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Restrictions on Digital Transformation on Micro and Small Enterprises in Kolaka Regency

Sapriyadi[1]*, Surianto Ilham[2], and Andi Rezah Tenri Zizih[3]

[1] Development Economics, Universitas Sembilanbelas November Kolaka, Southeast Sulawesi, Indonesia
[2] Accounting, Universitas Sembilanbelas November Kolaka, Southeast Sulawesi, Indonesia
[3] Development Economics, Universitas Sembilanbelas November Kolaka, Southeast Sulawesi, Indonesia
* Correspondence: sapriyadi.ansar@gmail.com

Abstract: *The results of the National Digital Transformation Index measurement in Southeast Sulawesi Province in 2022 are 44, indicating that digital transformation is still classified as adequate. Limited technology adoption and innovation in business among micro and small business actors are one of the causes of low performance in the business pillar, which affects the acquisition of the TDN Index score. This study aims to investigate the factors that inhibit the implementation of digital transformation among micro and small business actors in Kolaka Regency. The sample in this study is 106 micro and small business actors with various types of businesses, including culinary, fashion, handicrafts, and agribusiness. Binary logistic regression analysis was used to estimate the inhibiting factors influencing the implementation of digital transformation in micro and small businesses. The study's findings reveal that digital knowledge, digitalization training, and digital transaction security are the primary factors hindering digital transformation among micro and small business actors in Kolaka Regency. Micro and small business actors who are unable to access information and participate in the digital community, have not received digital marketing and financialization training, and have not utilized the official digital transaction system are more likely to remain digitally untransformed. Meanwhile, the availability of digital devices and digital ecosystems does not have a significant influence on digital transformation. These findings recommend strategies to enhance digital transformation for micro and small business actors by focusing on increasing digital literacy and knowledge, continuous digitalization training, and building trust in the security of digital transactions.*

Keywords: Digital Transformation; Internal And External Restriction; Micro And Small Enterprises

JEL: M2, O3

1. INTRODUCTION

The technological surge has disrupted people's lives over the past few years. The use of digital technology plays a central role in decision-making among economic actors. Consumers utilize digital platforms to enhance their satisfaction by discovering various types of goods they prefer (Marzuki & Yasin, 2021), comparing products and their availability, comparing prices, and finding convenience in the payment system (Muniraju & Hariprasad, 2019). Meanwhile, manufacturers are leveraging digital platforms to increase their profits. Through digital marketing platforms, MSMEs can reach a broad market, increase sales, and expand their customer base (Cong et al., 2024; Garmann-Johnsen et al., 2024), thereby enhancing their revenue and business competitiveness (Hardiyansyah et al., 2024).

Although digital technology has penetrated economic interactions, many MSME economic actors in Indonesia still struggle with digital transformation. According to the report issued by INDEF (2024), in 2023, only around 22 million MSMEs, or 33.6% of the total MSMEs, had undergone digital transformation. The challenges faced by MSMEs include digital infrastructure that is not evenly distributed across regions, a lack of knowledge and awareness about technology (Hendrawan et al., 2024), and organizational barriers (Lei et al., 2023). Referring to Sujarwoto & Tampubolon (2016), Internet access inequality in Indonesia continues to widen in all areas, including between urban and rural areas, as well as on remote islands and the mainland. There is even a massive gap in internet usage among people in rural areas (Onitsuka et al., 2018). In

addition, the low level of digital literacy of MSME actors is a result of limitations and difficulties in adapting to digital technology as well as concerns about digital security (Trisninawati & Sartika, 2024).

Various efforts are being made to accelerate digital transformation in response to achieving digital development goals towards a Golden Indonesia 2045. The Government of Indonesia, through the Ministry of Communication and Digital of the Republic of Indonesia (Komdigi), developed the National Digital Transformation Index (TDN) to measure the overall condition and progress of digital transformation.

Figure 1. Results of the National Digital Transformation Index in 2022
Source: Ministry of Communication and Digital of the Republic of Indonesia & LPEM FEB UI, 2024

The results of the National Digital Transformation Index measurement, published by the Ministry of Digital Communication of the Republic of Indonesia and LPEM FEB UI (2024), indicate that in 2022, Indonesia's TDN index score was 49.2, classifying digital transformation as C (adequate). When viewed based on the score of each pillar, digital transformation in the business pillar ranks lowest compared to other pillars. The score in the business pillar is only 39.12, indicating that the use of technology in economic sectors is not fully optimized. The limited adoption of digital technology by MSME actors, as well as low business innovation, are the primary causes of low performance in the business pillar and can impact the overall score of the National Digital Transformation (TDN) index.

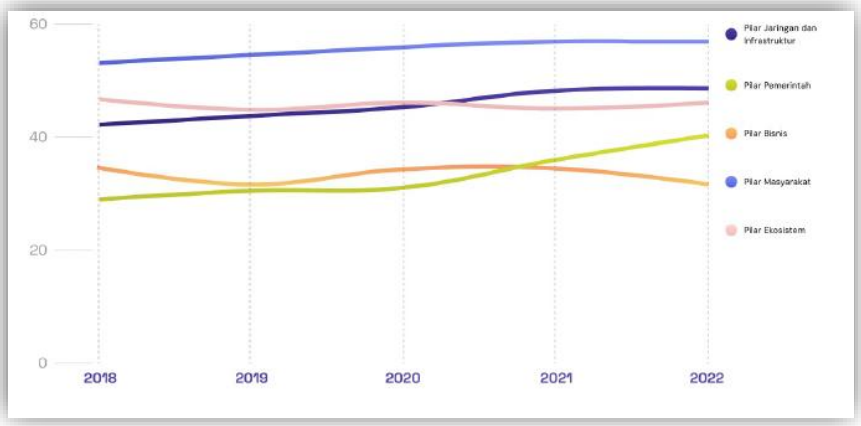

Figure 2. Development Trends of the TDN Index of Southeast Sulawesi Province
Source: Ministry of Communication and Digital of the Republic of Indonesia & LPEM FEB UI, 2024

Southeast Sulawesi Province is one of the regions with a relatively low TDN index score compared to other provinces on the island of Sulawesi. This suggests that efforts are still required to enhance digitalization across all sectors, including the economic sector. In 2022, the TDN index

score in Southeast Sulawesi was 44, indicating that it remains in the C (adequate) classification. The business pillar still ranks lowest compared to the other pillars, suggesting that a strong boost is still needed in aspects of the business environment, capital inflow, and the utilization of digital tools for businesses.

The movement of the TDN Index score in the business pillar, which tends to be stagnant, indicates that there is still a need for improvement efforts. This can be achieved by first identifying the inhibiting factors that affect the implementation of digital technology and business innovation among micro- and small-business actors. The identification carried out serves as the basis for local governments to design more targeted strategies and policies by regional conditions and needs, thereby accelerating digital transformation. In this regard, the research to be conducted highlights the urgency.

