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A GOVERNMENT ROLE THROUGH ICT FOR ECONOMIC GROWTH

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Abstract: The economic growth processes and their acceleration have become essential factors in solving social and economic problems. Innovation-driven Information and Communication Technology (ICT) is believed to be the driver of economic growth. However, ICT raises the digital divide problem, which weakens the influence of ICT on economic growth. This study aims to develop a model that can explain the role of government as a factor that strengthens the influence of ICT on economic growth. The model is formulated using data from 114 countries listed in the Network Readiness Index (NRI) 2019. The study results prove that the digital divide is a factor that weakens the influence of ICT on economic growth and the role of government as a factor that strengthens the influence of ICT development on economic growth. This study recommends that innovations for ICT development provide options for countries that find it challenging to invest in ICT development, especially for 4.0 or 5.0 technological innovations. Nevertheless, human resource development is used to realize innovations in ICT development.

Keywords: *ICT development, Digital Divide, Bridging Digital Divide, Economic Growth, Role of Government, Ease of doing business, Social safety net protection*

INTRODUCTION

The economic growth processes and their acceleration have become essential factors in solving social and economic problems and improving the quality of human life. The development of information and communication technology (ICT) and its ability to keep up to date with the data are key factors affecting economic growth (Nasab & Aghaei, 2009). The public believes that universal access to ICT results in global community interactions through trade and education, leading to higher living standards and higher social welfare.

Innovation-driven digital technology has become the catalyst for boosting economic growth. Nevertheless, the technological gap has resulted in a digital divide that can disrupt the estimated outcomes (Riggins & Dewan, 2005). This digital divide has raised concerns that ICT development would widen the levels of welfare disparities between countries in the world.

The digital divide can occur at the country level and between countries. The digital divide at the country level occurs when ICT development is only concentrated in big cities and is not evenly distributed to the regions. However, countries with higher GDP have more significant ICT development investment opportunities globally than countries with lower GDP. For example, in 2019, Malawi had the lowest GDP at

$378, while Luxembourg had the highest GDP at $115,839. The data were analyzed from 121 countries with an average value of $18,592 (World Data Atlas 2019). In addition, the increase in GDP through ICT development requires a significant investment (Banelienė & Melnikas, 2020). The GDP is a different problem for low-income countries with limited resources. The digital divide can worsen social inequality on a global scale (Nieminen, 2016) because far lagging countries will have fewer opportunities to participate in the information-based digital economy (Szeles & Simionescu, 2020). The Network Readiness Index (NRI, 2019) data shows the instances of disparity between countries with higher GDP and those with lower GDP (Yemen had 12.33, while Sweden was at 82.65).

The digital divide can be overcome by using the institutional theory approach, which asserts that diversity of behavior, social, culture, and technology can be regulated and are taken for granted in an order. The government, as the regulator, has the ability to bridge the digital divide, which is done through the role of government (Mistry, 2014). Inclusive policies are the success factors in narrowing the digital divide.

Several studies have been conducted to develop a framework for the relationship between ICT development and economic growth. (Park & Choi, 2019) explain the relationship between digital innovation and the level of economic growth from two approaches: Diffusion of Innovation (DOI) and Technology-Organization-Environment (TOE). In addition, (Tsaura & Felayati, 2016) stated that the benefits of information technology could be associated with economic growth and development. In another study, (Toader, Firtescu, & Roman, 2018) mentioned that ICT drives the development of entrepreneurship and small and micro enterprises, increasing economic growth. However, digital and information technology diffusion has resulted in a gap between the groups who have access to ICT and those who do not (Nipo, Bujang, & King, 2014). The emergence of the digital divide has divided society into an 'information-rich' group and an 'information-poor' group (Zhang, Jin, & Peng, 2018). Thus, the development of big cities is getting faster, while small towns are developing more slowly (Zhang et al., 2018). These concerns were not proven in South Korea, Hong Kong, and China. The difference is that Korea and Hong Kong have promoted digital inclusion (Wong, Law, Chu Fung, & Ping Lee, 2010). China has used mobile platforms to narrow the digital divide and help rural areas achieve social inclusion (Ye & Yang, 2020).

