

## The Impact of Digitalization on Regional Macro Development Indicators

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**Abstract:** In the era of Internet of Things, digitalization has become one of the key factors driving the progress of regions. According to various studies, digitalization brings positive impacts across various sectors, including social, economic, labor, and others. The topic of how digitalization affects regional development has been extensively discussed, but most studies focus primarily on the effects of digitalization in developed countries. On the other side, research regarding the relationship between digitalization and macro-level regional development achievements is still limited in developing countries. Therefore, this study seeks to examine the impact of digital transformation on macro-level development outcomes in developing countries, particularly focusing on Indonesia. This study uses a quantitative approach with regression methods. The data used is macro-level data from all provinces in Indonesia, specifically data related to variables concerning digitalization and regional development achievements. The findings show that digitalization has a significant positive impact on the quality of life and the economic contributions of regions.

**Keyword:** Digitalization; Regional Development; Developing Countries.

## INTRODUCTION

The development of ICT (information and communication technology) has significantly impacted regional development in the rapidly advancing global era. Digital transformation is one of the ways to accelerate a region's progress. In the context of regional economics, digitalization in the economy contributes to sustainable development progress (1). Digitalization fosters urban economic sustainability by driving innovation, boosting daily consumption, and improving human resource dynamics, all of which contribute to economic sustainability (2). Digitalization in the economic sector brings positive impacts on high-quality, innovative, and environmentally friendly economic development, leading to better collaboration between urban and rural areas, improving economic development quality, innovation efficiency, and accelerating digital transformation in the real sector (3).

In the regional context, the growth of the digital economy drives innovation in underdeveloped cities, underdeveloped infrastructure, and small cities in China (4). Further studies in cities in China also show that Digitalization becomes more prominent in underdeveloped areas only when the government invests in digital infrastructure and education in those regions. (5), and the development of the digital economy in central cities significantly boosts the digital economy in peripheral cities (6). However, in developing countries, the opposite effect is observed, where inclusive digitalization in the financial sector encourages development in more advanced rural areas and has no significant impact in less developed region (7). However, in Indonesia, digitalization can provide progress for development

in rural areas (8). Ultimately, digitalization also supports environmental, strengthening the process of sustainable development (3).

Every country has different indicators, while discussions on the influence of digitalization on regional development have been frequent, most existing studies focus on developed countries, especially China. Moreover, studies on developing countries have yet to investigate the connection between digitalization and macro-level regional development achievements. Therefore, this study aims to examine how digital transformation impacts macro-level development achievements in developing countries, specifically in Indonesia. This study serves as preliminary research, and based on the results, further studies will be conducted at a more micro-level.

### **The Impact of Digitalization on Various Sectors**

Digitalization influences various economic sectors. In the industrial and labor sectors, the digital economy drives the increase in industry and social capital, as well as human capital for workers in China (9). In the agricultural sector, The digital economy plays a significant role in the advancement of high-quality agriculture in China (10). In the financial sector, digital financial inclusion is essential for fostering real economic growth, as it supports entrepreneurial activities and contributes to the development of higher-quality regional economies. (11).

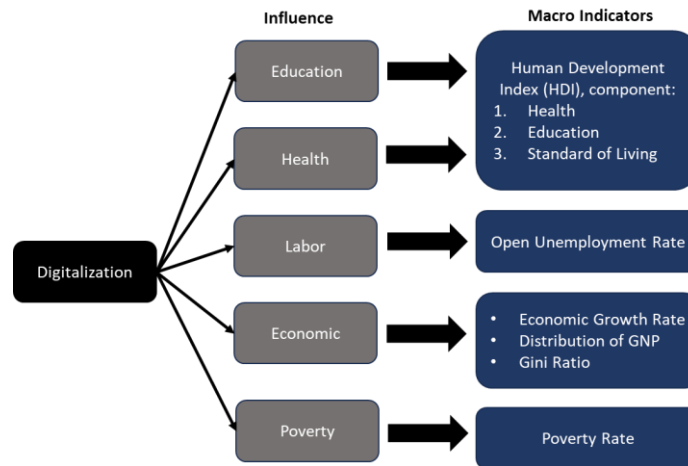
Regarding household income, digitalization in the economy can reduce income inequality (12). Communities trained in using digital content platforms demonstrate greater income resilience and improved employment outcomes during the Covid-19 pandemic. (13). This indicates that digitalization also provides resilience for workers in preparing for future challenges. Other studies, however, show the opposite: regions with greater access to digital technologies tend to experience higher income inequality. However, this negative relationship can be minimized by having strong formal and informal institutions, particularly through improving government effectiveness and strengthening social capital (14).