Numerous previous researchers have conducted research related to the digital transformation of MSMEs in Indonesia. Based on a search of several papers in the SINTA 1-4 database, it was found that the factors that inhibit digital transformation in MSMEs include digital leadership (Ferdiansyah & Tricahyono, 2023; Lestari & Choirunnisa, 2025), Digital Marketing and Finance Implementation (Amalia et al., 2024; Telagawathi et al., 2022), Weak business management (Pradesa et al., 2023), and a culture that resists change (Sisilianingsih et al., 2023). Most previous research has examined the obstacles to digital transformation from the internal aspects of MSMEs, while obstacles from the external elements have received less attention. External factors, such as digitalization training and partnerships from various elements of the digital ecosystem, are necessary to meet the needs of MSMEs sustainably in the future (Asrol et al., 2022; Hasan et al., 2021).

The novelty of this research conceptually is to examine the inhibiting factors that affect the implementation of digital transformation in micro and small businesses by looking at internal and external aspects simultaneously. A comprehensive approach has advantages because it encourages a deeper understanding of the difficulties of micro and small businesses in implementing digital technology and business innovation. This approach can also encourage closer synergy and collaboration among producers, consumers, and governments in developing a strong and sustainable digital ecosystem. In addition, this study also examines the obstacles to digital transformation not only in physical infrastructure but also in the capacity of human resources, namely micro and small business actors.

In addition, most previous studies have employed qualitative methods and literature reviews to identify the factors that hinder the digital transformation of MSMEs (Aisyah et al., 2023; Bahasoan et al., 2024; Ferdiansyah & Tricahyono, 2023). The novelty of this research from a methodological perspective lies in the use of a quantitative model with a nonlinear regression analysis technique, specifically the binary logistic regression model. This method is still rarely used to estimate the inhibiting factors that affect the implementation of digital transformation in micro and small businesses.

Kolaka Regency was chosen as the location for the study, referring to the findings of Sabaruddin et al (2024) which revealed that micro and small business actors in Kolaka Regency still have low levels of digital literacy and a lack of business innovation and creativity. This study aims to find out the inhibiting factors that affect the implementation of digital transformation in micro and small businesses in Kolaka Regency, as one of the regions in Southeast Sulawesi Province that has a low level of digital literacy and a lack of business innovation and creativity. In addition, the factors inhibiting digital transformation in Kolaka Regency are important to study, referring to data from the Southeast Sulawesi Information and Data Management System, Kolaka Regency is one of the regions with the highest number of MSME actors. However, the high number of MSMEs has not been balanced with the level of digital literacy. This condition has the potential to hinder the adoption of digital technology in business activities, limit market access, reduce competitiveness, and threaten sustainability and MSMEs in the midst of an increasingly competitive digital economy. Therefore, research that systematically identifies and analyzes the factors that inhibit digital transformation in Kolaka Regency is crucial. The identification carried out is the basis for local governments to design more targeted strategies and policies in accordance

with conditions and needs in order to accelerate digital transformation.

2. LITERATURE REVIEW

2.1. Digital Knowledge and Digital Transformation

Digital knowledge is the primary foundation for digital transformation. Micro and small business actors with a good understanding of how to find information, use software, and interact in the digital community will be better equipped and motivated to undertake digital transformation. The emphasis on digital literacy as a driving force for digital transformation in small and medium enterprises is crucial, especially in the era of technological disruption like today (Destrian, 2025). Studies conducted by Zhao et al. (2024) revealed that digital literacy among companies, including employees, plays a crucial role in successful digital transformation. Digital knowledge makes a significant contribution to digital business transformation, as it enables companies to leverage and integrate business data more effectively (Raharjo et al., 2024; Xicang et al., 2024).

2.2. Digital Infrastructure and Digital Transformation

Digital transformation for micro, small, and medium enterprises will not be realized without the availability of a strong digital infrastructure. This infrastructure encompasses hardware, software, and a high-speed telecommunications network. Studies have found that digital infrastructure can encourage companies to transform digitally, as it helps them minimize production costs and improve technical skills. Digital infrastructure can increase the use of digital technology. As a foundation in the digital economy, it facilitates the production process, making it easier and faster, thereby increasing productivity (T. Zhao & Duan, 2025). The success of digital transformation will not only be measured by the extent to which new technology is adopted but also by how inclusive and equitable the infrastructure that supports it is.

2.3. Digitalization Training and Digital Transformation

The success of digital transformation for micro, small, and medium enterprises depends on the development of their human resource capabilities. Digitalization training can equip MSMEs with the knowledge and skills necessary to leverage digital technology and enhance business competitiveness. Studies conducted by Coco et al. (2024) highlight the crucial role of training and networking in promoting the adoption of digital technology by MSMEs. Digital skills development through training for various groups, including employees, can foster opportunities for collaboration among stakeholders, thereby facilitating the digital transformation process (Brunetti et al., 2020). Meanwhile, most micro businesses are experiencing difficulties in digital transformation due to factors such as resistance to change and skills gaps (Agustin et al., 2024). Micro and small business actors who have participated in digitalization training, particularly in digital marketing and finance, tend to have a better practical understanding of the benefits of digital technology. This training provides not only knowledge but also the skills needed to implement digital technology, thereby providing opportunities to increase the success of digital transformation.

2.4. Digital Ecosystem and Digital Transformation

The success of digital transformation for micro, small, and medium-sized enterprises is also determined by how actively they interact and participate in the broader digital ecosystem. The deeper the integration of the digital ecosystem, the greater the opportunity for digital transformation (Oberländer et al., 2025). Digital transformation strategies necessitate an understanding of the digital economy and the development of a digital ecosystem (Vinh & Linh, 2022). The integration and synergy of various elements within the digital ecosystem are indispensable for ensuring the sustainable development of MSME digital transformation.

2.5. Digital Transaction Security and Digital Transformation

The security of digital transactions greatly determines the decision of micro and small business actors to adopt digital technology. Studies conducted by Rupeika-Apoga & Petrovska (2022) show that the most critical obstacle for MSMEs is the issue of digital security. Data security issues continue to be a challenge for MSMEs in adopting digital technology, as they raise concerns about data breaches and the theft of sensitive information (Hariyanti & Kristanti, 2024;

Manapa Sampetoding & Er, 2024). The importance of security and practices in digital transactions can reduce the risk of data and financial loss, and build a stronger foundation for adopting digital systems, including financial technology systems (Febriyani et al., 2024).

3. METHOD

3.1. Types and Locations of Research

This study employs a quantitative, descriptive, and explanatory approach. A descriptive approach is used to present and summarize data collected from micro and small business actors in Kolaka Regency. The characteristics of the data described included the type of respondent's business, respondent demographics (such as age and gender), and a description of the research variables. Meanwhile, the explanatory approach is used to identify the inhibiting factors that affect the implementation of digital transformation in micro and small businesses, encompassing both internal and external factors. This research was conducted in Kolaka Regency, Southeast Sulawesi Province.

3.2. Sampling Technique

The sampling technique in this study uses a purposive sampling approach, which is sample selection based on the researcher's assessment (Firmansyah & Dede, 2022). The respondents were selected based on the criteria set by the researcher, namely micro and small business actors registered with the Cooperatives, Small and Medium Enterprises Office of Kolaka Regency with various types of businesses such as culinary, handicrafts, fashion, and agribusiness. The number of samples in this study is 106 people, this number has met the minimum sample criteria needed in logistic regression analysis if the sample size is large (Thoriq et al., 2018). The number of samples of 106 respondents was determined based on the methodological considerations of binary logistics regression, where the minimum number of respondents was 50-100 people. Thus, the number of 106 respondents has met and is representative.

