant relationship between broadband contribution, digitisation, and ICT

regulation with economic growth. It helps to promote digitisation to boost the economy.

Haftu (2019) empirically analysed the impact of information and communication technology on economic growth in sub-Saharan Africa. This study used panel data from 40 countries for the period 2006 to 2015, employing a robust two-step system GMM. The variables used for estimation were the GDP per capita of individual countries and their lagged GDP per capita. General government final consumption expenditures as a percentage of GDP, merchandise trade as a percentage of GDP, gross capital formation as a percentage of GDP, Percentage of individuals using the internet, cellular telephone subscription per 100 individuals, Annual inflation rate, and annual population growth rate. Results suggested that mobile phone penetration had a positive and significant impact on economic growth, while the internet had a positive but insignificant impact due to insufficient ICT-skilled development. Improvisation of internet access-focused ICT skill development is the main policy implementation.

Bahrini and Qaffas (2019) evaluated the impact of ICT on the economic growth of 45 selected developing countries in the Middle East and North Africa (MENA) and sub-Saharan Africa. For this analysis, a panel generalised method of moments (GMM) for cross-sectional data was used for the period 2007 to 2015. The variables used for the ICT measurement were internet usage, broadband penetration, telephone subscriptions, and mobile operators across four models. The remaining explanatory variables were financial development, general government consumption expenditure, country trade volume, inflation, and domestic investment for each group. Collectively, it was found that all the ICT measurements had a positive and significant effect on driving the economic growth, except for fixed telephone subscriptions in MENA and SSA. Moreover, mobile phone subscriptions had the most significant and positive impact on economic growth in SSA countries. The main policy implications were the acceleration of ICT infrastructure for internet usage and broadband adoption, and the establishment of e-government and public-private partnerships.

Jiang et al. (2024) studied the impact of digital financing on household consumption, which in turn drives economic growth. For this analysis, a panel data set was compiled by combining data from different cities and provinces in China, using China Household Finance (CHFS), for the years 2013, 2015, and 2017. Moreover, the digital inclusive finance index was developed to assess the impact on household consumption. The model consisted of consumption, index, and internet usage. A fixed-effect model was used for the estimation. The results suggested that digital finance was positively correlated with household consumption (food, clothing, household maintenance, medical care, and education). It had been promoting online shopping, digital payment, and the purchase of financing products.

Aly (2020) estimated the impact of digital transformation on labour productivity, economic development, employment, and vulnerable employment in 25 developing countries. The cross-sectional data were collected in 2017. This study used the Digital Evolution Index to analyse digital transformation. For the estimation, FGLS is used to examine the relationship between digital transformation and related developing countries. This study made four models to see the impact of digital transformation. For this purpose, labour productivity, log per capita GNI, and the employment rate were used as dependent variables. The results showed that there is a positive and significant relationship between digital transformation and labour productivity, economic development, and the employment rate. But there was an insignificant relationship between digital transformation and vulnerable employment. Artificial intelligence and rapid technological advancement were the major policy implications of the study. Moreover, the proper allocation of funds to the technically intensive sector and the creation of a proper working environment for digital markets were also mandatory.

Dasgupta et al. (2005) identified the policy reforms that explain the digital divide and affect economic growth. This study used data from many countries in Africa, Asia, and Latin America for 1990, collected from the WDI. This paper mainly

focuses on the digital divide through two main determinants: internet subscribers (internet subscriptions per telephone main line) and telecom services. Moreover, it includes urban population size, income per capita, the index of competition policy, the percentage of the population with secondary education, and the index of general government quality. The results clearly suggested that the mobile telephone diffusion had been much more rapid. A Policy recommendation suggested feasible reforms to narrow the digital divide.

Indjikian & Siegel (2005), Kraemer et al. (2005), Kyem & LeMaire (2006), Lee (2017), along with Shabeer (2022), Shabeer et al. (2021), Ayyubi et al. (2024), Ahsan et al. (2024), and Monawar et al. (2025), collectively show that ICT adoption, knowledge sharing, and broader macroeconomic and structural factors such as energy use, financial integration, and labor market dynamics play an important role in shaping productivity and long-run economic growth across both developing and developed economies.

