The Impact of Digital Technology Adoption in Food Micro, Small, and Medium Enterprises : A Case Study of Borobudur Area in Indonesia

ABSTRACT

Aim: To investigate the awareness of using digital technology in Food MSMEs and understand its benefits.
Study design: This research uses a quantitative approach with hypothesis testing.
Place and Duration of Study: The research location is in the Borobudur area, Borobudur District, Magelang Regency, Central Java, one of Indonesia's priority tourist destinations.The duration of the research study is approximately 6 months, from June to December 2023.
Methodology: This study's dependent or bound variable (Y) is Food MSME's Scaling Up in the Borobudur area. Independent or independent variables (X) are Asset Efficiency (X1), Lower Cost (X2), Quality (X3), and Safety & Sustainability (X4). Data collection was done through surveys, questionnaires, and structured observations. The number of respondents in this study was 145 respondents of local food MSMEs are in the Borobudur area, Borobudur District, Magelang Regency, Central Java. Data is tested with the Partial Least Squares Structural Equation Model (PLS-SEM) using SmartPLS version 3.
Results: The results obtained in terms of quality (QT), lower cost (LC), safety, and Sustainability (SAS) were found to have a significant impact on food MSME's scaling up (FMS). However, asset efficiency (AE) was found to have no significant impact on food MSME scaling up (FMS). This research can contribute valuable insights to guide policymakers, industry stakeholders, and MSMEs toward more effective technology adoption strategies that drive growth and resilience in an increasingly digital business landscape.
Conclusion: Quality (QT), Lower Cost (LC), Safety And Sustainability (SAS) were found to have a significant impact on food MSME's scaling up (FMS). However, asset efficiency (AE) was found to have no significant impact on food MSME's scaling up (FMS). Overcoming challenges associated with digital adoption is crucial for these businesses to thrive in a rapidly evolving business landscape.

Keywords: Impact, Digital Technology, Adoption, MSME, Food Business

1. INTRODUCTION

In this digital era, all human activities seem inseparable from technology. Digital technology has developed rapidly worldwide to facilitate communication and accelerate human activities. Digital technology is based on computer technology, the internet, and smartphones. The application of digital technology is increasingly prevalent in many sectors, ranging from education, trade, health, agriculture, government, banking, and others. If utilized optimally, digital technology can be relied upon to increase productivity. However, in reality, the utilization of digital technology has yet to be optimal, so Indonesia has not experienced a significant economic transformation, especially in the micro, small, and medium enterprises (MSMEs) sector.

Bank Indonesia (2015) reports that MSMEs can contribute around 60% to GDP (Gross Domestic Product) and create jobs (Salim et al., 2020). Culinary is the subsector that contributes the largest to the gross domestic product (GDP) of the creative economy. Based on data, the culinary subsector contributed IDR 455.44 trillion or around 41 percent of the total creative economy GDP of 1,134.9 trillion in 2020 (antaranews.com, 2021). Showing thatMSMEs are able to increase community income which can contribute to regional income.Micro, small, and medium enterprises are household business activities that absorb much labor in Indonesia. According to (databoks.katadata.co.id, 2021), labor absorption from Indonesian MSMEs is 96.92% of the total workforce in Indonesia, with the rest coming from large businesses. The Ministry of Cooperatives.Small and Medium Enterprises noted that MSMEs were able to absorb 119.6 million workers in 2019. This number increased by 2.21% compared to the previous year, which was 117 million people. Unfortunately, there are still many MSMEs that need help in utilizing the internet in their businesses.

According to the Ministry of Communication and Information of the Republic of Indonesia (kominfo.go.id, 2020), active smartphone users in Indonesia are estimated to be around 42%, or more than 100 million people, in 2018. However, only around 13% of MSME players nationally utilize digital technology, especially e-commerce platforms. Therefore, the government must facilitate the use of digital technology in MSMEs' efforts to expand the market by using various digital marketplaces. In addition, e-money is an effort to increase digital transactions to make them safer and more effective. (Susanto., et.al, 2022) found that aspects of technology adoption such as the use of digital payments are significantly related to service quality, added value to tourist destination services and are related to visit satisfaction which triggers intentions to visit in the future.