Digitalization is also linked to labor. Digitalization can reduce youth unemployment and increase productivity (15,16). However, research in 163 countries indicates that as digital technology advances, unemployment rates increase until reaching a peak, and then decline when the expansion of technology exceeds a certain threshold (17). In companies, the advancement of digital infrastructure can enhance investment efficiency (18), and the growth of regional digital economies has a notable positive impact on company productivity. (19). Digital transformation within companies also increases labor income shares in China due to higher R&D investments in workers and company competitiveness (20,21).

In the social sector, digital literacy impacts poverty reduction in China (22). In education, digital competence for workers in the education field leads to better learning experiences, thereby improving education in a region (23). In health, digitalization plays a role in reducing public medical expenses and improving public health (24).

### **Macro Development Indicators in Indonesia**

Indonesia has several macro development indicators used to measure the achievements of regional development in provinces and districts. These indicators are part of the National and Regional Medium-Term Development Plans as targets to be achieved every five years and also included in the Regional Development Work Plan as annual development targets. These macro development indicators include: Economic Growth Rate and Distribution of Regional Gross Domestic Product (PDRB) in the economic sector; Human Development Index, Unemployment Rate, Poverty Rate, and Gini Index in the social sector; and Environmental Quality Index in the environmental sector.



**Figure 1. Theoretical Framework**  
*Source: Author, 2025*

The theoretical framework for this research, based on the literature review on the impact of digitalization and regional development, is presented in Figure 1. The literature reveals the aspects that can be influenced by digitalization. These aspects are then mapped to the development indicators used in Indonesia in this study.

## RESEARCH METHOD

This study uses a quantitative approach. The research utilizes secondary data from BPS (Central Bureau of Statistics) and Komdigi, covering data from all provinces in Indonesia. The analytical method used in this study is regression analysis to examine the impact of the Indonesian Digital Society Index on Macro Development Indicators. The variables used in this study (Table 1) based on the previously outlined theoretical framework, and the data for each variable across all provinces in Indonesia is presented in Table 1.

**Table 1. Research Variables**

| Variable           | Indicator                               | Definition                                                                                                                                                                                                                                                                                                                                                                                  | Source                                |
|--------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <b>Independent</b> | Indonesian Digital Society Index (IMDI) | The level of competence and skills of the population in using digital technology in daily life as well as related to their work.                                                                                                                                                                                                                                                            | Komdigi, 2024                         |
| <b>Dependent</b>   | Economic Growth Rate (LPE)              | A macroeconomic indicator that shows the success of regional development within a certain period.                                                                                                                                                                                                                                                                                           | Central Statistics Agency (BPS), 2024 |
|                    | Open Unemployment Rate (TPT)            | Percentage of unemployed people in the labor force.                                                                                                                                                                                                                                                                                                                                         |                                       |
|                    | Human Development Index (IPM)           | A composite indicator to measure the achievement of human quality of life development. Component: <ul style="list-style-type: none"> <li>Life expectancy (to measure health),</li> <li>Education (measured by mean years of schooling for adults and expected years of schooling for children),</li> <li>Standard of living (measured by Gross National Income (GNI) per capita)</li> </ul> |                                       |
|                    | Percentage of Poor Population (PPM)     | The percentage of the poor population.                                                                                                                                                                                                                                                                                                                                                      |                                       |
|                    | Gini Ratio (Gini)                       | A ratio to measure the degree of income distribution inequality.                                                                                                                                                                                                                                                                                                                            |                                       |
|                    | Distribution of GRDP (PDRB)             | The percentage contribution of GRDP from each region to the overall GRDP value.                                                                                                                                                                                                                                                                                                             |                                       |

*Source: Author, 2025*

## RESULT AND DICUSSION

### RESULT

#### Descriptive Statistics

The average score of the Indonesian Digital Society Index (IMDI) is 43.63, with a variance of 2.427. The maximum value is 51.07, and the minimum value is 39.21. This indicates a notable gap in the digitalization level of society across provinces. The descriptive statistics for the others variables are shown in Table 2.

**Table 2. Descriptive Statistics**

|                    | N  | Min    | Max   | Mean    | Std. Deviation |
|--------------------|----|--------|-------|---------|----------------|
| IMDI               | 34 | 39,21  | 51,07 | 43,6388 | 2,42717        |
| IPM                | 34 | 62,25  | 82,46 | 72,6221 | 3,85971        |
| PPM                | 34 | 4,25   | 26,03 | 10,0891 | 5,18351        |
| TPT                | 34 | 2,27   | 7,52  | 4,6138  | 1,41907        |
| LPE                | 34 | -50,35 | 41,32 | 3,9506  | 13,11934       |
| GINI               | 34 | 0,25   | 0,45  | 0,3443  | 0,04685        |
| PDRB               | 34 | 0,25   | 16,77 | 2,9071  | 4,12999        |
| Valid N (listwise) | 34 |        |       |         |                |

*Source: Analysis, 2025*

#### Pattern of Relationship Between Digitalization and Macro Development Indicators

Based on the correlation analysis, it was found that digitalization, represented by the IMDI, significantly and positively correlates with (1) IPM, which measures the quality of life with a significance level of  $<0.05$ , and (2) PDRB Distribution, which measures the percentage contribution of PDRB from each region to the total PDRB, with a significance level of  $<0.01$ . Meanwhile, other variables do not show a significant relationship with the level of digitalization in Indonesia. The correlation analysis results are shown in Table 3.