3.3. Data Types and Sources

This study uses secondary data and primary data. Secondary data was obtained from the Kolaka Regency Small and Medium Business Cooperative Office. The secondary data needed is in the form of a list of micro and small businesses in Kolaka Regency. The primary data was obtained from the results of filling out questionnaires conducted by the researcher to the respondents. The questionnaire instrument was developed through a conceptual adaptation and contextual reconstruction approach, as well as an instrument using binary indicators.

3.4. Research Variables

This study uses response variables and predictor variables. The response variable used is the implementation of digital transformation, which encompasses the utilization of various digital technologies, including both software and hardware, within a business. The response variable uses a nominal scale with two categories (binary): 1 = not yet digitally transformed, 0 = digitally transformed. This study employed five predictor variables, each measured on a nominal scale of categories. Digital knowledge (1 = not yet able to find information and participate in the digital community, 0 = other), digital devices (1 = not yet have digital devices and internet access, 0 = other), digitalization training (1= not yet enrolled in marketing and financial digitalization training, 0 = other), digital ecosystem (1 = not yet connected to banking institutions and digital society, 0 = other), digital transaction security (1= not yet using the digital official transaction system, 0 = other).

3.5. Data Analysis Techniques

The analysis method used in this study is logistic regression, which is employed to determine whether the predictor variable can predict the likelihood of the response variable occurring. For dichotomous response variables with a nominal scale of two categories, the model used is binary logistic regression. According to Agresti (2013), the probability function of the response variable in logistic regression is shown in the following equation:

$$f(y_i) = \pi_i^{y_i} = (1 - \pi_i)^{1-y_i} \quad [1]$$

Where π_i The probability of the occurrence of i and y_i, and the random variable i

consisting of 0 and 1. The binary logistic regression equation model with five predictor variables is as follows:

$$\pi(x) = \frac{\exp(\beta_0+\beta_1x_1+\beta_2x_2+\beta_3x_3+\beta_4x_4+\beta_5x_5)}{1+\exp(\beta_0+\beta_1x_1+\beta_2x_2+\beta_3x_3+\beta_4x_4+\beta_5x_5)} \quad [2]$$

Where $\pi(x)$ is the probability of occurrence of an event Y = 1 with a probability value $0 \leq \pi(x) \leq 1$. Equation [2] is performed with a logit transform to make it easier to estimate the parameters as follows:

$$g(x) = ln\left[\frac{\pi(x)}{1-\pi(x)}\right] = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 \quad [3]$$

3.6. Goodness of Fit Test

The goodness-of-fit test aims to assess the model's fit to the data. Hypotheses used in this test are H0: the model corresponds to the data (there is no difference between the observation results and the predicted results of the model) and H1: the model does not correspond to the data (there is a difference between the observation results and the predicted results of the model). The statistical tests used are as follows, (Nurmin et al., 2022):

$$\hat{C} = \sum_{k=1}^{g} \frac{(O_k-n_k\bar{\pi}_k)^2}{n_k\bar{\pi}_k(1-\bar{\pi}_k)} \quad [4]$$

The null hypothesis (H0) is rejected if $\hat{C} > X^2_{(a,g-2)}$ or $p - value < \alpha$.

3.7. Simultaneous Test

Simultaneous tests were used to determine the contribution of the predictor variables together to the response variables. The hypothesis used is H0: $\beta_1 = \beta_2 = \beta_k = 0$, and H1: $\beta_k \neq 0; k = 1,2 \dots, k$. Simultaneous tests were carried out using the likelihood ratio test. The statistical tests used were:

$$G = -2ln\left[\frac{(\frac{n_1}{n})^{n_1}(\frac{n_0}{n})^{n_0}}{\prod_{i=1}^{n}\hat{\pi}_i^{y_i}(1-\hat{\pi}_i)^{1-y_i}}\right] \quad [5]$$

Null hypothesis (H0) rejected if $G > X^2_{(db,a)}$ or $p - value < \alpha$.

3.8. Partial Test

Partial tests were used to determine the contribution of each predictor variable to the response variable. The hypothesis used is H0: $\beta_i = 0, i = 1,2 \dots, k$, and H1: $\beta_i \neq 0, i = 1,2 \dots, k$. Partial tests are performed using the Wald Test. The statistical tests used were:

$$W = \frac{\hat{\beta}_J}{SE(\hat{\beta}_J)} SE(\hat{\beta}_J) = [var(\hat{\beta}_J)]^{1/2} \quad [6]$$

Null hypothesis (H0) rejected if $W > Z_{a/2}$ or $p - value < \alpha$.

To facilitate the calculation of parameter estimation, the SPSS statistical software application, version 25, is used.

4. RESULTS AND DISCUSSION

4.1. Results

4.1.1 Descriptive Statistical Analysis Results

Descriptive statistical analysis of respondents was used to present and summarize data collected from micro and small business actors in Kolaka Regency. The characteristics of the sample described included respondents' business types, respondent demographics such as age and gender, and descriptions of research variables comprising digital transformation, digital knowledge, digital devices, digitalization training, digital ecosystem, and digital transaction security. Descriptive analysis is a crucial first step before conducting binary logistic regression analysis. The following are the results of descriptive data analysis.

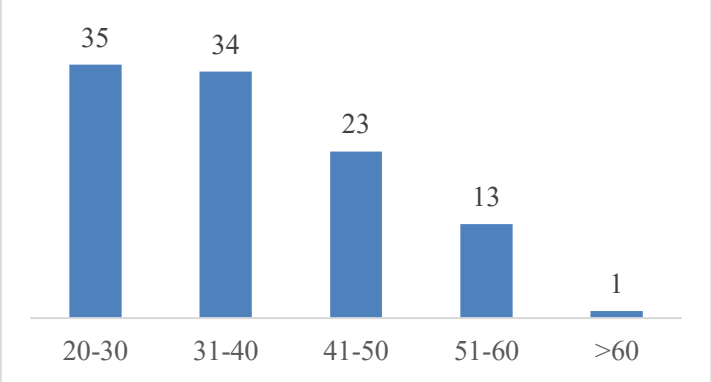

Figure 3. Respondent Age
Source: Primary Data Processing, 2025

Figure 3 presents the frequency distribution of respondents by age group. It can be seen that most respondents are micro and small business actors in the age ranges of 20-30 years and 31-40 years, with a total of 35 and 34 people in each category. The 41-50 year old age group ranks third, with 23 people, and the 51-60-year-old group has the fourth-highest number of respondents, at 13 people. The age group of 60 years and above has the fewest number of respondents, with only one person. Overall, the data showed that the respondents in this study were predominantly middle-aged, with an age range of 20 to 40 years.