Furthermore, the quality of regulations regarding technology can reduce the digital divide (Chinn & Fairlie, 2007). Narrowing the digital divide through improving the economy, demographics, institutions, digital inclusion, and quality of regulations can be addressed as bridging the digital divide. (Mistry, 2014) adds that the role of government can also bridge the digital divide by the implementation of government policies and initiatives. This idea was triggered by the digital divide, which drives the demands for ICT innovation and diffusion (Genus & Nor, 2007); (Kaba & Said, 2015); (Srinuan, Srinuan, & Bohlin, 2012). Furthermore, the digital divide also prompts the government to issue regulations that can help create a business climate needed to increase the growth of domestic, industrial, and service businesses.

In previous studies, observations only focused on the effect of ICT development and digital divide on economic growth. In contrast to previous studies, this study adds the role of

government as a variable that moderates the influence of ICT development on economic growth. The Role of Government is a proxy for the bridging digital divide. This study aims to analyze the digital divide and role of government as factors that can moderate the influence of ICT development on economic growth. The digital divide is a factor that weakens the influence of ICT development on economic growth and Role of Government is a factor that strengthens the influence of ICT development on growth rates. The analysis is based on the interaction of ICT development and the role of government, where the countries selected as samples are grouped into 3, good, average and poor. Meanwhile, the grouping of countries is based on the level of income, namely high, upper middle, lower middle, and lower.

LITERATURE REVIEW

The institutional theory develops a concept originating from a practical understanding into an established norm through a process that is not entirely rational because the process includes a system of behavior or norms which are taken for granted as social facts. This theory explains the social aspect and focuses on the role of formal and informal rules, which become authoritative guidelines for social life. Furthermore, the theory specifies that a person's behavior, such as individuals, and organizations, is influenced by institutional rules, including values, norms, beliefs, and taken-for-granted assumptions (Zheng, 2015). It can be explained that an institution is a mechanism that is considered objective and constrains the behavior of individuals coming from various cultures and social norms and obeying the existing laws.

There is a complex interaction between ICT and social life in which both are selected, developed, implemented, and used. Furthermore, there is a complex relationship between ICT and social structures, and the outcomes of ICT projects, consequently, are highly uncertain and cannot be easily predicted. Although initially institutional theory was concerned with higher-level social structure and change, its recent development has focused on organizational change and the institutionalization of social norms (Zheng, 2015).

From an institutional point of view, ICT is not seen as a set of material products that function according to technical rules embedded in their physical components but as a product that is part of social networks and embedded in social institutions. Supported by research results, ICT has become not only technological artifacts but also the social and organizational aspects surrounding the artifacts (Luna-Reyes & Gil-Garcia, 2011). There is an alignment between technological innovation and ideology. Innovation becomes the symbol of progressivism, effective government, and best practices in gaining status in developing countries (Avgerou, 2003).

The practice of government (RoG) role regarding ICT development in each country has its own specificity. In India, the government role is developed by direct and indirect roles. The indirect role was started by establishing the Department of Information Technology (DIT) as a unit under the Ministry of Communication and Information Technology. The first tasks are to overcome the inadequacy of ICT connectivity infrastructure and the problem of high costs. The task provides incentives to reduce registration fees, tariff exemption, and zone regulations, create jobs, implement programs to increase the community capacity in using ICT, improve ICT connectivity and infrastructure in schools, and ensure

computer literacy. The direct role has been conducted by subsidizing internet access in rural areas, providing resources for more excellent connectivity, and establishing a Community Information Center (CIC) equipped with computers and internet access. In health services, telemedicine connects health care centers in remote locations via satellite to particular hospitals in big cities. In direct resource provision, partnerships between the public and private sectors have resulted in the development of 'Simputer' (Simple Computer) to convert English content (from the internet) into many of India's local languages. In addition, DIT has developed public administration services that use ICT, such as computerized identity cards, citizen databases, registration, and village-level administration services. Another innovative use of ICT for public administration is the establishment of computerized interstate checkpoints in the state of Gujarat (Mistry, 2014).

2.2. Conceptual framework and Hypothesis Development

In this study, the relationship between variables is that the Digital divide as a moderating variable weakens the influence of ICT development on economic growth. At the same time, the role of the government, as a moderating variable, serves as a factor that strengthens the influence of ICT on economic growth.

According to Nasab and Anghei (2009), investments in information and communication technology (ICT) can trigger economic growth. ICT is seen as a key driver of productivity growth. Their relationship has been carefully studied in developed countries at the firm, industry, and country levels. Most of the results show that ICT productivity positively and significantly affects economic activities (Niebel, 2017). A similar opinion is also expressed by (Toader et al., 2018), who state that ICT is a critical factor in a country's economic and social development because ICT has a positive effect on economic growth, productivity, and employment.