In the case of the Borobudur Super Priority Tourism Destination (DPSP), local food MSMEs have enormous potential to be developed. The food sector is the community's primary need and is the central pillar of economic development in Indonesia. Local food MSMEs play an essential role in improving the welfare of local communities and are an effective catalyst for local labor absorption. However, its existence, which needs to be appropriately managed and developed, does not provide optimal benefits. The abundance of local food potential in tourism destinations needs to be considered, more so in DPSPs that are developing in terms of access, infrastructure, resources, and other facilities as the driver of Indonesian tourism.

One indicator of successful tourism is when it positively impacts the region, such as the community's welfare in tourist destinations. The role of MSMEs has been proven to be an accelerator of labor absorption. If developed thoughtfully, local food MSMEs in destinations will contribute to the regional economy, particularly in Indonesia. The importance of digital technology as a source of information, marketing, and distribution channels needs to be underlined and maximized. The creative sector needs to be encouraged more optimally so that local products can dominate in their own country.

Therefore, it is necessary to analyze the impact of digital technology adoption on local food MSMEs. This research aims to provide a deeper understanding and increase public awareness, especially among MSME players, of the importance of utilizing digital technology. This research is expected to provide theoretical and practical implications for developing MSMEs in Indonesia in general and in the Borobudur DPSP area.

2. MATERIAL AND METHODOLOGY

Literature Review

a. Digital Technology Adoption

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Technology adoption must be connected to daily activities, whether from economic activities, education, trade, banking, or others. Technology adoption is the process of accepting new things, as seen in the behavior of individuals who do it (Sumarno, 2010). Three essential stages are needed in adopting technology: perception of an innovation and adoption by formally allocating the resources needed to implement the innovation. Then the third is the routinization stage, which is accepted by company members and used continuously (Chiu et al., 2017).

The development of digital technology and the internet has rapidly changed the behavior of consumers when communicating with each other. Even (Vlachvei&Notta, 2014) stated that purchasing products and services online is more favorable than offline. In its development, social media is now also evolving into digital marketing tools. Of course, Micro, Small, and Medium Enterprises can utilize digital technology and the internet to expand markets, distribution networks, ease of transactions, and marketing. If utilized optimally, digital technology can positively impact business actors. (Susanto., et.al, 2022) found that aspects of technology adoption such as the use of digital payments are significantly related to service quality, added value to tourist destination services and are related to visit satisfaction which triggers intentions to visit in the future.According to (deloitte.com, 2017), Digital technology adoption is characterized by four indicators including :

1. Asset Efficiency

Digital technology can result in better overall asset efficiency compared to traditional methods. Integrating technology can simplify processes and reduce manual tasks. For example, digital stock checks, transactions, and revenue data analysis will provide asset efficiency. Asset efficiency can be shown by lower asset downtime, capacity optimization, changeover time efficiency (Lee et al., 2015), and increased productivity and profitability (fastercapital.com, 2023).

2.Quality

Utilizing technology in the production process can detect and verify the quality of MSME products. For example, using vacuum machines in the packaging process can reduce damage to the food produced, increase product shelf-life, and ensure product quality. In addition, digital technology can also improve the quality of the marketing process (Bartodziej, 2016). For example, we are using social media analytics to predict market trends and using advertising for digital marketing.

3.Lower Cost

Integrating technology in production, transaction, or marketing directly reduces costs. Improvements in processes through technology integration will result in better-quality products and lower maintenance and product warranty costs. In marketing, costs can be minimized because digital marketing is much cheaper than conventional marketing.