3. METHODOLOGY

Theoretical Framework

The theoretical framework of this study is primarily based on the Solow–Swan growth model and the Cobb–Douglas production function, both of which highlight the importance of technological progress in promoting long-run economic growth. The Solow–Swan model explains that economic output is determined by the combined effects of capital, labour, and technology. It argues that while capital accumulation and labour contribute to growth, sustained increases in output are largely driven by technological advancement. The model is represented as:

$$Y = K^{\alpha} AL^{1-\alpha}$$

where (Y) denotes output, (K) represents physical capital, (L) is labour, (A) captures the level of technology, and (α) measures the output elasticity of capital.

Consistent with this theoretical perspective, the study adopts the Cobb–Douglas production function to examine the contribution of digital technology to economic growth. The Cobb–Douglas framework assumes that output depends on capital, labour, and total factor productivity (TFP), which reflects technological progress and efficiency improvements. The production function is expressed as:

Y=AKαLβ

where (Y) is economic output, (K) denotes capital input, (L) represents labour input, (A) captures total factor productivity, and (\alpha) and (\beta) are the output elasticities of capital and labour, respectively. Within this framework, digital technology is considered a key component of technological progress that enhances productivity, improves efficiency, facilitates innovation, and promotes knowledge diffusion. Therefore, greater adoption of digital technologies is expected to contribute positively to economic growth.

Data Source

The panel series data for 19 years has been taken for Asian countries (Pakistan, India, China, Japan), African countries (South Africa, Albania, Algeria, and Zimbabwe), and Latin American countries (Venezuela, Peru, Guatemala, and Chile) for the period of 2000-2018. The data sources are varied, variable to variable, and is given in Table 1.

Model Specification

This study offers three models relevant to Asian, African, and Latin American countries. This study comprises two main variables: economic growth and digital technology. The selection of DTI variables is inspired by the DESI (Digital Economy and Society Index), which is limited to European countries. The DESI Index includes all the essential variables that cover all the digital technology aspects. This is an initiative to inculcate these concepts in the study. The choice of personal remittances (PR) and macroeconomic stability (MES) stems from the fact that most previous studies have used foreign remittances (FR) to improve digital technology, while this study considers the digital earnings aspect, preferring PR over FR.

For Full Model;

$$GDP = \alpha 0 + \beta 1\,(DTI) \pm \beta 2(PR) \pm \beta 3(MES) + \varepsilon t \quad \text{.....iv}$$

For Asian countries;

$GDPac = \alpha 0 + \beta 1\ (DTI)ac \pm \beta 2(PR)ac \pm \beta 3(MES)ac + \varepsilon t$.....v

For African countries;

$GDPafc = \alpha 0 + \beta 1\ (DTI)afc \pm \beta 2(PR)afc \pm \beta 3(MES)afc + \varepsilon t$ vi

For Latin American countries;

$GDPlac = \alpha 0 + \beta 1\ (DTI)lac \pm \beta 2(PR)lac \pm \beta 3(MES)lac + \varepsilon t$.....vii

Where,
GDP = Gross domestic product
DTI = Digital Technology Index
PR = Personal remittances
MES=Macroeconomic stability
± = Expected signs

Table 1: Description of variables

Variable	Symbol	Measurement/Definition	Expected Relationship
Economic Growth	GDP	Increase in the inflation-adjusted value of goods and services produced in an economy, measured by the growth rate of real GDP.	Dependent Variable
Digital Technology Index	DTI	Composite index constructed using Principal Component Analysis (PCA), incorporating indicators such as fixed connectivity, mobile connectivity, ICT capital, internet usage, and investment in digital technology.	Positive (+)
Personal Remittances	PR	Sum of personal transfers and compensation received from individuals working abroad, measured as remittance inflows. Remittances can increase consumption, investment, and economic activity.	Positive (+) / Negative (−)
Macroeconomic Stability	MES	Proxy measured by the Consumer Price Index (CPI), reflecting the degree of stability in prices and resistance to economic shocks. Stable macroeconomic conditions support growth, while high inflation and debt burdens may hinder it.	Positive (+) / Negative (−)

Panel data analysis combines both cross-sectional and time-series dimensions, allowing the examination of multiple countries over time. The general model takes the form $y_{it} = \alpha + \beta x_{it} + \varepsilon_{it}$, where i represents countries and t represents time. This approach helps control for unobserved heterogeneity and improves estimation efficiency compared to purely cross-sectional or time-series analysis.

