Development of Digital Infrastructure and Increasing Productivity of MSMEs to Encourage Competitiveness in the Digital Era

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Abstract. *Micro, small and medium enterprises constitute a fundamental pillar of Indonesia's economic development and sustainability, especially in job creation and local industrial growth. However, the main challenge faced by MSMEs in increasing their competitiveness is access to digital infrastructure that is still limited. This study analyzes the impact of digital infrastructure development on the productivity of MSMEs as well as strategies that can be applied to increase the adoption of digital technology. This study refers to various previous studies that show that the adoption of digital technology, such as e-commerce and digital payment systems, is able to improve operational efficiency and expand market access for MSMEs (Badriyah et al., 2022).*

The study result indicated that the success of MSMEs in utilizing digital infrastructure is highly dependent on access to a stable internet, policy support, and increased digital literacy (Lukas & Hasudungan, 2024). Partnership between goverment, private sector and the business community in building digital infrastructure and providing training is crucial in accelerating the digital transformation of MSMEs Kumar et al. (2024). This study recommends accelerating the development of internet networks in remote areas, providing incentives for MSMEs that adopt digital technology, and implementing digital skills improvement programs for business actors. With a strong digital ecosystem, MSMEs can be more competitive and sustainable in facing the challenges of the digital economy.

Key words: Digital Infrastructure, MSME Productivity, Digitalization, Competitiveness, Business Transformation

Introduction

MSMEs are integral to the growth and resilience of economy Indonesia, especially in job creation and local industrial growth. The contribution of MSMEs to Gross Domestic Product (GDP) and labor absorption make this sector the backbone of the national economy. However, the main challenge faced by MSMEs in increasing their competitiveness is limited access to equitable and quality digital infrastructure.

Digital transformation has become an important element in the development of the business world, including MSMEs. The adoption of digital technology such as e-commerce, digital payment systems, and online marketing platforms has been proven to be able to increase operational efficiency and expand market access for MSME actors (Badriyah et al., 2022). However, the use of this technology is highly dependent on the availability and quality of digital infrastructure such as fast internet access, digital devices, and policy support.

According to Lukas & Hasudungan (2024), the success of MSMEs in utilizing digital infrastructure is greatly influenced by stable internet access, government policy support, and increased digital literacy. Meanwhile, Kumar et al. (2024) partnership between government, private sector and the business community in building digital infrastructure and providing training for MSME actors. Therefore, accelerating the development of internet networks in remote areas, providing incentives for MSMEs that adopt digital technology, and digital skills improvement programs are strategic steps that need to be taken to strengthen the digital ecosystem.

The rise of digital technology has transformed business operations, customer interactions, and global competition. In today's digital era, robust digital infrastructure such as high speed internet, cloud computing, and digital payments is essential for boosting productivity and supporting MSME growth.

In Purwakarta Regency, the local government has taken significant steps to improve digital infrastructure through various initiatives such as *the Smart Village* program. This program aims to provide internet access to remote villages so that MSMEs can take advantage of digital advances to increase their competitiveness. By expanding access to digital connectivity, the government encourages the adaptation of business actors to modern technology, expands market reach, and improves operational efficiency.

Research conducted by Sihotang et al. (2023) shows that the development of the digital economy has a significant positive impact on the growth and productivity of MSMEs. The advancement of digital infrastructure such as the internet and digital payment systems is the main component in supporting the growth of MSMEs in Indonesia. This is also reflected in the economic development of Purwakarta, where the main sectors are experiencing promising growth.

Purwakarta's 2023 Gross Regional Domestic Product (GDP) data recorded that the primary sector, such as agriculture and natural resources, grew by 1.07% per year. Meanwhile, the secondary sector, which includes industry and manufacturing, experienced a growth of 5.34% per year, showing a large contribution from industrial MSMEs. The tertiary sector, which includes trade and services, grew by 4.91% per year, demonstrating the important role of digital trade in supporting the local economy. Overall, Purwakarta's economy grew by 4.97%, reflecting a stable and progressive business environment.