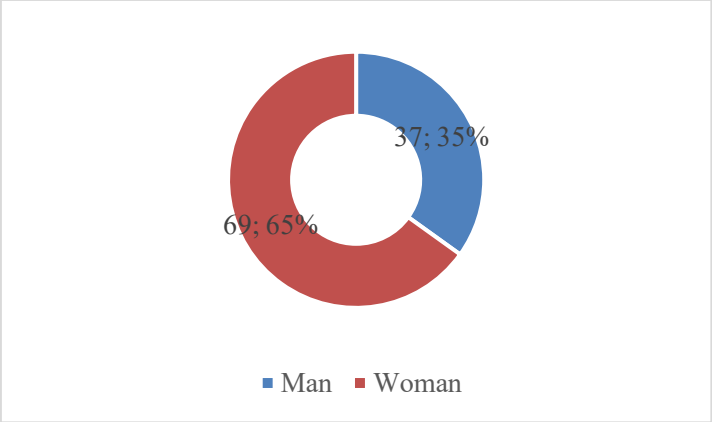

Figure 4. Respondent Gender
Source: Primary Data Processing, 2025

Figure 4 illustrates that the number of female micro and small business actors is significantly higher than that of male micro and small business actors. This can be seen in the graph, where the number of female respondents is 69 people, or 65%, while the number of male respondents is 37 people, or 35%.

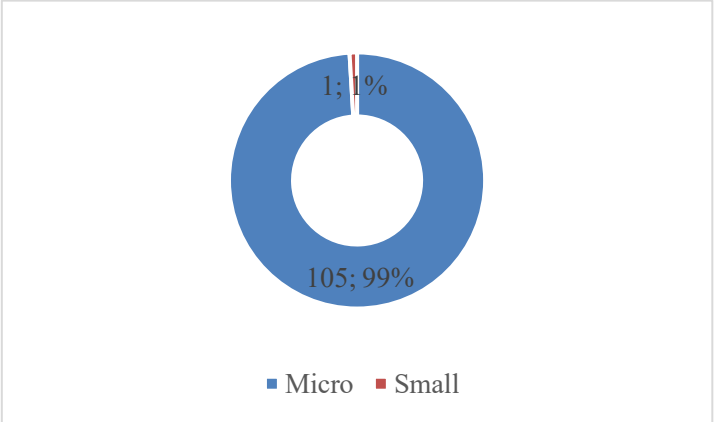

Figure 5. Respondents' Business Criteria
Source: Primary Data Processing, 2025

Figure 5 shows that the majority of respondents are engaged in the micro business segment. This can be seen from the number of respondents who have micro businesses, which is much more dominant than the number of respondents with small businesses. The number of respondents who own micro businesses is 105 people, or 99% of the total respondents, while in small businesses, there is only one person or 1% of the total respondents.

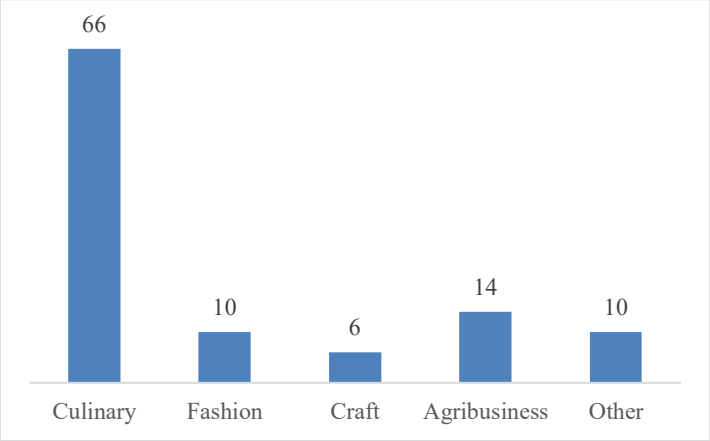

Figure 6. Respondent's Business Type
Source: Primary Data Processing, 2025

Figure 6 shows that most respondents have businesses in the culinary sector, with a very dominant number of 66 people. The culinary businesses engaged in by the respondents include various snacks, cakes, and regional foods and drinks. The number of respondents with businesses in the fashion sector is 10 people, including those engaged in sewing clothes, hijab reselling, and selling children's and adult clothing. The respondents have a business in the field of handicrafts, with six people involved. The handicraft business engaged by the respondents is a bouquet. The number of respondents with businesses in the agribusiness sector is 14 people. These businesses are involved in various activities, including hydroponics and the production of palm sugar. Respondents who have businesses in other types of business categories are 10 people. Businesses in this category include laundry services.

Table 1. Results of Descriptive Statistical Analysis of Variables

		Frequency	Percent	Parameter Coding (1)
Digital Transformation	Not yet digitally transformed	51	48.1	1
	Digitally transformed	55	51.9	0
Digital Knowledge	Not able to find information and participate in digital communities	67	63.2	1
	Other	39	36.8	0
Digital Devices	Don't have a digital device and internet access yet	12	11.3	1
	Other	94	88.7	0
Digitalization Training	Have not attended the marketing and finance digitalization training	88	83.0	1
	Other	18	17.0	0
Digital Ecosystem	Not yet connected to banking institutions and the digital society	84	79.2	1
	Other	22	20.8	0
Digital Transaction Security	Not yet using the official digital transaction system	48	45.3	1
	Other	58	54.7	0

Valid	106	100.0
Missing	0	
Total	106	

Source: Primary Data Processing, 2025

Table 1 presents the results of the descriptive statistical analysis of the variables used in the study. The table shows that among micro and small business actors in Kolaka Regency, those who have digitally transformed are 51.9% or 55 people. However, there are still micro and small business actors who have not or have not transformed digitally, namely 48.1% or 51 people. These results show that almost half of the study respondents are still in the early stages of digital technology adoption. The majority of micro and small business actors are still unable to find information and participate in the digital community, namely 63.2% or 67 people; only 36.8% or 39 people possess adequate digital knowledge, enabling them to locate information and join the digital community to support their business. This suggests that significant challenges remain in terms of digital literacy, a crucial foundation for the success of digital transformation. Most micro and small business owners already have digital devices and internet access, which is the case for as many as 88.7% or 94 of people. Only 11.3% or 12 people do not have digital devices or internet access. This data shows that the availability of digital infrastructure and devices is quite adequate; therefore, the challenges ahead lie in the aspects of knowledge and utilization of these digital devices. Most micro and small business actors did not participate in or had not participated in digital marketing and financial training, namely 83% or 88 people. Only 17% or 18 people have participated in digitalization training. This data is quite consistent; a lack of training can have an impact on low digital knowledge, and in turn, can hinder micro and small business actors from undergoing digital transformation. The majority of micro and small business actors are not or have not been connected to banking institutions and digital society, namely 79.2% or 84 people. Only 20.8% or 22 people are already connected to banking institutions and the digital society. This suggests that the integration and synergy of various digital ecosystem elements have not been successful. As many as 54.7% or 58 micro and small business actors have used the official digital transaction system. Meanwhile, 45.3% or 48 people still do not use it. This data shows that the adoption of digital transaction systems is quite good, although some micro and small business actors still face obstacles in using these systems.

4.1.2. Goodness of Fit Test Results

The goodness-of-fit test in binary logistic regression aims to assess how well the model explains the existing data, in the sense of determining whether the logistic regression model formed is consistent with the observational data. This test is crucial to ensure that the results of the logistic regression analysis are reliable and the interpretation is valid, in the sense that it accurately represents the relationship between the predictor variable and the response variable. In this study, two methods were employed to assess the model's feasibility: the Hosmer-Lemeshow Test and the classification table. The results of the model feasibility test are presented in the following table.

