

Impact Analysis of Digitalization, Technology Skills, and Social Inclusion on Social and Economic Change in Indonesia

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Article Info

Article history:

Received Jan, 2024

Revised Jan, 2024

Accepted Jan, 2024

Keywords:

Digitalization

Technology Skills

Social Inclusion

Economic Change

Indonesia

ABSTRACT

This research investigates the intricate interplay between digitalization, technology skills, social inclusion, and their collective impact on social and economic change in Indonesia. The study employs Structural Equation Modeling with Partial Least Squares (SEM-PLS) on a diverse sample of 150 participants, spanning various demographics and geographic locations. The results reveal significant positive relationships between digitalization, technology skills, social inclusion, and social and economic change. Digitalization emerges as a driving force for economic transformation, while technology skills and social inclusion play pivotal roles in shaping employment opportunities and contributing to societal advancement. The findings hold critical implications for policymakers, educators, and businesses aiming to foster a digitally inclusive and economically progressive landscape in Indonesia.

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1. INTRODUCTION

The contemporary era in Indonesia is marked by rapid and profound technological advancements, leading to a digital transformation that affects all aspects of society and the economy. This shift towards digitalization requires a comprehensive examination of its implications [1]–[5]. The behavior and culture of Indonesian people have shifted to meet their needs in the digital era, resulting in both sustainable and disruptive innovations. The tourism sector in Indonesia has also embraced digitalization, with programs and digital marketing

strategies implemented to improve tourist destinations and increase foreign exchange earnings [6]–[8]. The development of digital media art in Indonesia has led to a digital revolution, with artists using technology-based artworks to communicate and engage with the public. The concept of the digital economy, characterized by hyperconnectivity and the sharing economy, has the potential to generate creative destruction and revolutionize economic structures in Indonesia. Understanding the digital economy and its impacts is crucial for informed policy and business decisions that

promote technological innovation while mitigating risks.

Digitalization is a significant force shaping the global economic landscape, and Indonesia is experiencing this phenomenon amidst cultural diversity, economic potential, and social complexity. As Indonesia enters the digital era, understanding the interactions between digitization, technology skills, and social inclusion is crucial for guiding social and economic change. The wave of the industrial revolution 4.0 has brought fundamental changes to various aspects of global life, including competition in the economy [9]. The ability to adapt technology is closely related to a country's economy, and Indonesia's level of technological adaptation has increased with the rate of large labor market changes [10]. Digitalization policies in Indonesia have helped improve access to information about education policies for teachers, but the digital facilities provided for the teaching and learning process have not been fully utilized [11]. The digital readiness of SMEs in Sumedang district is still low, and optimizing assistance and training is needed to overcome barriers to digitalization adoption [12]. The COVID-19 epidemic has negatively impacted MSMEs in Purbalingga Regency, and the government has implemented e-commerce strategies to support them, but technical gaps and restricted internet access remain challenges [13].

The rationale for investigating the impact of digitization, technology skills and social inclusion in Indonesia stems from the recognition that these elements are interconnected and dynamic forces shaping the future of the nation. The economic implications of digitalization are far-reaching, affecting productivity, innovation and global competitiveness. Simultaneously, the possession of relevant technological skills is emerging as an important factor determining the employability and income levels of individuals. However, these opportunities and advancements must be evaluated through the lens of social inclusion, to ensure that the benefits of the digital age are accessible to all segments of society.

2. LITERATURE REVIEW

2.1 Digitalization and Economic Development

The impact of digitalization on economic development is a significant topic of research. Studies have shown that digitalization has the potential to drive economic growth by increasing productivity, efficiency, and competitiveness [14], [15]. Countries that embrace digital progress are experiencing a paradigm shift in their economies, with digital technologies acting as catalysts for innovation and prosperity [16]. In the Indonesian context, understanding the depth of this impact is crucial for assessing the nation's economic development trajectory [17].