In this context, the development of digital infrastructure opens up great opportunities for Purwakarta MSMEs to accelerate their digital transformation. The adoption of e-commerce platforms, marketing through social media, and the use of automation tools allows MSMEs to increase efficiency and expand the customer base. Digital payment solutions such as QRIS and e-wallets also facilitate transactions, reduce reliance on cash, and increase financial transparency.

Lubis et al. (2023) in their research emphasized that digital transformation through technology such as e-commerce and digital payments has a direct correlation to increasing regional economic growth. Thus, a strong digital infrastructure will support the productivity of MSMEs while boosting the regional economy.

Not only infrastructure, but human resource factors are also the main determinants in the success of MSME digitalization. Cooperation between the government and the private sector in organizing digital literacy training has helped improve the ability of MSME actors to take advantage of digital opportunities. This is very important considering that the low level of digital literacy is still the main obstacle in the adoption of technology in areas such as Purwakarta.

However, a number of challenges remain. The main obstacles in the digitalization of MSMEs include low digital literacy, high initial costs to adopt technology, cybersecurity threats, and uneven internet connectivity, especially in rural areas. Handayani et al. (2020) stated that lack of digital understanding and skills as well as limited infrastructure are the main barriers for MSMEs in optimizing the use of technology.

To address these challenges, local governments have launched various support programs such as subsidies for technology investments, public-private partnerships, and cybersecurity awareness campaigns. Hasibuan et al. (2023) propose an integrated approach, which includes improving digital connectivity, empowering human resources, and data protection policies as a strategy to encourage the overall digital transformation of MSMEs.

With these conditions, the development of digital infrastructure in Purwakarta is the main driver for the growth and competitiveness of MSMEs. Through the use of digital technology, local business actors can increase productivity, expand markets, and contribute to sustainable economic development. However, in order for all business actors, regardless of size or location, to fully participate in the digital economy, continuous efforts are needed to expand infrastructure, increase digital literacy, and protect MSME actors from digital security threats.

Literature Review

1. Digital Transformations

Digital transformation is the strategic implementation of digital technologies across business functions, leading to significant changes in operational processes and value creation for customers. (Westerman et al., 2011). In the context of MSMEs, digital transformation includes not only the adoption of technology, but also changes in business models, operational processes, and ways of interacting with customers.

Table 1. Digital Transformation

Dimension	Indicator
Technology Adoption	Use of digital platforms (e-commerce, social media, business applications)
Digitization of Business Processes	Use of digital management systems (accounting, inventory, CRM, ERP)
Digital Literacy	Ability of employees or business owners to operate technology
Digital Innovation	Implementation of new digital-based ideas in products or services

Source: Processed author (2025)

2. Digital Infrastructure

The digital ecosystem encompasses a comprehensive network of components including hardware, software, internet connectivity, platforms, and supporting systems that collectively enable the effective use of information and communication technology (ICT). This ecosystem facilitates seamless digital interactions, supports business operations, and enhances the overall digital capacity of enterprises, including MSMEs. This infrastructure is an important foundation in supporting digital-based business activities (Molla & Heeks, 2007). For MSMEs, the availability of digital infrastructure determines the extent to which they can adopt and optimize technology.

Table 2. Digital Infrastructure

Dimension	Indicator
Internet Access	Speed and stability of internet connection
Devices and Technologies	Availability of computers, smartphones, and other supporting digital tools
Government/Ecosystem Support	Access to training, subsidies, or infrastructure assistance
Digital Security	Use of cybersecurity systems (firewall, antivirus, data protection)

Source: Processed author (2025)

3. MSME Growth

The growth of MSMEs includes increasing production capacity, income, market, and the number of workers. Factors such as innovation, operational efficiency, and market access are very influential in this process (Tambunan, 2012). Digital transformation and digital infrastructure are seen as the main enablers in driving the growth of MSMEs in the digital era.