In panel data, three main estimation approaches are commonly used: pooled OLS, fixed-effects, and random-effects models. Pooled OLS ignores country-specific heterogeneity and serves as a baseline model. The fixed effects model controls for time-invariant country characteristics, while the random effects model assumes that unobserved heterogeneity is random and uncorrelated with the regressors.

Model Selection and Estimation Strategy

To identify the most appropriate panel data model, several model selection tests were conducted. The F-test was used to determine whether the fixed-effects model was preferred over pooled OLS, while the Breusch–Pagan Lagrange Multiplier (LM) test was applied to assess the suitability of the random-effects model. Furthermore, the Hausman test was employed to choose between fixed-effects and random-effects estimators. The selection of the final model was based on the statistical significance of these tests.

Construction of the Digital Technology Index

To capture the multidimensional nature of digital technology, a Digital Technology Index (DTI) was developed using Principal Component Analysis (PCA). This technique combines several digital

technology indicators into a single composite measure while preserving as much information as possible from the original variables. The index includes indicators related to fixed and mobile connectivity, ICT capital, internet usage, and investment in digital technologies.

4. RESULTS AND INTERPRETATIONS

Basically, results and discussion are used to determine whether this study meets the objectives or confirms the study's hypothesis. The results include findings from different tests and estimation methods. The discussion includes the similarities and conflicts of the results.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
GDP	228	26.181	1.955	22.66	30.01
MES	228	4.606	.499	3.762	7.917
PR	228	21.083	1.972	16.267	25.09
DTI	228	1.398	.884	-2.422	2.338

Table 2 reports the descriptive statistics of the variables. The mean values lie within the observed minimum and maximum ranges, indicating no obvious data inconsistencies. The sample consists of 228 observations for all variables

Table 3: Matrix of Correlation

Variables	GDP	MES	PR	DTI
GDP	1.000			
MES	0.101	1.000		
PR	0.258	0.025	1.000	
DTI	0.178	0.478	0.173	1.000

Table 3 describes the degree of correlation among the variables as 1 shows that all the variables are perfectly positively correlated with each other. It further explains that each variable has a weak correlation with other variables.

Table 4: Comparative Panel Regression Results

Variable	Pooled OLS	Fixed Effects	Random Effects
MES	0.149	0.050*	0.049*
	(0.285)	(0.026)	(0.026)
PR	0.235***	0.133***	0.133***
	(0.064)	(0.019)	(0.019)
DTI	0.262	0.135***	0.135***
	(0.164)	(0.016)	(0.016)
Constant	20.178***	22.959***	22.951***
	(1.864)	(0.365)	(0.651)
R^2	0.086	0.660	0.086
F-statistic / Wald χ^2	7.032***	137.877***	412.166***
Observations	228	228	228

Notes: *** p<0.01, ** p<0.05, * p<0.10.

Table 4 presents the results of pooled OLS, fixed-effects, and random-effects estimations. The coefficient estimates remain broadly consistent across specifications. Personal remittances exhibit

a positive, statistically significant association with economic growth across all models. Digital technology is positive but insignificant under pooled OLS; however, it becomes positive and highly significant under both fixed-effects and random-effects estimations. Macroeconomic stability also shows a positive effect on economic growth and becomes weakly significant in the panel estimators. The model's explanatory power improves substantially under the fixed-effects specification (R^2 = 0.660) relative to pooled OLS (R^2 = 0.086). To determine the appropriate panel estimator, the Hausman specification test is subsequently employed.

Table 5: Hausman (1978) Specification Test

Hausman Statistics	Coef.
Chi-square test value	-.434
P-value	1

The Hausman test fails to reject the null hypothesis ($p > 0.05$), suggesting that the random-effects model is preferred to the fixed-effects model.

To confirm whether the above analysis is suitable for model estimation, diagnostic tests are applied to assess the presence of Hetero-, Auto-, and Cross-Sectional dependence.