Table 2. Hosmer-Lemeshow Test Results

Hosmer and Lemeshow Test			
Step	**Chi-square**	**df**	**Sig.**
1	1.444	6	.963

Source: Primary Data Processing, 2025

The Hosmer and Lemeshow test in Table 2 compares the frequency of actual observations with the frequency expected by the model. The table shows a Chi-square value of 1.444, a degree of freedom (df) value of 6, and a significance value (Sig.) of 0.963. Because the significance value (Sig.) is greater than the alpha level (0.05), it can be concluded that the observational data support the logistic regression model used. In a sense, there is no significant difference between the frequency of actual observations and the frequency predicted by the model.

Table 3. Classification Table Results

Classification Table					
		Observed	Predicted Digital Transformation		Percentage Correct
			Digitally transformed	Not yet digitally transformed	
Step 1	Digital Transformation	Digitally transformed	50	5	90.9
		Not yet digitally transformed	8	43	84.3
	Overall Percentage				87.7

Source: Primary Data Processing, 2025

Table 3 presents the logistic regression model's ability to classify observations accurately. The classification table shows that out of 55 micro and small business actors who have undergone digital transformation, the model correctly predicted as many as 50 respondents, achieving a prediction accuracy rate of 90.9%. Of the 51 micro and small business actors who had not yet digitally transformed, the model correctly predicted as many as 43 respondents, achieving a prediction accuracy rate of 84.3%. Overall, this model predicts classification with an accuracy rate of 87.7%, regardless of whether the data is digitally transformed or not. Thus, the logistics regression model made has a relatively good predictive ability.

4.1.3. Simultaneous Test Results

Simultaneous testing in binary logistic regression aims to determine whether all predictor variables together have a significant influence on the response variable, assessing the significance of the model as a whole rather than examining it partially. In this study, simultaneous testing using an omnibus test of model coefficients and a summary model table of Nagelkerke R-squared is presented. The results of the test for the two methods are shown in the following table.

Table 4. Omnibus Tests of Model Coefficients Results

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	83.321	5	.000
	Block	83.321	5	.000
	Model	83.321	5	.000

Source: Primary Data Processing, 2025

The results of the omnibus test of model coefficients in Table 4 compare models that do not include predictive variables with models that do, to see if the addition of predictive variables can significantly improve the model's predictive ability. The table shows the Chi-square value is 83.321, the degrees of freedom (df) value is 5, and the significance value (Sig.) is 0.000. Since the significance value (Sig.) is smaller than the alpha level (0.05), it can be concluded that the overall logistic regression model is significant. In a sense, the predictive variables in the model, which include digital knowledge, digital devices, digitalization training, digital ecosystems, and digital transaction security, simultaneously have a significant influence on the digital transformation response variables. Thus, it can be concluded that models incorporating predictive variables are more effective at predicting outcomes than models that do not include these variables.

Table 5. Summary Model Analysis Results

Model Summary			
Step	**-2 Log likelihood**	**Cox & Snell R Square**	**Nagelkerke R Square**
1	63.476[a]	.544	.726

Source: Primary Data Processing, 2025

The summary model table measures the extent to which variation in the response variable —namely, digital transformation —can be explained by the predictor variables in the model. Table 5 displays the Nagelkerke R-squared value of 0.726, corresponding to 72.6%. The predictor variables of digital knowledge, digital devices, digitalization training, digital ecosystem, and digital transaction security can explain the variation in the digital transformation response variables. A value of 0.726 also means that the predictor variable has a strong relationship to the response variable.

4.1.4. Partial Test Results

Partial testing in binary logistic regression aims to determine whether each predictor variable partially has a significant influence on the response variable. In this study, partial testing uses the Wald Test presented in the following table.

Table 6. Wald Test Results

Variables in the Equation									
								95% C.I.for EXP(B)	
		B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Step 1[a]	Digital Knowledge	1.961	.769	6.499	1	.011	7.106	1.573	32.089
	Digital Devices	2.204	1.256	3.079	1	.079	9.063	.773	106.274
	Digitalization Training	2.998	1.299	5.327	1	.021	20.052	1.572	255.818
	Digital Ecosystem	-.665	.860	.599	1	.439	.514	.095	2.772
	Digital Transaction Security	3.668	.837	19.197	1	.000	39.187	7.594	202.205
	Constant	-5.447	1.543	12.468	1	.000	.004		

Source: Primary Data Processing, 2025

The results of the Wald test in Table 6 show that the significance value (Sig.) of the digital knowledge variable, 0.011, is smaller than the alpha level (0.05). This suggests that the digital knowledge variable has a partial and significant effect on the digital transformation variable. The significance value (Sig.) of the digital device variable, 0.079, is greater than the alpha level (0.05). This means that the digital device variable does not have a significant effect on the digital transformation variable. The significance value (Sig.) of the digitization training variable, 0.021, is smaller than the alpha level (0.05). This means that the digitization training variable has a partial and significant effect on the digital transformation variable. The significance value (Sig.) of the digital ecosystem variable, 0.439, is greater than the alpha level (0.05). This indicates that the digital ecosystem variable does not have a significant effect on the digital transformation variable. The significance value (Sig.) of the digital transaction security variable, 0.000, is smaller than the alpha level (0.05). This means that the digital transaction security variable has a partial and significant effect on the digital transformation variable.

We can develop a binary logistic regression model based on predictor variables that have a significant impact on the following response variable.

$$\pi_i = \frac{\exp(\beta_0+\beta_1 x_1+\beta_3 x_3+\beta_5 x_5)}{1+\exp(\beta_0+\beta_1 x_1+\beta_3 x_3+\beta_5 x_5)} = \frac{e^{\beta_0+\beta_1 x_1+\beta_3 x_3+\beta_5 x_5}}{1+e^{\beta_0+\beta_1 x_1+\beta_3 x_3+\beta_5 x_5}} \quad [7]$$

$$\pi_i = \frac{\exp(-5{,}447+1{,}961x_1+2{,}998x_3+3{,}668x_5)}{1+\exp(-5{,}447+1{,}961x_1+2{,}998x_3+3{,}668x_5)} = \frac{e^{-5{,}447+1{,}961x_1+2{,}998x_3+3{,}668x_5}}{1+e^{-5{,}447+1{,}961x_1+2{,}998x_3+3{,}668x_5}}$$

The odds ratio value in table 6 is shown by the value of Exp(B). The odds ratio value of the digital knowledge variable was 7.106, this shows that micro and small business actors who are not able to find information and participate in the digital community have a 7.106 times greater chance of not transforming digitally compared to respondents who are already able to seek information and participate in the digital community. The variable odds ratio value of digitalization training was 20.052, this means that micro and small business actors who have not participated in marketing and financial digitalization training have a 20.052 times greater chance of not going digitally transformation compared to respondents who have participated in digitalization training. The odds ratio value of the digital transaction security variable is 39.187, this shows that micro and small business actors who have not used the digital official transaction system have a 39.187 times greater chance of not transforming digitally compared to respondents who have used the digital official transaction system.