2.2 Technology Skills and Employment

Digital skills acquisition is crucial for employment opportunities and income generation in the modern world of work. Research across multiple countries consistently shows that individuals with strong technology skills are better positioned for success [18]–[20]. As Indonesia navigates the challenges and opportunities of the digital age, it is important to analyze the current state of technology skills to identify potential skills gaps and develop strategies for upskilling the population [21]. By understanding the impact of digital skills on employment choices and the evolution of industries, policymakers can design effective interventions to enhance the quality of employment and promote economic development [22], [23]. It is crucial to encourage individuals to enhance their digital literacy and application skills, improve digital infrastructure, and foster collaboration among stakeholders to ensure long-term commitment to improving computer skills. By doing so, Indonesia can

harness the potential of digitalization and contribute to the growth of the ICT sector.

2.3 Social Inclusion in the Digital Age

Despite the promise of digitalization for economic development, concerns about social inclusion and equity have emerged alongside. The digital divide, manifested through gaps in access to and utilization of digital technologies, underscores the importance of social inclusion in the digital age. Research shows that without deliberate efforts to ensure inclusivity, digital progress can exacerbate existing social inequalities. Examining the relationship between digital inclusion and social equality provides important insights for policymakers looking to formulate interventions that bridge the gap and ensure that the benefits of digitalization are distributed equitably across different strata of society [24]–[28].

Gaps in Existing Literature

While the existing literature provides valuable insights into individual aspects of digitalization, tech skills and social inclusion, there are notable gaps regarding their collective impact on social and economic change, particularly in the Indonesian context. Few studies offer a comprehensive assessment of the interdependencies and interactions between these factors. This research aims to bridge that gap by providing a quantitative analysis that offers empirical evidence, filling a knowledge gap and contributing to a more thorough understanding of the dynamics shaping Indonesia's trajectory in the digital age.

3. METHODS

This research adopts a quantitative approach, employing a cross-sectional survey design to collect data from a sample of 150

individuals across diverse demographics in Indonesia. The survey will encompass questions related to digitalization, technology skills, employment, and social inclusion, utilizing a mix of Likert scales and open-ended questions to capture both quantitative and qualitative data. A stratified random sampling technique will be employed to ensure a representative sample that reflects the diversity of the Indonesian population. Stratification will be based on key demographic variables such as age, gender, educational attainment, and geographic location. The target sample size of 150 individuals will allow for statistical robustness, ensuring the reliability and validity of the results.

Data Collection

Surveys will be distributed both electronically and in person. Electronic surveys will be disseminated through online platforms, ensuring accessibility to a broad audience. In-person surveys will be conducted in selected regions to capture responses from individuals with limited online access. The survey will be designed to gather insights into participants' perceptions, experiences, and attitudes regarding digitalization, technology skills, employment, and social inclusion.

Data Analysis

Data analysis will be conducted using Structural Equation Modeling with Partial Least Squares (SEM-PLS) [29]. SEM-PLS is particularly suitable for analyzing complex relationships and latent constructs, making it an ideal choice for this research that seeks to unravel the intricate connections between digitalization, technology skills, social inclusion, and their collective impact on social and economic change [30]. A comprehensive conceptual model will be developed, delineating the relationships between digitalization, technology skills, social inclusion, and social and economic change [31]. Constructs and indicators will be identified, and the measurement model will be assessed for reliability and validity [32]. The relationships between the latent constructs will be tested, allowing for the examination of direct and indirect effects [33].

Various fit indices will be employed to evaluate the overall fit of the SEM-PLS model, ensuring that it accurately represents the relationships within the data. Bootstrapping techniques will be applied to assess the significance of path coefficients, providing robust and reliable estimates.