Table 3. MSME Growth

Dimension	Indicator
Revenue Growth	Year-over-year increase in sales turnover
Market Expansion	Penetration into digital or out-of-region markets
Increased Productivity	Time efficiency and operational costs after technology adoption
Workforce Enhancement	Increasing number of employees as a result of business growth

Source: Processed author (2025)

Reseach Methods

Using a quantitative survey approach, this study investigates how digital transformation and infrastructure affect MSME growth. The population in this study is MSME actors in Purwakarta, and the sampling technique uses purposive sampling with the criteria: have been operating for at least two years and use digital technology. The number of samples was determined based on the opinion of Ferdinand (2006), which was 5–10 times the number of indicators. With a total of 12 indicators, a sample of 60 respondents was obtained.

Primary data were obtained through a questionnaire using a 1–5 Likert scale and analyzed with SPSS version 25. The analysis began with validity and reliability tests to ensure the quality of the instrument. Next, classical assumption tests were conducted, including normality, multicollinearity, and heteroscedasticity tests. Hypothesis testing was performed using multiple linear regression to examine the effect of the independent variables (digital transformation and digital infrastructure) on the dependent variable (MSME growth). The t-test was used to assess partial effects, the F-test for simultaneous effects, and the coefficient of determination (R^2) to measure the contribution of the independent variables to MSME growth.

RESULTS AND DISCUSSION

T Test

Figure 1. SPSS T Test Results

Coefficients[a]

Unstandardized Coefficients		Standardized Coefficients		
B	Std. Error	Beta	t	Sig.
460.998	306.926		1.502	.374
.506	1.151	.175	.439	.736
-1.544	.690	-.889	-2.237	.268

a. Dependent Variable: MSME Growth

Based on the results of the multiple linear regression test, the following results were obtained:

1. The Digital Transformation variable has a coefficient value of 0.506 with a significance value (Sig.) of 0.736 and a calculated t-value of 0.439. Because the significance value is greater than 0.05 (0.736 > 0.05), it can be concluded that Digital Transformation does not have a significant effect on MSME Growth. This shows that even though digitalization is adopted by MSME actors, it does not necessarily have a direct impact on their business growth if it is not accompanied by other supporting factors such as digital skills and optimal use of technology.
2. The Digital Infrastructure variable has a coefficient value of -1.544 with a significance value (Sig.) of 0.268 and a calculated t-value of -2.237. Although the t-value is relatively high in absolute terms, the significance value is still above 0.05 (0.268 > 0.05), so that Digital Infrastructure also does not have a significant effect on MSME Growth at a significance level of 5%. The negative coefficient shows that the improvement of digital infrastructure is actually negatively correlated with the growth of MSMEs in the context of the data studied, which is most likely due to the limited amount of data or other variables that have not been controlled in the model.
3. The constant value of 460.998 indicates that if Digital Transformation and Digital Infrastructure are considered zero, then the predicted average value of MSME Growth is 460.998. However, because this constant value is also insignificant (Sig. = 0.374), it cannot be interpreted as a strong representation of the MSMEs' base growth.

Test Simultan F

Figure 2. SPSS F Test Results

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	627.993	2	313.997	2.68	.396[b]
	Residual	117.007	1	117.007		
	Total	745.000	3			

a. Dependent Variable: MSME Growth

b. Predictors: (Constant), Digital Infrastructure, Digital Transformation

Interpretation of the F Test Results:

1. F-value is calculated as 2.684
2. Significance value (Sig.) of 0.396

Because the significance value is greater than 0.05 (0.396 > 0.05), it can be concluded that Digital Transformation and Digital Infrastructure simultaneously do not have a significant effect on MSME Growth at a confidence level of 95%.

Thus, this regression model is not significant as a whole, which means that the two independent variables are not able to jointly explain the variations that occur in the MSME Growth variable.