Table 6: Diagnostic Test Results

Test	Statistic	p-value	Conclusion
Wooldridge Autocorrelation Test	F(1,11)=104.50	0.0000	Autocorrelation present
Modified Wald Test	χ^2(12)=9405.30	0.0000	Heteroskedasticity present
Pesaran CD Test	3.225	0.0013	Cross-sectional dependence present

FEM Regression with Driscoll-Kraay Standard Errors

Table 7: FEM Regression with Driscoll-Kraay Standard Errors

GDP	Coef.	Std.Err.	T	P>t	[95% Conf	Interval]
MES	0.050	0.028	1.750	0.097	-0.010	0.109
PR	0.133	0.021	6.220	0.000	0.088	0.178
DTI	0.135	0.028	4.840	0.000	0.077	0.194
_cons	22.959	0.315	72.980	0.000	22.298	23.620

The model is estimated using 228 observations from 12 countries. The R^2 value of 0.6601 indicates that approximately 66% of the variation in economic growth is explained by the independent variables. The F-statistic (429.32, $p < 0.01$) confirms the model's overall significance.

The coefficient of digital technology index (DTI) is 0.13. It shows that a 1% increase in digital technology leads to a 0.13% increase in economic growth. Its t-statistic is 4.840, indicating a significant and positive relationship between economic growth and digital technology (Dasgupta, Lall, and Wheeler, 2005). It means that, with the development of digital technology across countries (Asian, African, and Latin American), the standard of living is raised through before analysis, which may affect the model's stability during estimation.

Diagnostic Tests

Diagnostic tests are applied to identify the problem, strengths, and weaknesses of the model

the efficiency of digital use. It increases the productive efficiency of nations, which stimulates the digital industry, improves exports, and promotes the productive use of the internet, leading to increased economic growth.

Table 7 indicates that the coefficient of macroeconomic stability (MES) is 0.05. It shows that a 1% increase in macroeconomic stability leads to a 0.05% increase in economic growth. Its t-statistic is 1.75, indicating a significant, positive relationship between economic growth and macroeconomic stability (Haftu, 2019). It shows that macroeconomic stability is most important for paving the way for a flourishing development process.

The estimation highlights that the coefficient of personal remittances (PR) is 0.133. It shows that a 1% increase in personal remittances leads to a 0.13% increase in economic growth in African countries. Its t-statistic is 6.22, indicating a significant and positive relationship between economic growth and personal remittances (Sutradhar, 2020; Adusah-Poku, 2016). It means that personal remittances, in the form of foreign earnings, are added to the country's GDP for productive use. It increases investment, which generates revenues that drive economic growth.

Lastly, the value of r-square (R2) is 0.6601, which shows that there is a 66 % variation collectively explained by independent variables (DTI, MES, PR) to affect the dependent variable (GDP). The F-statistic proves the overall significance of the model.

Results of Random Effect Model REM Estimation Across Regions

Table 08: Regional Random-Effects Regression Estimates

Variables	Asia	Africa	Latin America
DTI	0.601	0.167	0.419***
MES	0.581	0.415	0.243**
PR	-0.323**	-0.500***	-0.301***
Constant	32.063***	38.599***	30.123***
R^2	0.234	0.244	0.658
Hausman p-value	0.6589	0.5272	0.7120
F-statistic	7.317	7.748	46.789
Observations	76	76	76

Notes: *** p<0.01, ** p<0.05, * p<0.10.

Discussion about Asia

The coefficient of digital technology index (DTI) is 0.60. It shows that a 1% increase in digital technology leads to a 0.60% increase in economic growth in Asian countries. Its t-statistic is 1.64, indicating a significant, positive relationship between economic growth and digital technology. It means that with the technological revolution and activities such as investment in ICT, which enhance the digital market, export goods, which increase the economy's revenue, the use of the internet for multi-productive services, and the development of cellular devices for better communication, the economic growth of Asian countries increases. According to the results, the coefficient of macroeconomic stability (MES) is 0.58. It shows that a 1% increase in macroeconomic stability leads to a 0.58% increase in economic growth in Asian countries. Its t-statistic is 0.54, indicating an insignificant, positive relationship between economic growth and macroeconomic stability. It means that as consumer prices increase, economic growth increases over time. The reason for the increase is that inflation encourages productivity and output. A producer produces more to earn a higher reward for their output and make a profit, which also increases economic growth. It can be said that inflation should prevail in the economy to raise economic growth, but it shouldn't exceed high inflation.