The application of internet technology has enabled the increase of the ICT role in the business processes of the digital economy. From the digital economy perspective, ICT has created opportunities for online specialization and cooperation between companies from various regions, thereby reducing transaction costs, creating easy access to foreign markets, and facilitating the development of various e-business models (Afonasova, Panfilova, Galichkina, & Ślusarczyk, 2019) (Berisha-shaqiri, 2015). ICT and e-businesses help business entities to compete in the global market. The exponential growth in the aggregation of machine-readable information or digital data via the internet has become critical to a company's competitiveness. The definition of the digital economy describes how digital technology changes the production and consumption patterns (Gault, 2019)(UNCTAD, 2019). Berisha-shawiri (2015) explains the importance of ICT in the economy, the computerization trend, and the opportunities offered by the technology.

H1 : ICT affects the Economic Growth

The development of the digital economy presents opportunities and challenges for future development. Furthermore, Guo et al. (2017) conclude that demographic, educational, economic, and innovation factors that influence ICT development can create the digital divide. Burri (2011) states that the digital divide can be explained through the first and second phases of the digital divide. The first phase can be dealt with simply by providing computers and internet connections. In contrast, the second phase presents a more significant challenge in

skills and abilities to create, manage, and distribute content effectively and efficiently. Ragnedda (2020) discusses the third phase of the digital divide. The digital divide is seen as social and cultural benefits at this phase. Inaccuracy in taking the appropriate actions can create a more comprehensive digital divide between the developed and developing countries. Cyber threats can pose an increasing risk to the global economy's resilience. Uncertainty and the ensuing chaos will increase the tension of unequal development and ultimately lead to economic stagnation (Guo, Ding, & Lanshina, 2017

H2 : Digital Divide affects the Economic Growth

The ICT cycle is expected to function as the driver of economic growth, but the increasing digital divide can disrupt this ICT cycle (Mistry, 2014). Experts have been addressing that the rapid development of ICT may pose some risks of creating more disadvantages to people who do not have the necessary resources to use the technology. However, these risks can be mitigated when government agencies take a more direct role in ensuring that market-led development does not result in a new 'dualism' or 'disparity of access' between the rich and the poor in developing countries (Mansell, 2001). However, Ragnedda (2020) stated that without a dichotomy between the rich and the poor regarding the digital divide. ICT capacities can transform the digital benefits of ICT use into social benefits that can increase human life opportunities to obtain better welfare. Based on the results of their research, Zang et al. (2018) propose a policy recommendation to narrow the digital divide in China. The policy focuses on six factors: digital technology infrastructure, ICT readiness, national economic development, government innovation support, digital education and literacy, and digital content & applications. In India, Mistry (2014) states that the government can make policies that can trigger the demands for experts in the ICT field, giving rise to an educated workforce group. The government can use this condition to create a more conducive investment climate, encouraging the growth of the domestic and multi-national corporates in service industries. This growth can boost more job opportunities and raise the gross national product (GNP) and foreign exchange.

H3 : The Role of Government affects the Economic Growth

The widespread diffusion of ICT and its positive impact on economic growth will always be followed by the ensuing digital divide phenomenon (Nipo et al., 2014). The digital divide refers to the gap between individuals, households, businesses, and geographic regions at different socio-economic levels in terms of their opportunities to enjoy the benefits of the access to ICT and the use of the internet for various activities (OECD, 2001). This digital gap problem has existed since ICT innovations have been commercially available for individuals, organizations, and countries. This is because the adoption of ICT occurs at different rates of speed which causes variations in ICT access levels (Mardikyan et al., 2015). The digital gap has two connotations. First, it includes the gap between the quantity of ICT ownership and the quality of ICT mastery. The ownership quantity includes the coverage level and the access status, while the ownership quality includes the price of access, the speed of access, and the advanced degree of ICT. Second, the digital divide covers the gap in digital literacy, which includes the ability to own, obtain, and use the necessary information (Zhang et al., 2018).