4.2. Discussion

4.2.1. The Influence of Digital Knowledge on Digital Transformation

The results of binary logistics regression analysis show that digital knowledge has a significant effect on digital transformation, in other words, low digital knowledge will reduce opportunities for micro and small business actors to digitally transform. The results of this study are in line with the results of the study by Kokolek et al (2019) which identifies key factors impacting the successful implementation of digital transformation in private companies in Croatia. The study found that digital knowledge and skills greatly improve the digital transformation process in private companies. On the other hand, companies, including small businesses, have fundamental challenges in mastering digital transformation as a result of a lack of digital knowledge and capabilities, lack of awareness of digitalization and limited resources (Chen et al., 2021; Wolf et al., 2018). Another study comes from Li et al (2023) which investigates the role of knowledge in the digital transformation process of SMEs. The findings reveal that knowledge empowerment plays an important role in the digital transformation of SMEs, integration and knowledge sharing for SMEs increases the effectiveness of SMEs in achieving digital transformation. Limited digital knowledge can be a major obstacle for MSMEs on the journey to successful digital transformation (Arjang et al., 2025; Bahasoan et al., 2024). Therefore, digital knowledge is the main foundation for the adoption of digital technology. Micro and small business actors with a good understanding of how to find information, use software, and interact in the digital community will be better prepared and motivated to carry out digital transformation.

Most of the micro and small business actors in Kolaka Regency, who are respondents in this study, still lack an in-depth understanding and skills in using social media and digital marketplace platforms for business purposes. The tendency of micro and small business actors to still rely on hereditary knowledge from their families means they are still reluctant to try new things. They are comfortable with the old ways, which are considered to have proven effective. They may not be aware of the great potential of social media and other digital platforms to grow their businesses. They view social media primarily as a personal communication tool, rather than as a means to develop businesses, such as identifying new business ideas, finding target customers, and creating attractive products through research. If this condition persists, micro and small business actors with limited digital knowledge will face increased competition from those who are more innovative in utilizing digital platforms, such as social media and marketplaces, to develop their businesses. On the other hand, their companies tend to be stagnant and struggle to adapt to changing market trends and consumer behavior.

4.2.2. The Effect of Digitalization Training on Digital Transformation

The results of binary logistics regression analysis show that digitalization training has a significant effect on digital transformation, in other words, the lack of digitalization training will reduce opportunities for micro and small business actors to digitally transform. The results of this study are in line with the findings of Coco et al (2024) which investigates the factors that facilitate the digital transformation process of MSMEs. The findings of the study emphasize the important role of training and networking in encouraging the adoption of digital technology for MSMEs. Digital skills development through training to several groups including employees can encourage the creation of opportunities for cooperation among stakeholders to encourage the digital transformation process (Brunetti et al., 2020). Meanwhile, most micro businesses are experiencing difficulties in digital transformation due to factors such as resistance to change and skills gaps (Agustin et al., 2024). Limited digital skills among MSME actors and employees are often an obstacle for MSMEs to transform digitally (Darmeinis, 2024). Micro and small business actors who have participated in digitalization training, particularly marketing and finance digitalization training, tend to have a better practical understanding of the benefits of digital technology. This training not only provides knowledge, but also the skills needed to implement digital technology so as to provide opportunities to increase the success of digital transformation.

Most of the micro and small business actors in Kolaka Regency, who are respondents in this study, still do not participate in digitalization training, including both digital marketing and financial training. In terms of marketing, most of them still rely on traditional, conventional methods of running a business, such as marketing products by opening a store, setting up stalls in crowded areas, displaying products in large stores, or selling directly from their homes. This limits their products to being known only to people in the local business area, so the opportunity to reach a broader market, such as outside the city or the island, becomes very small. They have not effectively utilized digital marketing platforms, such as social media and marketplaces, to efficiently reach the market. Likewise, in terms of finance, most micro and small business actors still use conventional methods. Business capital still relies heavily on personal funds, and the recording of financial statements often involves manual bookkeeping or is not recorded at all. This makes it difficult for micro and small businesses to monitor their cash flow, determine the cost of goods sold, and calculate profits. The lack of understanding and training about digitalization, both in marketing and finance, has an impact on the low opportunities for digital transformation for micro and small business actors. In fact, by adopting digital marketing and financial technology, they can expand their market reach, increase operational efficiency, and, in turn, enhance their revenue and business competitiveness in an increasingly competitive digital era (Sapriyadi et al., 2023).

4.2.3. The Effect of Digital Transaction Security on Digital Transformation

The results of binary logistics regression analysis show that digital transaction security has a significant effect on digital transformation, in other words, the lack of digital transaction security will reduce opportunities for micro and small business actors to digitally transform. The results of this study are in line with the findings of Rupeika-Apoga & Petrovska (2022) which investigates the main obstacles to sustainable digital transformation for MSMEs. The findings of the study show that the most important obstacle for MSMEs is the issue of digital security. Data security issues are still a challenge for MSMEs in adopting digital technology because they raise concerns about data breaches and theft of sensitive information (Hariyanti & Kristanti, 2024; Manapa Sampetoding & Er, 2024). The important role of security and practices in digital transactions can reduce the risk of data and financial loss and build a stronger foundation for adopting digital systems, including the adoption of financial technology systems (Febriyani et al., 2024). Thus, security and privacy aspects are important considerations for MSMEs in adopting technology (Arestha et al., 2025).

Most micro and small business actors in Kolaka Regency have utilized official digital transaction systems, including digital banking services in the form of mobile banking applications and QRIS non-cash payment systems. However, some respondents from micro and small businesses in this study have not yet switched to a digital transaction system. They still rely on

cash transactions. Some of the reasons why micro and small business actors are hesitant to adopt it are due to security concerns. They are concerned about the safety of their personal and financial data, and they fear falling victim to online fraud.

Additionally, a small percentage of respondents believe that using digital transactions is complicated, and not all customers can utilize them. Cash transactions, on the other hand, make it difficult for micro and small business actors to maintain a clear transaction record because there is no transaction receipt. This makes it difficult for micro and small business actors to monitor profits and losses regularly. Therefore, the security of digital transactions greatly determines the decision of micro and small business actors to adopt financial technology.

5. CONCLUSION AND SUGGESTION

CONCLUSION

Overall, this study found that digital knowledge, digitalization training, and digital transaction security are the main factors inhibiting digital transformation for micro and small business actors in Kolaka Regency. Micro and small business actors who are unable to access information and participate in the digital community, have not received digital marketing and financialization training, and have not utilized the official digital transaction system are more likely to remain digitally untransformed. Meanwhile, the availability of digital devices and digital ecosystems does not have a significant influence on digital transformation.

SUGGESTION

This study recommends strategies to enhance digital transformation in micro and small enterprises in Kolaka Regency, with a focus on improving digital literacy and knowledge, providing continuous digitalization training, and fostering trust in the security of digital transactions.

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REFERENCE

Agresti, A. (2013). *Categorical Data Analysis Third Edition*. John Wiley & Sons Inc.