4. Security and Sustainability

The benefits that are also directly felt in using technology are increasing security and reducing human errors in processes, transactions, and marketing. The Sustainability of a business will occur if all business activities are carried out efficiently.

b. MSMEs Scaling Up in Super Priority Tourism Destinations

Numerous studies confirm that MSMEs significantly contribute to the Gross Domestic Product (GDP) due to their ability to drive economic depth, strengthen the domestic economy, and strengthen industrialization (Nenova& Ahmad, 2009). (iqualifyuk.com, 2023) in describing the advantages of MSMEs in many countries, MSMEs create many new employment opportunities, encourage innovation, expand the tax base, increase competition among MSMEs, and generate innovation, ideas, and skills. Several studies have found that

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economic growth in many Asian countries, such as Korea, Taiwan, and Japan, is directly proportional to the surge in MSME activity (Ika et al., 2020).

Moreover, if MSMEs are located in a developed tourist destination, they should positively impact the tourist attractions. Tosun and Timothy (2003) emphasize that an essential aspect of sustainable tourism development is the emphasis on community-based tourism. Community-based tourism means that all the good things from tourism development can be felt directly by local communities. However, there are still problems because the optimization of MSMEs as the nation's economic engine still needs to be improved. In Indonesia, one of the obstacles is the need for more adoption of digital technology in the production and marketing processes. It causes domestic MSMEs to lag behind global products that enter Indonesia.

It is necessary to get input from all stakeholders so that MSMEs are upgraded and can compete with global products. Many efforts have been made to develop MSMEs from the previous level to a higher level. This is done to reduce poverty and economic inequality. According to (iqualifyuk.com, 2023), another advantage of MSMEs is that they quickly adapt to the dynamic business world, including switching to e-commerce and online transactions of goods and services. Conventional sales processes are difficult to adapt to the needs of society which currently demands things that are fast and easy, cash payments are considered unsafe, where digital payments are considered the safest without carrying physical money (Susanto., et.al, 2022). Therefore, it is hoped that this research can motivate businesses to upgrade. The following are indicators of MSMEs upgrading based on (Ika et al., 2020) ;

1. Size of MSMEs Business Capacity

A business is considered upgraded if there is increased capacity and performance. A business's capacity increase is seen in the increase in assets, capital, and labor. Meanwhile, an increase in business performance is seen in turnover, profits, and taxes.

2. Accessibility to Financing Sources

By upgrading, MSMEs can access banks, cooperatives, and financial technology more efficiently.

3. Governement Intervention

Upgrading MSMEs is indicated by better legal documents that make it easier for the government to intervene in social assistance, capital assistance, business assistance, and digitalization.

4. MSMEs Business Orientation

Upgrading MSMEs is reflected in increased productivity, revenue, business capacity, and the development of large enterprises.

The independent variables (X) in this research, namely Asset Efficiency (X1), Lower Cost (X2), Quality (X3), and Safety & Sustainability (X4) are thought to have relevance or relationship between constructs, the relationship between latent variables and the PLS-SEM technique on the dependent variable (Y), Food MSME's Scaling Up in the Borobudur area.The research will test the research hypothesis, among others, as follows:

H1:It is suspected that there is an influence ofAsset Efficiency (X1) on Food MSME'sScallingUp (Y)

H2: It is suspected that there is an influence ofLower Cost (X2) on Food MSME's Scaling Up (Y)

H3:It is suspected that there is an influence ofQuality (X3) on Food MSME's Scaling Up (Y)

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H4:It is suspected that there is an influence ofSafety & Sustainability (X4) on Food MSME's Scaling Up (Y)

H5:It is suspected that there is an influence ofTechnology Adoption (X1, X2, X3, X4) on Food MSME's Scaling Up (Y)

Methods

This type of research uses a quantitative approach that emphasizes objectivity, generalization, and hypothesis testing. This study's dependent or dependent variable (Y) is Food MSME's Scaling Up in the Borobudur area. Independent or independent variables (X) are Asset Efficiency (X1), Lower Cost (X2), Quality (X3), and Safety & Sustainability (X4). Data collection is in the form of numbers, either through surveys, questionnaires, or structured observations, where researchers try to minimize bias and personal influence in the research process.