Song et al. (2019) link the digital divide with ICT development. The

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relationship is explained in the conceptual framework stating that the factors related to the digital divide are the independent variables, and the factors related to

ICT development is the dependent variable. The idea of the digital divide can be explained by demographic, educational, economic, and innovation factors, then the ensuing gaps between these four factors will affect the development of ICT. Furthermore, Ayanso, Cho, and Lertwachara (2014) explain that ICT development has created many business opportunities that affect economic growth. However, at the regional level, the disparity in ICT adoption between the developed and the developing countries continues to widen. As a result, the digital divide remains a critical issue for policymakers and experts. Although policymakers and experts differ in their descriptions, they agree that the ICT development will not have the same effects on each region as long as the gap still exists. Song et al. (2019) emphasize factors in the digital divide that can affect ICT development, whereas Ayanso et al. (2014) suggest that this gap can be overcome through regulations.

H4 : Digital Divide weakens the influence of ICT development on the Economic Growth

Kaba and Said (2015) researched the digital divide in ASEAN and Arab countries members of the Gulf Cooperation Council (GCC). Their research used four ICT-related factors: ICT infrastructure, government support of ICT, government usage of ICT, and individual usage of ICT. The results showed that ICT infrastructure is consistently significant in narrowing the digital divide. This means that a better ICT infrastructure does not reflect the digital divide in society. In addition, there is a significant relationship between government support for ICT and the government use of ICT. This means that the higher the government support for ICT, the higher the use of ICT facilities and equipment by the government.

An organization that is able to manage the digital economy properly is needed to eliminate the disparities between the developed and the developing countries, which eventually can minimize the digital divide (Guo et al., 2017). In China, the digital divide between the developed and underdeveloped regions also emerged, and this digital divide can disrupt the development of the digital economy. Regarding this problem, the government is required to promote the integration of the internet, big data, artificial intelligence, and the real economy in order to increase investments in underdeveloped areas, develop the digital economy, and pay attention to regions that have lagged in the economy and development structure (Zhang et al., 2018). Furthermore, Szeles and Simionescu (2020) identify the indicators that can accelerate the growth of the EU regional digital economy. The first indicator is a series of policy measures that stimulate the development of the digital economy at the EU regional level. Second, the increase in tertiary education attainment stimulates the development of the regional digital economy. Finally, the number of patents issued at the regional level is also an indicator that triggers the growth of the digital economy. At the same time, a higher poverty rate hinders the growth of the digital economy.

H5 : Bridging Digital Divide strengthens the influence of ICT development on the Economic Growth

METHOD

The data are taken from the Network Readiness Index 2019 (NRI, 2019) and World Data Atlas 2019 (WDA, 2019). The NRI 2019 data are secondary

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data taken from various sources, such as International Telecommunication Union (ITU), GSM Association, World Economic Forum, UNESCO Institute for Statistics, United Nations Conference on Trade and Development (UNCTAD), and World Bank. All of the data have been processed by removing the outliers from the data and data normalization. NRI 2019 processed data from 121 countries but recorded seven countries, namely Belarus, Eswatini, Iceland, North Macedonia, Oman, Qatar, and Venezuela, whose data were incomplete. The number of data samples used in this study was 114 countries. These countries are grouped by income level: 11 low-income countries, 24 lower-middle-income countries, 34 upper-middle-income countries, and 45 high-income countries.

The empirical model used in this study corresponds to the stages in data analysis; thus, it consists of 2 (two) SEM models: a model without interaction and a model with interaction. The first model is used to estimate the three parameters: factor loadings (λ), variances (φ), and error variances (d) of the latent variables. The second model includes the latent interaction variable using a single indicator as to the moderating latent variable. Measuring indicators is used to calculate the factor loadings (λ) and the interaction variable's error variances (d).

Table 1.
Latent Variables and Their Indicators

Variable		Measurement	Reference	Data Source
ICT	1.	Internet access	(Song et al., 2019)	The Network Readiness Index 2019
	2.	4G mobile network coverage		
	3.	Mobile application development		
	4.	Availability of latest technologies		
	5.	Government procurement of advanced technology products		
DD	1.	Urban population / total population	(Song et al., 2019)	The Network Readiness Index 2019
	2.	Adult literacy rate		
	3.	Tertiary gross enrollment ratio		
	4.	Rural gap in the use of digital payment		
	5.	Socio-economic gap in the use of digital payment		
BDD	1.	Ease of doing business	(Ayanso et al., 2014)	The Network Readiness Index 2019
	2.	E-commerce legislation		
	3.	Regulatory Quality		
	4.	Social safety net protection		
	5.	ICT regulatory environment		
EG	1	Inflation	(Niebel, 2017)	World Data Atlas 2019 Knoema.com
	2	GDP/capita		
	3	Unemployment		
	4	Net Export		