The coefficient of personal remittances (PR) is -0.32. It shows that a 1% increase in personal remittances leads to a 0.32% decrease in economic growth in Asian countries. Its t-statistic is -2.37, indicating a significant negative relationship between economic growth and personal remittances. An increase in personal remittances increases residents' purchasing power, boosting GDP. It mainly includes online services to earn foreign currency. But here, the reason for the negative relationship may be that, despite increased individual remittances and GDP, this may reduce the labour force and labour participation of recipients, especially in manpower countries. Basically, the moral hazard problem can be enough to reduce economic activity. Sutradhar (2020) A negative and significant relationship between personal remittances and economic growth for Asian countries. Lastly, the value of r-square (R2) is 0.233646, which shows that there are 23% variations collectively explained by independent variables (DTI, MES, PR) to affect the dependent variable (GDP).

Discussion about Africa

The coefficient of digital technology index (DTI) is 0.16. It shows that a 1% increase in digital technology leads to a 0.16% increase in economic growth in African countries. Its t-statistic is 0.63, indicating an insignificant, positive relationship between economic growth and digital technology. It means that an increase in digital technology leads to higher economic growth, but not to high levels in African countries. This is because African countries are facing hyperinflation and high poverty levels across the continent, so they lack a digital mechanism in their economies that they need for economic stability. Bahrini and Qaffas (2019) also found a positive, though insignificant, relationship between digital technology and economic growth in African countries.

The coefficient of macroeconomic stability (MES) is 0.41. It shows that a 1% increase in macroeconomic stability leads to a 0.41% increase in economic growth in African countries. Its t-statistic is 1.11, indicating an insignificant, positive relationship between economic growth and macroeconomic stability. It means that the more the economy is shock-free, the greater the rise in economic growth, so if the economy is macroeconomically stable, there is a higher chance of facing external shocks or economic ups and downs. Fischer (1992) found a positive, though insignificant, relationship between macroeconomic stability and economic growth in African countries, mainly due to the fixed exchange rate system, which limits the adjustment of currencies and interest rates to boost economic growth.

The estimation highlights that the coefficient of personal remittances (PR) is -0.49. It shows that a 1% increase in personal remittances leads to a 0.49% decrease in economic growth in African countries. Its t-statistic is -4.07, indicating a significant negative relationship between economic growth and personal remittances. It means that as more foreign currency enters the host economy, economic growth slows. Adusah-Poku (2016) also found a negative, significant relationship between PR and economic growth in African countries. Its main reason is that, as they are low-income countries, they readily spend on consumption goods and basic household items rather than on productive investment. Lastly, the value of r-square (R2) is 0.244057, which shows that there are 24% variations collectively explained by independent variables (DTI, MES, PR) to affect the dependent variable (GDP).

Discussion about Latin American Countries

The coefficient of digital technology index (DTI) is 0.41. It shows that a 1% increase in digital technology leads to a 0.41% increase in economic growth in Latin American countries. Its t-statistic is 4.19, indicating a significant, positive relationship between economic growth and digital technology. It means that by increasing investment in the digital technology sector, utilising the net for productive purposes, exporting technological goods, and enhancing digital communication, there is an optimal increase in economic growth, and this significance underscores the great impact of digital technology on economic growth. Table 5 highlights that the coefficient of macroeconomic stability (MES) is 0.24. It shows that a 1% increase in macroeconomic stability leads to a 0.24%

increase in economic growth in Latin American countries. Its t-statistic is 2.55, indicating a significant, positive relationship between economic growth and macroeconomic stability. It means that macroeconomic stability in Latin American countries has a significant impact on economic growth. On the other hand, Latin America has been facing less of a price shock.