The population in the study is based on data from the Department of Trade Cooperatives Small and Medium Enterprises (Disdagkop UKM) of Magelang District (2023). The number of local food MSMEs in the Borobudur area is around 1,939 MSMEs. These MSMEs produce various types of local food products, which are spread across 20 villages in Borobudur District. Data from 2011–2021 recorded that only around 200 MSMEs were active in training or development activities. In this survey, the expected sample was at least 100 respondents, but 145 respondents were netted. According to Roscoe (Sekaran, 2017), a sample size of 30–500 is an appropriate amount of data for quantitative research. The research location is in the Borobudur area, Borobudur District, Magelang Regency, Central Java, one of Indonesia's priority tourist destinations.

Data analysis and hypothesis testing 1-4 using Partial Least Squares Structural Equation Model (PLS-SEM) using SmartPLS version 3. The choice of the PLS-SEM technique is because this technique estimates the model using an algorithm with a segmentation process that divides each model into subgroups (Hair et al., 2019). Results of indicator values, such as missing values, mean, median, minimum, maximum, standard deviation, excess kurtosis, and slope, are essential for initial data description (Aburumman et al., 2023). SmartPLS also assesses the measurement model by evaluating internal consistency, reliability, convergent validity, and discriminant validity (Hair & Alamer, 2022).

Convergent validity tests ensure that indicators measure the latent variable well. The composite reliability test ensures the internal consistency of the latent variable. The path coefficient significance test assesses the strength and direction of the relationship between variables. R-squared (R^2) test that explains the Variance of the dependent variable. Test bootstrapping to get more accurate standard error and p-value estimates. Then, the expected results will be evaluated and interpreted to be generalized to a broader population. Meanwhile, hypothesis 5 testing uses the F test, which previously conducted data validity and reliability tests, and classical assumption testing.

3. RESULTS AND DISCUSSION

a. Description results

Based on the results of distributing questionnaires to 145 respondents, the characteristics of respondents are grouped by gender, age, last education, marital status, type of MSMEs, number of employees, start-up capital, income per week, income per month, consumer segment, and collaboration partners, which are presented in Tables 1.

Table 1.

Characteristics of Respondents

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Characteristics	Frequency	Percent (%)
Gender		
Male	54	37.24
Female	91	62.75
Age		
20-30 years old	12	8.27
31-40 years old	46	31.72
41-50 years old	68	46.89
>50 years old	19	13.10
Last Education		
Elementary school	2	1.38
Junior high school	3	2.07
Senior High School	64	44.14
Diploma degree	18	12.41
Bachelor degree	53	36.55
Postgraduate	5	3.45
Marital Status		
Married	132	91.03
Not married yet	13	8.97
Type of MSME's		
Beverage business	31	21.38
Food and cake business	102	70.34
Herbs and spices business	12	8.28
Number of Employees		
1-20	142	97.93
21-40	2	1.38
>41	1	0.69
Start-up Capital		
Rp 300.000 – Rp 5.900.000	90	62.07
Rp 5.900.001 – Rp 20.000.000	31	21.38
Rp 20.000.001 - Rp 50.000.000	19	13.10
>Rp 50.000.000	5	3.45
Income per week		
Rp 200.000 – Rp 1.000.000	62	42.76
Rp 1.000.001 – Rp 5.000.000	58	40
Rp 5.000.001 – Rp 10.000.000	14	9.66
>Rp 10.000.000	11	7.57
Income per month		
Rp 2.000.000 – Rp 10.000.000	95	65.52
Rp 10.000.001 – Rp 20.000.000	22	15.17
Rp 20.000.001 – Rp 30.000.000	9	6.21
>Rp 30.000.000	19	13.10
Consumer Segment		
Local community and domestic tourists	125	86.21
Local community, domestic and international tourists	20	13.79
Collaboration Partners		
Government	76	52.41
Institutions/associations	33	22.76
Supermarkets and Online Stores	8	5.51
Individual	28	19.31