Source: processed data

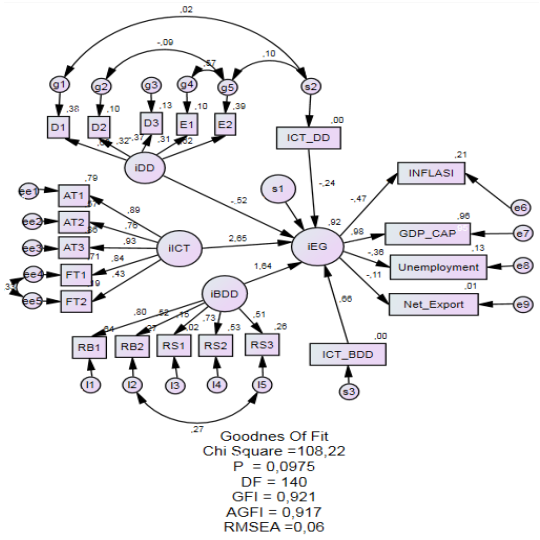
The first step in MSEM analysis is to perform SEM modeling to estimate the parameters to be used to calculate factor loadings (λ) and error variance (d) for the latent variable interaction indicators. The results of statistical tests on the effect of each exogenous latent (independent) variable on the endogenous latent (dependent) variable used in the calculation of factor loadings (λ) and error variance (d). The interaction variables are shown in Table 3 (showing the factor loadings (λ) and error variance (d) of the moderating variable).

Table 3.
Loadings (λ) and the error variance (d) of the interaction variable

Variables	λ	δ
ICT interaction and the digital divide variables	-,182	,061
ICT interaction and the bridging digital divide variables	,432	,053

After the calculation results of factor loadings (λ) and the interaction variables' error variance (d) are obtained, the parameters are estimated using the MSEM model. The results of parameter estimation using the MSEM model are illustrated in Figure 1.

Figure 1. Parameter Estimate of MSEM Model for the Dependent Variable of the Economic Growth



AT1	Internet Accsess
AT2	4G mobile network coverage
AT3	Mobile application development
FT1	Availability of the latest technologies
FT2	Government procurement of advanced technology products
D1	Urban population / total population
D2	Adult literacy rate
D3	Tertiary gross enrollment ratio
E1	Rural gap in the use of digital payment
E2	Socio-economic gap in the use of digital payment
RB1	Ease of doing business
RB2	E-commerce legislation
RS1	Regulatory Quality
RS2	Social safety net protection
RS3	ICT regulatory environment

The contribution of each indicator variable to its dimensions can be seen in Table 4. The results of statistical tests for the effect of each exogenous latent (independent) variable on the endogenous latent (dependent) variable are shown in Table 4.

Table 4.
Statistical Test of the Correlation between Variables

Variables	Estimate		Std. Estimate	S.E.	C.R.	P
	Unstandardized	Standardized				
EG<---ICT	3470,521	2,65	2,65	1253,731	2,768	0,006**
EG <---DD	-1366,885	-0,52	0,52	650,781	-2,100	0,036*
EG <---BDD	3823,467	1,64	1,64	1959,7	1,951	0,051*
EG <---MDD	-0,182	-0,24	0,24	0,061	-2,972	0,003**
EG <---MBDD	0,432	0,66	0,66	0,053	8,221	0,000**

*significant at the level 5% and ** significant at the level 1

Next, the Goodness of Fit test according to the model is shown in Table 5.

Table 5.
Goodness-of-Fit Model

No.	Goodness-of-Fit	Cut-off Value	Indicator Value	Conclusion
1	□2-Significance Probability	≥0,05	0,0975	Acceptable
2	CMIN/DF	≤3	0,77	Acceptable
3	RMSEA	≤0,08	0,06	Acceptable
4	GFI	≥0,90	0,921	Acceptable
5	AGFI	≥0,90	0,917	Acceptable

RESULT AND DISCUSSION

As illustrated in Table 5, the test results of all the hypotheses tested in this model are accepted. Statistically, it can be explained that there is an interaction of ICT development with RoG in the influence of ICT development on EG. The result proves that RoG has a contribution to ICT development. The following sections explain how the digital divide weakens the influence of ICT development on EG and how the role of government strengthens the influence of ICT development on EG.