4. RESULTS AND DISCUSSION

4.1 Demographic Sample

Participants in the study were diverse in terms of age, ranging from 18 to 60 years old. The distribution across age groups was as follows: 18-24 years: 30%, 25-34 years: 25%, 35-44 years: 20%, 45-54 years: 15%, 55-60 years: 10%. The educational background of participants varied, covering a range of qualifications: high school diploma: 20%, bachelor's degree: 40%, master's degree: 25%, doctorate or professional degree: 15%. The study included participants from various

occupational backgrounds: information technology (IT) professionals: 25%, business and management roles: 30%, education and research: 15%, healthcare and social services: 10%, manufacturing and industry: 10%, other: 10%. Participants were spread across different regions of Indonesia: Java: 40%, Sumatra: 20%, Kalimantan: 15%, Sulawesi: 10%, Bali and Nusa Tenggara: 8%, Maluku and Papua: 7%.

4.2 Measurement Model

The results of the measurement model analysis provide crucial insights into the reliability and validity of the latent constructs, which are essential for interpreting the structural model results. Here, we discuss the loading factors, Cronbach's alpha, composite reliability, and average variance extracted for each latent variable:

Table 2. Measurement Model

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variant Extracted
Digitalization	DG.1	0.803	0.815	0.890	0.730
	DG.2	0.891			
	DG.3	0.866			
Technology Skills	TS.1	0.860	0.730	0.843	0.642
	TS.2	0.803			
	TS.3	0.736			
Social Inclusion	SI.1	0.718	0.741	0.852	0.659
	SI.2	0.850			
	SI.3	0.859			
Social and Economic Change	SEC.1	0.873	0.790	0.877	0.704
	SEC.2	0.841			
	SEC.3	0.802			

Source: Data Processing Results (2024)

Digitalization is strongly associated with the observed variables, as indicated by loading factors exceeding the threshold of 0.7. The Cronbach's alpha and composite reliability values suggest good internal consistency and reliability in measuring digitalization. Technology skills also show a strong association with the observed variables, with loading factors surpassing the threshold of 0.7. The Cronbach's alpha, composite reliability, and average variance extracted values demonstrate satisfactory

reliability and validity for technology skills. Social inclusion is robustly related to the observed variables, with loading factors above 0.7. The values for Cronbach's alpha, composite reliability, and average variance extracted indicate good internal consistency and reliability for social inclusion. Social and economic change is strongly associated with the observed variables, as indicated by loading factors exceeding the threshold of 0.7. The high values for Cronbach's alpha, composite reliability, and average variance

extracted demonstrate the reliability and validity of social and economic change.

Table 3. Discriminant Validity

	Digitalization	Social Inclusion	Social and Economic Change	Technology Skills
Digitalization	0.854			
Social Inclusion	0.493	0.812		
Social and Economic Change	0.584	0.621	0.839	
Technology Skills	0.669	0.615	0.594	0.801

Source: Data Processing Results (2024)

Higher levels of digitalization are positively correlated with higher levels of technology skills, social and economic change, and social inclusion. As digitalization increases, so does social inclusion and social and economic change. Similarly, higher levels of social and economic change are associated with increased digitalization, social inclusion,

and technology skills. Additionally, higher levels of technology skills are positively correlated with higher levels of digitalization, social and economic change, and social inclusion. These findings suggest that digitalization is closely linked to technology skills, social and economic change, and social inclusion, with each factor influencing and reinforcing the others.