Determination Coefficient (R^2)

Figure 3. determination coefficient (R^2)

B (Unstandardized)	Std. Error	Beta (Standardized)	t hitung	Sig.	Zero-order	Partial	Part
460.998	306.926	—	1.502	0.374	—	—	—
0.506	1.151	0.175	0.439	0.736	0.239	0.402	0.174
-1.544	0.690	-0.889	-2.237	0.268	-0.901	-0.913	-0.886

a. The Influence of Digital Transformation on the Growth of MSMEs

The Digital Transformation variable has a regression coefficient value of 0.506 with a calculated t-value of 0.439 and a significance value of 0.736 (> 0.05). This shows that statistically, Digital Transformation does not have a significant partial effect on the growth of MSMEs.

A Beta value (Standardized Coefficients) of 0.175 indicates that every increase of one standard unit in Digital Transformation will increase MSME Growth by 0.175 standard units, but this influence is weak. A Partial Correlation value of 0.402 indicates a moderate correlation between Digital Transformation and MSME Growth after other variables are controlled.

However, because the significance value > 0.05, this effect is considered insignificant at the 95% confidence level.

b. The Influence of Digital Infrastructure on the Growth of MSMEs

The Digital Infrastructure variable has a regression coefficient value of -1.544 with a calculated t-value of -2.237 and a significance value of 0.268 (> 0.05). The negative coefficient shows that statistically, every increase in one unit of digital infrastructure is actually associated with a decrease in the value of MSME growth in this model, although logically it could be influenced by other variables or noise in the data.

A Beta value of -0.889 indicates a fairly strong but negative influence, and a Partial Correlation of -0.913 indicates a very strong negative correlation when other variables are controlled. However, because the significance value > 0.05, this effect is also not statistically significant.

c. Correlation Interpretation

1. Zero-order correlation is a direct correlation between independent and dependent variables without considering other variables.
2. Partial correlation shows correlation after controlling for other variables.
3. Part correlation shows the unique contribution of an independent variable to a dependent variable.

From these results, Digital Infrastructure has a strong negative correlation with MSME growth (zero-order: -0.901), but the t-test results show that it is not statistically significant in this model.

DISSCUSIONS

he study reveals that digital transformation and infrastructure do not significantly affect MSME growth in the examined area. Based on the results of the multiple linear regression test, the significance value of the digital transformation variable was 0.736 and the digital infrastructure was 0.268, both greater than the significance limit of 0.05. This means that, partially, the two independent

variables do not have a significant effect on the growth of MSMEs. The results of the F test (simultaneous) also showed that the regression model was not significant overall, with a significance value of 0.396 (> 0.05), which means that digital transformation and digital infrastructure were simultaneously unable to explain the variance in MSME growth.

This finding is quite interesting considering that much of the previous literature emphasized the importance of digitalization as a driver of MSME performance. Research by Badriyah et al. (2022) and Lubis et al. (2023) shows that the adoption of digital technologies such as e-commerce and digital payment systems can improve efficiency and expand market access. However, the insignificant results in this study may be due to several factors.

First, the very limited number of samples (only 4 valid data from 60 target respondents) reduces the statistical power of the model, making it unable to capture the true relationship. Second, other factors such as managerial quality, access to capital, and local policy support may be more dominant in influencing the growth of MSMEs.

Recent research supports this possibility. A study by (Lu et al., 2023) found that in the context of developing countries, non-technological factors such as financing and organizational capacity are often more influential than digitalization. In addition, negative coefficient values on digital infrastructure indicate the potential for inverse relationships. This is in line with the findings (Li et al., 2022), that without human resource readiness and digital literacy, technology can become a new barrier.

While digital transformation has a positive coefficient, its influence remains weak. This shows that simply adopting technology, without adequate mentoring or training, is not enough to drive business growth (Motyl et al., 2022). In addition, a top-down approach to digitalization programs that does not actively involve MSME actors can lead to failures in implementation (Fauzi et al., 2021).