The empirical results indicate that the coefficient of personal remittances (PR) is -0.30. It shows that a 1% increase in personal remittances leads to a -0.30% decrease in economic growth in Latin American countries. Its t-statistic is -9.02, indicating a significant negative relationship between economic growth and personal remittances. Ekanayake and Moslares (2020) also found a negative, significant relationship between personal remittances and economic growth. It's because all the personal remittances in foreign currency are ultimately used as a major counterweight to consumption, not for investment or productive purposes. Apparently, personal remittances have been increasing for many years, but investment in the economy's development has been declining. Lastly, the value of r-square (R2) is 0.658116, which shows that there are 65 % variations collectively explained by independent variables (DTI, MES, PR) to affect the dependent variable (GDP).

5. CONCLUSIONS AND RECOMMENDATIONS

The objective of this study is to examine the impact of digital technology on economic growth across three groups of countries: Asian, African, and Latin American. In this era, digital technology is emerging globally across all fields, from management to production. So, it has become a key driver of economic growth in any country. This study focuses on the admirable impact of digital technology across 12 countries to determine whether it is similar to or contradicts the previous study, and, if it does, what the reasons are. Initially, it has estimated the full model analysis. This study further explains the comparative analysis of Asian, African, and Latin American countries based on results and findings, which may prove helpful for future studies.

Firstly, this study estimates the full model using the Driscoll-Kraay standard errors test due to the presence of Hetero, auto-, and cross-sectional dependence. The results indicate that DTI has a positive and significant relationship with the highest coefficient value (0.135). It shows that by investing in the digital sector and promoting all its drivers, GDP will surely expand.

MES has a positive but significant relationship with GDP. It shows that monetary policy is not weak in dealing with economic shocks. So, the impact is significant across all aspects, leading to a lower real GDP. PR has a positive and significant relationship with GDP. It shows that converting foreign currency into home currency has proven beneficial for the nation, as long as it is used for productive purposes (investments across sectors). It will surely boost economic growth.

This study has run 3 models to estimate and compare results for Asia, Africa, and Latin America. It is concluded that the impact of digital technology is positive across all 3 groups of countries, but insignificant in Asian and African countries, and significant in Latin American countries. The DTI coefficient is higher in Asian countries, at 0.60, compared to African (0.16) and Latin American (0.41) countries. It means that if Asian countries invest more in digital technology, their economic growth will surely outpace that of other groups.

As far as the significance of the DTI is concerned, it is significant in Asian countries and insignificant in African countries due to improper utilisation of digital sector investment. Investment is increasing in nominal terms, but not in real terms, which is why ICT exports are lower than ICT imports. On the other side, this analysis includes 2 high-income countries, which are China and Japan, which have made high investments in digital, and 2 middle-income countries, which are Pakistan and India, which haven't made as much investment in this sector as compared to those countries, which affects the estimates of the model as insignificant.

The value of DTI is lower in African countries than in other regions because they have invested less in this sector. Only South Africa (a newly emerging technology country with strong figures over the past few years) has invested at a high rate,

while the other three countries, Albania, Algeria, and Zimbabwe, have invested very little in the digital sector. Moreover, Zimbabwe had faced severe economic and political crises since 2000 and onwards, suffered from record inflation, which reduced the economy to 40%. The DTI value of Latin American countries is lied between the rest because all the countries (Venezuela, Peru, Guatemala and Chile) have made investments in digital sector almost with same ratio, there is no extreme values for any country in this group, though the investment and exports are less (due to which insignificant effect holds) as compared to other groups but communication technology is more than other groups.

The empirical results for the control variables indicate that macroeconomic stability has a positive impact on economic growth across all 3 groups. This means there is macroeconomic stability across groups of countries, but it has an insignificant impact on Asian and African countries, while in Latin America, it has a significant impact. The MES coefficient is higher in Asian countries (0.58) than in African (0.41) and Latin American (0.24) countries. An indicator of macroeconomic stability is the CPI, which measures price increases. So, prices are high in Asian countries. In other words, there is more inflation in Asian countries than in African and Latin American. Inflation is good for boosting economic growth until it reaches hyperinflation. The MES coefficient in Latin American countries is lower than in other regions. A strong reason is that Venezuela experienced hyperinflation, leading to over 3 million people leaving the country. So, demand for the goods decreased, leading to lower prices.