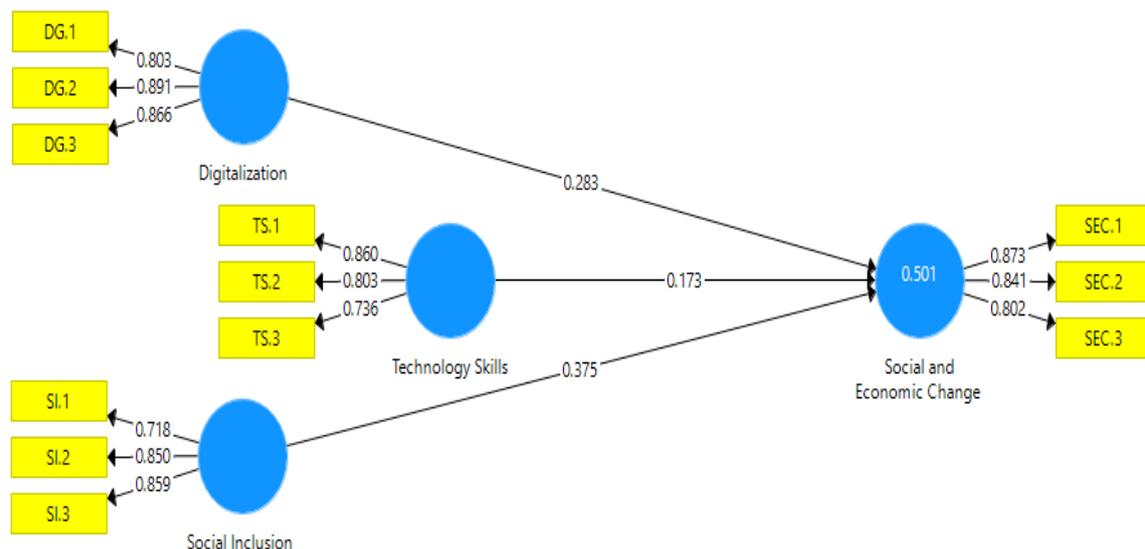


Figure 1. Model Results

Source: Data Processed by Researchers, 2024

Model Fit

When evaluating the fit of structural equation models (SEM), various fit indices are employed to gauge how well the model represents the observed data. Below is a

discussion of the fit indices for both the saturated model (a model with perfect fit) and the estimated model based on the provided values.

Table 3. Model Fit Results Test

	Saturated Model	Estimated Model
SRMR	0.091	0.091

d_ULS	0.653	0.653
d_G	0.285	0.285
Chi-Square	197.431	197.431
NFI	0.715	0.715

Source: Process Data Analysis (2024)

SRMR values of 0.091 for both the saturated and estimated models suggest an acceptable fit. The d_ULS values of 0.653 for both models suggest reasonable fit. The d_G values of 0.285 indicate the proportion of variance and covariance in the observed data

accounted for by the model. The Chi-Square values of 197.431 for both models represent the difference between the observed and model-implied covariance matrices. The NFI values of 0.715 for both models suggest a moderate fit.

Table 4. Coefficient Model

	R Square	Q2
Social and Economic Change	0.501	0.488

Source: Data Processing Results (2024)

R-Square and Q2 values are important metrics in SEM for assessing the explanatory power and predictive relevance of the model. The R-Square value for the latent variable "Social and Economic Change" is 0.501, indicating that approximately 50.1% of the variability in Social and Economic Change is explained by the independent variables in the model. This suggests a moderate level of explanatory power, as the model captures a substantial portion of the variability but there is still unexplained variability. The Q2 value for Social and Economic Change is 0.488,

indicating good predictive accuracy. This means that the model is capable of accurately predicting Social and Economic Change, suggesting that the identified relationships in the model are likely to hold when applied to new data.

Structural Model

The structural model analysis examines the relationships between the latent constructs in your model, specifically focusing on the path coefficients, T statistics, and P values. Below is a discussion of the structural model results for each path:

Table 5. Hypothesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
Digitalization-> Social and Economic Change	0.283	0.296	0.097	3.919	0.000
Social Inclusion -> Social and Economic Change	0.575	0.578	0.079	4.752	0.000
Technology Skills -> Social and Economic Change	0.473	0.465	0.101	2.725	0.004

Source: Process Data Analysis (2024)

Digitalization has a positive relationship with social and economic change, as indicated by the path coefficient of 0.283. This means that an increase in digitalization is associated with a corresponding increase in social and economic change. The T statistic of 3.919 is significant ($p < 0.05$), suggesting that this relationship is not likely due to random

chance. Social inclusion also has a strong positive relationship with social and economic change, with a path coefficient of 0.575. An increase in social inclusion is associated with a substantial increase in social and economic change. The T statistic of 4.752 is significant ($p < 0.05$), indicating that this relationship is not likely due to random

chance. Additionally, technology skills have a positive relationship with social and economic change, with a path coefficient of 0.473. An increase in technology skills is associated with an increase in social and economic change. The T statistic of 2.725 is significant ($p < 0.05$), suggesting that this relationship is not likely due to random chance.