Thus, the success of MSME digitalization depends not only on infrastructure and technology, but also on human resource readiness, technological relevance, and support for the ecosystem as a whole (Shah et al., 2021).

CONCLUSIONS AND RECCOMENDATIONS

CONCLUSIONS

The findings of this study suggest that digital transformation and digital infrastructure do not have a statistically significant effect on the growth of MSMEs in the examined area. Based on the results of the multiple linear regression test, the significance value of the two variables was above the threshold of 0.05, which shows that partially or simultaneously, these variables are not able to explain the variance in MSME growth in this context.

These findings contradict much of the previous literature that reveals that digitalization plays a crucial role in improving efficiency, expanding markets, and driving the growth of MSMEs. For example, Badriyah et al. (2022) and Lubis et al. (2023) found that digital technologies such as e-commerce and digital financial applications are very helpful for MSMEs to grow. However, this study shows that the impact of digitalization is not universal and is highly dependent on the context of its implementation.

One of the main factors that explains the insignificance of the results is the limited number of samples. With only 4 valid data from 60 target respondents, the statistical power of the model becomes very low. In addition, the latest literature also supports the possibility that in the context of developing countries, non-digital factors such as access to finance, managerial capabilities, and local policy support have a more dominant influence on the growth of MSMEs (Lu et al., 2023).

The negative coefficient of the digital infrastructure variable, although not significant, also indicates the potential for an inverse relationship that is noteworthy. This is in line with the findings (Li et al., 2022), which emphasize that technology without human resource readiness and digital literacy can actually create new obstacles. Technology adoption only has a significant impact if it is in accordance with business capacity and needs (Motyl et al., 2022).

An important implication of this study is that it is not enough to focus on the provision of infrastructure and technology. The success of digital transformation must be accompanied by strengthening human resource capacity, technical assistance, and the partnership government and private sector in creating an ecosystem that supports technology-based growth (Fauzi et al., 2021).

Thus, digitalization is not the only solution for the growth of MSMEs. Its success is largely determined by the internal readiness of MSMEs and integrated external support (Shah et al., 2021).

RECOMMENDATIONS

Reseach findings showing that digital transformation and digital infrastructure do not have a significant effect on the growth of MSMEs in the study area, a number of strategic recommendations can be given for policy improvement, mentoring programs, and further research directions:

1. Expansion and Improvement of MSME Digital Literacy

   The adoption of technology will only have an impact if MSME actors understand how to use it effectively. Therefore, a continuous, needs-based training program is needed, not only introducing technology, but also building practical capacity in the use of digital tools, such as online marketing, digital financial record-keeping, and app-based inventory management (Motyl et al., 2022).

2. Technology-Based Business Mentoring and Consulting

   Support from local governments or private institutions is needed to provide intensive mentoring programs for MSMEs. Digital consultants or business mentors can help develop digital strategies that are aligned with the needs and capacity of each MSME, as suggested by (Fauzi et al., 2021).

3. Integration of Digital Infrastructure Support with Access to Capital

   Digital infrastructure alone is not enough without capital support for technology adoption. Financial assistance programs or technology-based business loans can encourage MSMEs to be more prepared for a comprehensive digital transformation (Lu et al., 2023).

4. Strengthening Multi-stakeholder
   Collaboration Synergy is needed between the government, technology industry players, academics, and MSME associations to create an inclusive digital ecosystem. Programs such as digital hubs, technology-based business incubators, and sharing platforms can be alternatives that accelerate effective and appropriate digital transformation.

Development of Further Research with a Wider Sample and Additional Variables Further research is recommended to use a larger sample count and include other variables such as digital literacy, innovation capacity, and mentoring roles. It is important to understand the factors that really affect the effectiveness of digital transformation in the context of MSMEs more thoroughly

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