Personal remittances harm economic growth in all of 3 groups. It is summarized from all of above conclusions that digital technology have a positive effect of economic growth in all of 3 groups so that more investment should be made in this sector for the enhancement of economic growth but it should be utilized rationally for production (which increases ICT goods export) so that it may return the significant impact to the economy otherwise just increase in the nominal GDP is not to be the goal for the economy rather than the increase in real terms of GDP matters.

Highly relevant recommendations are suggested based on the findings. These are discussed on behalf of 3 groups, which have been categorised for this study. For Asian countries, it is recommended that investment should be made at both private and public levels to enhance the digital economy. Production of more ICT goods should be increased to boost our exports and drive economic growth. Authorities are also required to upgrade and expand existing digital infrastructure to accelerate Internet usage. Moreover, private investors in the IT field should be encouraged to invest in this sector. The government and private institutions should offer affordable IT courses so that people can easily learn IT skills. In addition, digital awareness should be promoted among individuals in the economy, as the effective use of ICT facilities is essential for a significant, positive impact on GDP growth. To maintain macroeconomic stability, authorities should revise their monetary policies in line with the economy's scenario. Prices of goods and services associated with digital technology should be less costly for individuals. People should be properly guided on how to invest their personal remittances for the sake of their economy, not just for consumption, through campaigns and webinars for students in the IT field to address its negative impact.

For African countries, it is recommended that the government. should encourage the flow of ICT in the private sector through several policy interventions, such as tax reductions, subsidies, promoting e-commerce, and developing public-private partnerships to build digital infrastructure and services. Inflation should be controlled through possible monetary measures, thereby strengthening the impact of macroeconomic stability on economic growth.

For Latin American countries, it is recommended that investments in the digital sector for goods and services be increased to enhance exports. Investments should be increased in mobile phone infrastructure, as internet usage is growing and mobile phones are more cost-effective and beneficial than fixed-line telephones.

REFERENCES

Ahsan, H., Iqbal, Z., & Shabeer, M. (2024). Developing an inclusive growth index: socio-economic determinants and macroeconomic perspectives for Pakistan. *Journal of Contemporary Macroeconomic Issues, 5*, 107–125.

Adusah-Poku, F. (2016). Which form of foreign capital inflows enhances economic growth? Empirical evidence in Sub-Saharan Africa. *Asian Economic and Financial Review, 6*(10), 557.

Ahmed, E. M., & Ridzuan, R. (2013). The impact of ICT on East Asian economic growth: Panel estimation approach. *Journal of the Knowledge Economy, 4*(4), 540–555.

Avila, L. A. P., Lee, D.-J., & Kim, T. (2018). Diffusion and competitive relationship of mobile telephone service in Guatemala: An empirical analysis. *Telecommunications Policy, 42*(2), 116–126.

Ayyubi, M. S., Ahsan, H., Anwar, A., Khan, A. E., & Shabeer, M. G. (2024). The nexus between growth and unemployment rate in Pakistan: Does Okun's law exist? *International Journal of Contemporary Issues in Social Sciences, 3*(2), 2124–2152.

Bahrini, R., & Qaffas, A. A. (2019). Impact of information and communication technology on economic growth: Evidence from developing countries. *Economies, 7*(1), 21.

Cadil, J., & Beranek, M. (2011). ICT and economic growth–short term causality analysis. *Research Journal of Economics, Business and ICT, 1*.

Chavula, H. K. (2013). Telecommunications development and economic growth in Africa. *Information Technology for Development, 19*(1), 5–23.

Claro, M., Preiss, D. D., San Martín, E., Jara, I., Hinostroza, J. E., Valenzuela, S., ... Nussbaum, M. (2012). Assessment of 21st century ICT skills in Chile: Test design and results from high school level students. *Computers & Education, 59*(3), 1042–1053.

Dasgupta, S., Lall, S., & Wheeler, D. (2005). Policy reform, economic growth and the digital divide. *Oxford Development Studies, 33*(2), 229–243.

Ekanayake, E., & Moslares, C. (2020). Do remittances promote economic growth and reduce poverty? Evidence from Latin American countries. *Economies, 8*(2), 35.