Agustin, N., Hidalgo, D. T., & Morante, B. J. (2024). Challenges in Digital Transformation of Microenterprises in Nueva Ecija: A Basis for Risk Management Plan. *Journal of Economics, Management and Trade*, *30*(4), 13–26. https://doi.org/10.9734/jemt/2024/v30i41201

Aisyah, S., Rokan, M. K., & Putri, F. (2023). Analisa Faktor yang Mempengaruhi Penerapan Transformasi Digital UMKM Kota Dumai SKR dan Syauqi (Studi Perbandingan). *ISOQUANT : Jurnal Ekonomi, Manajemen Dan Akuntansi*, *7*(2), 229–240. https://doi.org/10.24269/iso.v7i2.2294

Amalia, F., Dyah, A., Citraresmi, P., Rucitra, A. L., Mustaniroh, S. A., & Kartikaningrum, W. (2024). Pengaruh faktor-faktor resiliensi terhadap kesiapan transformasi digital di UKM. *Jurnal Teknologi Industri Pertanian*, *18*(1), 67–78. https://doi.org/10.21107/agrointek.v18i1.17527

Arestha, R., Afifah, N., & Mastaruddin. (2025). Mendorong Transformasi Digital UMKM : Analisis Faktor-Faktor Yang Memengaruhi Niat Adopsi Fintech di Indonesia. *Jurnal Manajemen Terapan Dan Keuangan*, *14*(2), 948–961. https://online-journal.unja.ac.id/mankeu/article/view/44970

Arjang, A., Wadu, R. M. B., & Kraugusteeliana, K. (2025). Mengakselerasi Daya Saing UMKM melalui Inovasi Teknologi: Peran Strategis Literasi Digital Masyarakat dalam Mewujudkan Ekosistem Ekonomi Berbasis Platform. *Jurnal Minfo Polgan*, *14*(2), 1608–1618. https://doi.org/10.33395/jmp.v14i2.15190

Asrol, S., Lidyah, R., Hartini, T., & Muhammadinah, M. (2022). Peran Percepatan Transformasi Digital untuk Keberlanjutan Bisnis dan Pemulihan Ekonomi Pelaku UMKM di Kota Palembang

Pascapandemi. *Jurnal Intelektualita: Keislaman, Sosial Dan Sains*, *11*(2), 242–246. https://doi.org/10.19109/intelektualita.v11i2.14685

Bahasoan, A. N., S, Q. N., Wahdaniah, B, I., & Azis, M. S. (2024). Transformasi Digital pada UMKM : Penggerak Pertumbuhan Ekonomi dan Inklusi di Negara Berkembang. *Jurnal Indragiri Penelitian Multidisiplin*, *5*(1), 9–19.

Brunetti, F., Matt, D. T., Bonfanti, A., De Longhi, A., Pedrini, G., & Orzes, G. (2020). Digital transformation challenges: strategies emerging from a multi-stakeholder approach. *The TQM Journal*, *32*(4), 697–724. https://doi.org/10.1108/TQM-12-2019-0309

Chen, C.-L., Lin, Y.-C., Chen, W.-H., Chao, C.-F., & Pandia, H. (2021). Role of Government to Enhance Digital Transformation in Small Service Business. *Sustainability*, *13*(3), 1028. https://doi.org/10.3390/su13031028

Coco, N., Colapinto, C., & Finotto, V. (2024). Fostering digital literacy among small and micro-enterprises: digital transformation as an open and guided innovation process. *R&D Management*, *54*(1), 118–136. https://doi.org/10.1111/radm.12645

Cong, L. W., Yang, X., & Zhang, X. (2024). Small and Medium Enterprises Amidst the Pandemic and Reopening: Digital Edge and Transformation. *Management Science*, *70*(7), 4564–4582. https://doi.org/10.1287/mnsc.2023.02424

Darmeinis. (2024). Transformasi Digital dalam Manajemen Rantai Pasokan: Tantangan dan Peluang bagi UMKM di Indonesia. *Juria: Jurnal Ekonomi Utama*, *3*(2), 212–221. https://doi.org/https://doi.org/10.55903/juria.v3i2.279

Destrian, O. (2025). The influence of manager's digital literacy on SMEs' digital transformation in Indonesia: A micro-foundational context. *IEEE Transactions on Engineering Management*, 1–14. https://doi.org/10.1109/TEM.2024.3467925

Febriyani, W., Supratman, N. A., & Witjaksono, R. W. (2024). Exploring the Contribution of Fintech to Digital Transformation in Indonesian MSMEs: A Literature Review. *Sistemasi*, *13*(6), 2564. https://doi.org/10.32520/stmsi.v13i6.4638

Ferdiansyah, M. R., & Tricahyono, D. (2023). Identifikasi Faktor-Faktor Penghambat Implementasi Transformasi Digital Pada Umkm (Studi Kasus Hotel Flamboyan Indah). *JIMEA Jurnal Ilmiah (Manajemen, Ekonomi, Dan Akuntansi*, *7*(2), 1583–1595.

Firmansyah, D., & Dede. (2022). Teknik Pengambilan Sampel Umum dalam Metodologi Penelitian: Literature Review. *Jurnal Ilmiah Pendidikan Holistik (JIPH)*, *1*(2), 85–114. https://doi.org/10.55927/jiph.v1i2.937

Garmann-Johnsen, N. F., Eikebrokk, T. R., & Olsen, D. H. (2024). The Triple Bottom Line Co-creation Canvas. *Procedia Computer Science*, *239*, 322–329. https://doi.org/10.1016/j.procs.2024.06.178

Hardiyansyah, Aries, Muchardie, B. G., & Rillia, A. (2024). Impact of External Factors on Determining E-commerce Benefits among SMEs in Jakarta and Palembang. *JOIV : International Journal on Informatics Visualization*, *8*(1), 213. https://doi.org/10.62527/joiv.8.1.1371

Hariyanti, S., & Kristanti, D. (2024). Digital Transformation in MSMEs: an Overview of Challenges and Opportunities in Adopting Digital Technology. *Jurnal Manajemen Bisnis, Akuntansi Dan Keuangan (JAMBAK)*, *3*(1), 37–46.

Hasan, M., Dzakiyyah, A., Kumalasari, D. A., Safira, N., & Aini, S. N. (2021). Transformasi Digital UMKM Sektor Kuliner Di Kelurahan Jatinegara, Jakarta Timur. *Jurnal Bisnis Dan Kewirausahaan*, *17*(2), 135–150. https://doi.org/10.31940/jbk.v17i2.2529

Hendrawan, S. A., Afdhal Chatra, Nurul Iman, Soemarno Hidayatullah, & Degdo Suprayitno. (2024). Digital Transformation in MSMEs: Challenges and Opportunities in Technology Management. *Jurnal Informasi Dan Teknologi*, *6*, 141–149. https://doi.org/10.60083/jidt.v6i2.551

INDEF. (2024). *Peran Platform Digital Terhadap Pengembangan UMKM di Indonesia*. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://indef.or.id/wp-content/uploads/2024/01/Laporan-Final-Peran-Platform-Digital-Terhadap-Pengembangan-UMKM-di-Indonesia-INDEF.pdf

Kementerian Komunikasi dan Digital Republik Indonesia, & LPEM FEB UI. (2024). *Indeks Transformasi Digital Indonesia*. chrome-extension://efaidnbmhttps//digital2045.id/wp-content/uploads/2024/12/pocketbookIndeksTDN.pdf

Kokolek, N., Jakovic, B., & Curlin, T. (2019). Digital knowledge and skills – key factors for digital transformation. *Annals of DAAAM and Proceedings of the International DAAAM Symposium*, *30*(1), 46–53. https://doi.org/10.2507/30th.daaam.proceedings.006

Lei, J., Indiran, L., & Haiyat Abdul Kohar, U. (2023). Barriers to Digital Transformation among MSME in Tourism Industry: Cases Studies from Bali. *International Journal of Academic Research in Business and Social Sciences*, *13*(3). https://doi.org/10.6007/ijarbss/v13-i3/16575

Lestari, N. P., & Choirunnisa, Z. (2025). Transformasi Digital dan Ketahanan UMKM: Systematic Literature Review (SLR). *Jambura Economic Education Journal*, *7*(1), 355–372.