**Table 3. Spearman Correlation**

| Variable | IMDI   |
|----------|--------|
| IPM      | .627** |
|          | .000   |
| PPM      | -.286  |
|          | .101   |
| TPT      | .243   |
|          | .166   |
| LPE      | -.034  |
|          | .848   |
| GINI     | .168   |
|          | .342   |
| PDRB     | .417*  |
|          | .014   |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

*Source: Analysis, 2025*

### Impact of Digitalization on Macro Development Indicators

Regression test (Table 4) was conducted on macro indicator variables that are significantly correlated with the level of digitalization in society, namely the quality of life (IPM) and regional economic contribution (PDRB). The significance in both models showed  $p < 0.01$ , meaning the models are very strong and the null hypothesis is rejected, indicating that digitalization significantly affects IPM and PDRB distribution. The  $R^2$  value for IMDI with IPM is quite large, at 51.7%, while 48.3% is influenced by other unexamined variables. Meanwhile, the  $R^2$  value for IMDI with PDRB is 33%, with 67% influenced by other unexamined variables.

**Table 4. Regression Test**

|                | Dependent Variable |                   |
|----------------|--------------------|-------------------|
|                | IPM                | PDRB              |
| IMDI           | 0.719<br>(0.00)**  | 0.575<br>(0.00)** |
| N              | 34                 | 34                |
| R <sup>2</sup> | 0.517              | 0.330             |

\*\*  $p < 0.01$

Source: Analysis, 2025

### DISCUSSION

#### Quality of Life

The positive impact of digitalization on the quality of life, which includes education and health, supports previous studies suggesting that digitalization can improve education and public health sectors (23,24). In the field of education, digitalization makes it easier for teachers and students to access broader knowledge, thereby enhancing the quality of education. Although it shows a positive impact, the disparity in digitalization in education in Indonesia remains significant, especially in border areas (Nama, 2022). Meanwhile, in the field of healthcare, digitalization facilitates faster and easier healthcare services for both patients and healthcare providers. Patients find it easier to register and purchase medications digitally, for example, through the use of telemedicine (26)

#### Economic Contribution

The positive impact of digitalization on the economic contribution of regions also aligns with previous studies indicating that digitalization influences the development of various economic sectors (9–11). In the economic sector, digitalization can accelerate marketing processes, financial management, and also enhance innovation across various economic sectors. One of the economic activities that benefit from digitalization in Indonesia is MSMEs (Micro, Small, and Medium Enterprises). Digitalization makes it easier for MSME actors to access cooperatives for capital provision (27). In utilizing digitalization, the main strategies that can be applied by MSMEs are differentiation, innovation, and operations (28). Another sector that also benefits from digitalization is tourism. Digitalization provides advantages in increasing the value of local products at tourist destinations (29). However, further research is needed to explore how digitalization can impact the economic sectors in Indonesia.

#### The Differences in The Influence of Variables Compared To Previous Studies

In this study, variables related to labor, income inequality, and poverty levels did not show a significant relationship with the level of digitalization in society. This contrasts with previous studies. This discrepancy may be due to other factors influencing the success of digitalization in developing

countries in reducing unemployment, increasing income, and decreasing poverty. Such factors include supporting infrastructure, workforce capacity, and the still-low level of higher education. Furthermore, in Indonesia's case, the geographical condition as an archipelagic nation may also contribute to the suboptimal success of digitalization efforts in the country

### **Recommendation**

Given the positive relationship between digitalization and both quality of life and economic contribution, this can serve as a basis for the conclusion that improving the digitalization level of society can enhance living standards and economic contributions in every region of Indonesia. The government should strengthen policies related to optimizing digitalization programs, such as enhancing digital infrastructure and providing digital training to communities, especially in more isolated areas.

### **CONCLUSION**

This study discusses the impact of digitalization on the achievement of macro development indicators. The results of this study show a positive influence between digitalization and the quality of life and economic contribution of regions. The government needs to strengthen policies to optimize digitalization programs, including improving digital infrastructure and providing digital training to the public, especially in more remote areas. This study recommends further research to explore how these variables influence each other qualitatively. Additionally, this study also suggests conducting research on factors that affect the success of digitalization in improving human quality of life and economic sectors.

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