Elgin, C. (2013). Internet usage and the shadow economy: Evidence from panel data. *Economic Systems, 37*(1), 111–121.

Fischer, S. (1992). Macroeconomic stability and growth. *Cuadernos de Economía, 29*(87), 171–186.

Haftu, G. G. (2019). Information communications technology and economic growth in Sub-Saharan Africa: A panel data approach. *Telecommunications Policy, 43*(1), 88–99.

Hofman, A., Aravena, C., & Aliaga, V. (2016). Information and communication technologies and their impact in the economic growth of Latin America, 1990–2013. *Telecommunications Policy, 40*(5), 485–501.

Indjikian, R., & Siegel, D. S. (2005). The impact of investment in IT on economic performance: Implications for developing countries. *World Development, 33*(5), 681–700.

Jiang, W., Hu, Y., & Cao, H. (2024). Does digital financial inclusion increase household consumption? Evidence from China. *Journal of the Knowledge Economy, 15*(4), 17333–17364.

Jin, S., & Cho, C. M. (2015). Is ICT a new essential for national economic growth in an information society? *Government Information Quarterly, 32*(3), 253–261.

Katz, R., & Callorda, F. (2018). The economic contribution of broadband, digitization and ICT regulation. *International Telecommunication Union*, Switzerland, Geneva.

Kraemer, K. L., Ganley, D., & Dewan, S. (2005). Across the digital divide: A cross-country multi-technology analysis of the determinants of IT penetration. *Journal of the Association for Information Systems, 6*(12), 10.

Kyem, P. A. K., & LeMaire, P. K. (2006). Transforming recent gains in the digital divide into digital opportunities: Africa and the boom in mobile phone subscription. *The Electronic Journal of Information Systems in Developing Countries, 28*(1), 1–16.

Lee, S. H. (2017). Digital democracy in Asia: The impact of the Asian internet on political participation. *Journal of Information Technology & Politics, 14*(1), 62–82.

Muto, M., & Yamano, T. (2009). The impact of mobile phone coverage expansion on market participation: Panel data evidence from Uganda. *World Development, 37*(12), 1887–1896.

Monawar, I., Iqbal, Z., Rasul, F., & Shabeer, M. G. (2025). Growth at a cost: Evaluating IMF program effects in South Asia through policy conditionalities. *Journal of Political Stability Archive, 3*(4), 181–201.

Paunov, C., & Rollo, V. (2016). Has the internet fostered inclusive innovation in the developing world? *World Development, 78*, 587–609.

Salahuddin, M., & Gow, J. (2016). The effects of Internet usage, financial development and trade openness on economic growth in South Africa: A time series analysis. *Telematics and Informatics, 33*(4), 1141–1154.

Sassi, S., & Goaied, M. (2013). Financial development, ICT diffusion and economic growth: Lessons from MENA region. *Telecommunications Policy, 37*(4–5), 252–261.

Shabeer, M. G. (2022). Financial integration, knowledge sharing, and economic growth: Does the experience of developing countries differ from developed countries. *Journal of Contemporary Issues in Business and Government, 28*(04).

Shabeer, M. G., Riaz, S., & Riaz, F. (2021). Energy consumption and economic growth nexus: A comparative analysis of US, China and Japan. *Journal of Economics, 2*(2), 58–74.

Solomon, E. M., & van Klyton, A. (2020). The impact of digital technology usage on economic growth in Africa. *Utilities Policy, 67*, 101104.

Sutradhar, S. R. (2020). The impact of remittances on economic growth in Bangladesh, India, Pakistan and Sri Lanka. *International Journal of Economic Policy Studies, 14*(1), 275–295.

Tufail, S. (2015). Impact of Internet Technology on Economic Growth in South Asia with Special Reference to Pakistan. *Pakistan Journal of Social Sciences, 35*(2), 777–784.

White, D. S., Gunasekaran, A., Shea, T. P., & Ariguzo, G. C. (2011). Mapping the global digital divide. *International Journal of Business Information Systems, 7*(2), 207–219.

Yousefi, A. (2011). The impact of information and communication technology on economic growth: Evidence from developed and developing countries. *Economics of Innovation and New Technology, 20*(6), 581–596.