The results of this study confirm that in high-income countries (see Table 9), the government is very concerned with ICT development. The government is developing in the field of internet access, 4G mobile network coverage, mobile application development, availability of the latest technologies. These countries also manage policies related to ease of doing business, e-commerce legislation, social safety net protection. The tendency is that the higher the country level of a country, the better the interaction of ICT development and the role of government.

The digital divide, which is represented by the urban population, and the socioeconomic gap in the use of digital payments are the two variables that give the highest contribution to economic growth. The digital divide as the moderating variable weakens the influence of ICT development on economic growth. The contribution indicates a negative coefficient value of 0.24 with a negative critical value of 2.972 (see Table 5). When the urban

population increases, its interaction with ICT development causes a higher demand, environmental pressures, and socioeconomic disparities in urban areas (Wolfram, 2012). The result is similar to the socioeconomic gap in digital payments. When the gap is more comprehensive, the interaction with ICT development worsens the influence of ICT on economic growth. The use of ICT that is exclusive or only spreads in certain groups hinders the influence of ICT on economic growth. The interaction of ICT development with adult literacy, gross tertiary enrollment, and the rural gap in the use of digital payments, which are still exclusive, disrupts the influence of ICT development on economic growth.

This study proves that the Role of Government, which is represented by the ease of doing business, e-commerce legislation, regulatory quality, social safety net protection, and ICT regulatory environment as moderating variables, strengthens ICT development's influence on economic growth. The role is indicated by its positive coefficient value of 0.066 with a critical value of 8.221 (see Table 5). Based on the results of the hypothesis testing, two main factors that strengthen the influence of ICT on economic growth are ease of doing business and social safety net protection. Ease of doing business is a set of facilities from the government of a country to create better, simpler, and stronger regulations and protections for local and foreign investors to do business in that country. Furthermore, the social safety net protection is how formal social safety nets protect the general public from economic insecurity, for example, when they lose their jobs or become disabled.

The results of this study confirm the notions of Avgerou (2003), which mentions IT as an institutional actor. IT, which later became ICT, acts as an actor in interacting with the ease of doing business, which drives the influence of ICT development on EG. As a variable, the ease of doing business can be explained by several indicators, namely starting a business permit, construction permit, obtaining electricity, registering property, obtaining credit, paying taxes, trading across borders, enforcing contracts, and resolving insolvency (Janaćković & Petrović-Ranđelović, 2019). As a moderating variable, the ease of doing business interacts with ICT, which plays a role in facilitating, accelerating, and improving work results, which are referred to as indicators of the ease of doing business. Janaćković and Petrović-Ranđelović (2019) also state that the resolving insolvency and construction permits are two essential factors in the ease of doing business. The results of their research also show a direct relationship between the quality of the regulations set by the ease of doing business indicator and FDI inflows. The results of this study are in line with those of Mohamed, Nadzri, Qureshi, Al-Dhubaibi, Arifin, & Yacob (2020), who conclude that the ease of doing business affects the inflow of foreign direct investment (FDI) into a country, and with those of Okwu, Oseni, & Obiakor (2020). They also conclude that FDI can increase economic growth.

CONCLUSIONS AND SUGGESTION

The results show that ICT has a significant effect on economic growth. Better development and uses of ICT in a country contribute to its higher economic growth. This study also proves that the digital divide weakens the influence of ICT development on economic growth, and the role of government strengthens the influence of ICT development on economic growth. Furthermore, this study confirms that the development of mobile applications, internet access, and the availability of the latest technology are the

leading indicators that contribute to ICT development. Meanwhile, ease of doing business and social safety net protection are two indicators of the role of government that give the highest contribution to the economic growth. In addition, the urban population and the socio-economic gap in the use of digital payments are the two leading indicators of the digital divide that weakens economic growth.

By using the institutional theory, the interaction of ICT development and the role of government can shape work practices and social lives that positively impact economic growth. However, the patterns of interactions are different, which results in diversity in strengthening the influence of ICT on EG.

The research limitation is that the interaction of ICT and RoG is only based on the multiplication between the value of the ICT and TOG indicator. Therefore, the results of the interaction can be predicted. Nevertheless, if ICT is considered as the institutional actor, it is inadequate to measure the results only by multiplication and ignore the progress and benefits of technological innovations. In addition, this research does not include elements of risk that can affect the implementation of RoG and ICT innovations. Finally, the measurement of ICT development still uses 4.0 technologies

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