Li, H., Yang, Z., Jin, C., & Wang, J. (2023). How an industrial internet platform empowers the digital transformation of SMEs: theoretical mechanism and business model. *Journal of Knowledge Management*, *27*(1), 105–120. https://doi.org/10.1108/JKM-09-2022-0757

Manapa Sampetoding, E. A., & Er, M. (2024). Digital Transformation of Smart Village: A Systematic Literature Review. *Procedia Computer Science*, *239*(2), 1336–1343. https://doi.org/10.1016/j.procs.2024.06.304

Marzuki, S. N., & Yasin, I. M. (2021). Factors Influencing Online Shoppers to Shop at Marketplace or Website: A Qualitative Approach. *Asian Journal of Business and Management*, *9*(4), 68–75. https://doi.org/10.24203/ajbm.v9i4.6736

Muniraju, Y., & Hariprasad, S. (2019). Digital payment: Rural web users' perception during online shopping. *International Journal of Social and Economic Research*, *9*(3), 147. https://doi.org/10.5958/2249-6270.2019.00026.6

Nurmin, D., Khasanah, L. D. N., Anggraeni, S., & Nohe, Andi, D. (2022). Penentuan Ketepatan Klasifikasi Indeks Kedalaman Kemiskinan di Indonesia dengan Model Logit. *Prosiding Seminar Nasional Matematika, Statistik, Dan Aplikasinya Terbitan II, Mei 2022 Samarinda, Indonesia*, 334–343.

Oberländer, A. M., Karnebogen, P., Rövekamp, P., Röglinger, M., & Leidner, D. E. (2025). Understanding the influence of digital ecosystems on digital transformation: The OCO (orientation, cooperation, orchestration) theory. *Information Systems Journal*, *35*(1), 368–413. https://doi.org/10.1111/isj.12539

Onitsuka, K., Hidayat, A. R. R. T., & Huang, W. (2018). Challenges for the next level of digital divide in rural Indonesian communities. *Electronic Journal of Information Systems in Developing Countries*, *84*(2), 1–25. https://doi.org/10.1002/isd2.12021

Pradesa, E., Syahrani, T., & Sakti, R. E. (2023). Transformasi Digital Adopsi Software as a Service Layanan Cloud Accounting Oleh UMKM. *EKOMBIS REVIEW: Jurnal Ilmiah Ekonomi Dan Bisnis*, *11*(2), 1669–1682. https://doi.org/10.37676/ekombis.v11i2.3949

Raharjo, K., Afrianty, T. W., & Prakasa, Y. (2024). Digital literacy and business transformation: social-cognitive learning perspectives in small business enterprises. *Cogent Business & Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2376282

Rupeika-Apoga, R., & Petrovska, K. (2022). Barriers to Sustainable Digital Transformation in Micro-, Small-, and Medium-Sized Enterprises. *Sustainability (Switzerland)*, *14*(20). https://doi.org/10.3390/su142013558

Sabaruddin, A., Maulid, Taslim, Septiana, A. R., Jamaludin, I. I., Triani, & Junus, I. (2024). Identifikasi Potensi Pengembangan Usaha Mikro Kecil Menengah di Desa Oko-Oko Kecamatan Pomalaa Kabupaten Kolaka Sulawesi Tenggara. *Jurnal Kolaboratif Sains*, *7*(1), 1–11. https://doi.org/10.56338/jks.v7i1.4687

Sapriyadi, S., Syaiful, M., & Wakiya, N. (2023). Pemanfaatan Digitalisasi Untuk Meningkatkan Pendapatan Pelaku Usaha Mikro (UMK) Perempuan Di Lorong Wisata Kota Makassar. *Benefit: Jurnal Manajemen Dan Bisnis*, *8*(2), 70–88. https://doi.org/https://doi.org/10.23917/benefit.v8i2.2483

Sisilianingsih, S., Purwandari, B., Eitiveni, I., & Purwaningsih, M. (2023). Analisis Faktor Transformasi Digital Pelayanan Publik Pemerintah Di Era Pandemi. *Jurnal Teknologi Informasi Dan Ilmu Komputer*, *10*(4), 883–892. https://doi.org/10.25126/jtiik.2024107059

Sujarwoto, S., & Tampubolon, G. (2016). Spatial inequality and the Internet divide in Indonesia 2010–2012. *Telecommunications Policy*, *40*(7), 602–616. https://doi.org/10.1016/j.telpol.2015.08.008

Telagawathi, N. L. W. S., Suci, N. M., & Heryanda, K. K. (2022). Strategi Transformasi Digital Umkm Kerajinan Tangan Pada Masa Pandemi Covid-19 Di Kabupaten Gianyar, Bali. *Jurnal Ilmu Sosial Dan Humaniora*, *11*(2), 204–212. https://doi.org/10.23887/jish.v11i2.39734

Thoriq, K. N., Hartoyo, S., & Sasongko, H. (2018). Faktor Internal dan Eksternal yang Memengaruhi Underpricing pada Saat IPO di Bursa Efek Indonesia. *Jurnal Aplikasi Bisnis Dan Manajemen*, *4*(1), 19–31. https://doi.org/10.17358/jabm.4.1.19

Trisninawati, T., & Sartika, D. (2024). Digital literacy model to improve the marketing skills of micro, small, and medium enterprises women with a community-based educational approach. *JPPI (Jurnal Penelitian Pendidikan Indonesia)* , *10*(2), 807–815.

Vinh, H. X., & Linh, N. T. (2022). Digital Ecosystem and Digital Transformation in the Vietnam Electricity Corporation. *VNU JOURNAL OF ECONOMICS AND BUSINESS*, *2*(1). https://doi.org/10.25073/2588-1108/vnueab.4741

Wolf, M., Semm, A., & Erfurth, C. (2018). *Digital Transformation in Companies – Challenges and Success Factors* (pp. 178–193). https://doi.org/10.1007/978-3-319-93408-2_13

Xicang, Z., Bilal, M., Jiying, W., Sohu, J. M., Akhtar, S., & Itzaz Ul Hassan, M. (2024). Unraveling the Factors Influencing Digital Transformation and Technology Adoption in High-Tech Firms: The Moderating Role of Digital Literacy. *Sage Open*, *14*(4). https://doi.org/10.1177/21582440241300189

Zhao, L., He, Q., Guo, L., & Sarpong, D. (2024). Organizational Digital Literacy and Enterprise Digital Transformation: Evidence From Chinese Listed Companies. *IEEE Transactions on Engineering Management*, *71*, 11884–11897. https://doi.org/10.1109/TEM.2023.3241411

Zhao, T., & Duan, L. (2025). Digital transformation: how digital infrastructure impacts urban livability in China. *Applied Economics*, 1–17. https://doi.org/10.1080/00036846.2025.2464820