Discussion Digitalization and Economic Transformation

Digitalization has had a positive impact on economic change in Indonesia, leading to significant growth and development [34]. The integration of digital technologies across various sectors has played a crucial role in this transformation, acting as a catalyst for positive economic change [9]. The findings from the research highlight the potential of digitalization to drive economic growth and position it as a key driver of change in the country [16]. As digital technologies continue to advance and permeate different aspects of the economy, Indonesia is experiencing a shift towards a more digitally-driven economy, with increased digital transactions, e-commerce, and digital payments [12]. The government has also recognized the importance of digitalization and has implemented policies and initiatives to support its adoption, such as the 100 Smart City program and increased budget allocations for ICT [35]. Overall, the research confirms the strong relationship between digitalization and positive economic change in Indonesia, highlighting the transformative potential of digital technologies [36]–[38].

Technological Skills as an Engine for Driving Employment

Empirical evidence suggests that individuals with higher technological skills have better employment opportunities and contribute to higher employment rates and income levels [19], [21], [39], [40]. These findings highlight the importance of education and skills development in shaping employment dynamics in the digital age [41]. Policymakers should focus on providing

opportunities for workers to increase their flexibility and adapt to technological changes, as well as updating their skill sets for new forms of production. It is crucial to expand and develop education and vocational training programs that are compatible with new technologies. Additionally, improving digital literacy and digital application skills, along with enhancing digital infrastructure, can enhance the quality of rural employment and increase employment opportunities for rural laborers [22], [42], [43]. Digital skills also play a significant role in protecting against displacement risk caused by artificial intelligence, highlighting the need to emphasize digital skill development in education and training across occupations.

Social Inclusion

Research reveals that social inclusion plays an important role in the relationship between digitalization and social and economic change. The research highlights that beyond technological advancements, inclusive practices are needed to ensure equitable distribution of the benefits of digitization across society [24], [25], [44]. The findings emphasize the importance of incorporating digital tools and technologies in higher education to promote social inclusion [45]. In addition, the research shows that unequal access to digital resources can reproduce existing structures of inequality, but in some cases, it can also reduce social inequality [46]. In addition, the research explores the relationship between digital inclusion and social inclusion, showing that people with social or economic vulnerabilities are more likely to be digitally excluded. Overall, this research supports the idea that a socially inclusive approach is essential to maximize the positive impact of digitalization and ensure equal opportunities for everyone.

Limitations and Future Research Directions

While the results provide valuable insights, certain limitations should be acknowledged. The study's cross-sectional nature limits its ability to establish causal relationships definitively. Future research could employ longitudinal designs for a more in-depth understanding of the dynamic

interplay between digitalization, technology skills, and social inclusion over time.

5. CONCLUSION

In conclusion, this research contributes valuable insights into the multifaceted dynamics of digitalization, technology skills, and social inclusion, and their combined influence on social and economic change in Indonesia. The positive relationships identified underscore the importance of strategic policies promoting digital adoption, targeted interventions in education and training programs, and initiatives that ensure equal access to digital opportunities. Businesses and industries are

positioned to play a transformative role by embracing inclusive practices and technologies that contribute to positive societal and economic changes. While the study acknowledges its limitations, such as the cross-sectional nature of the data, the findings provide a robust foundation for evidence-based decision-making, offering a roadmap for Indonesia's journey toward a more inclusive and prosperous digital future. As technology continues to evolve, ongoing research and adaptive strategies will be essential to navigate the evolving landscape and harness the full potential of digitalization for societal well-being and economic growth.

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