Source: primary data, 2023

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In table 1, it is shown that the characteristics of respondents based on gender can be known to respondents of the male sex, namely 54 people (37.24%), and the number of female respondents, as many as 91 people (62.75%) with the most marital status married. The characteristics of respondents by age show that most respondents are in the age range of 41–50 years, namely 68 respondents (46.89%), and at least age 20-30 years, namely 12 respondents (8.27%). The characteristics of respondents by last education show that most respondents are in senior high school, namely 64 respondents (44.14%), and at least elementary school, namely two respondents (1.38%).
The types of MSMEs are the Food and cake business (70.34%), the Beverage business (21.38%), and the Herbs and spices business (8.28%). The average number of employees is 1-20 employees at most. The maximum initial business capital is between IDR 300,000 and IDR 5,900,000, with the highest income being IDR 200,000 – IDR 1,000,000 per week or IDR 2,000,000 – IDR 10,000,000 per month. Most consumer segments come from local communities and domestic tourists. MSMEs also collaborate a lot with the government and institutions/associations.

Table 2.
Value loading factor dimensions measurement research variables

Variables (Constructs)	**Measurement Dimensions**	**SLF > 0.5**	**AVE > 0.5**	**CR ≥ 0.7**	**Cronbach Alpha > 0.70**
Asset Efficiency	The use of digital technology has an impact on the efficiency of the business assets used (AE1)	0.888	0.818	0.900	0.780
	The use of digital technology has an impact on optimizing business capacity (AE2)	0.921			
Quality	The use of digital technology can predict and detect deficiencies in the quality of MSME food products (QT1)	0.885	0.793	0.920	0.870
	The use of digital technology always follows marketing trends (QT2)	0.897			
	The use of digital technology can help identify marketing process errors (QT3)	0.889			
Lower Cost	The use of digital technology makes the marketing process cost-effective and more predictable (LC1)	0.898	0.804	0.891	0.756
	The use of digital technology makes financial inventory easier (LC2)	0.896			
Safety & Sustainability	The use of digital technology supports environmental Sustainability (go green) (SAS1)	0.834	0.738	0.849	0.747
	The use of digital technology reduces the potential for human error in marketing activities (SAS2)	0.883			
Food MSME's	Size of MSME Business	0.590	0.528	0.815	0.702

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Scaling Up	Capacity (FMS1)	
	Accessibility to financing sources (FMS2)	0.767
	Government Intervention (FMS3)	0.757
	MSME Business Orientation (FMS4)	0.775

Note: SLR = Standardized loading factor**,** CR = Composite Reliability, AVE = Average Value Extracted.
Source: primary data, 2023

b. Path model analysis

Partial Least Squares Structural Equation Model (PLS-SEM) using SmartPLS version 3 to analyze the data and test the hypothesis. PLS-SEM technique estimates models using an algorithm with a segmentation process that divides each model into subgroups (Hair et al., 2019) and allows at least 100 cases to be used to achieve adequate statistical power (Reinartz et al., 2009).

1. Measurement model assessment

Construct assessment includes convergent validity, composite Reliability, Cronbach Alpha/reliability, and discriminant Validity. Table 2 presents the results of the convergent validity test; it can be seen that each indicator's standardized loading factor (SLF) value on the latent variable, with a loading factor value of > 0.70. A loading factor value ≥ 0.7 can be ideal, meaning that the indicator is valid to measure the construct it forms. A loading factor value ≥ 0.5 is still acceptable. This value shows the percentage of the construct that can explain the variations in the indicator.

Average Variance Extracted (AVE) describes the amount of Variance or diversity of manifest variables that a latent construct can have. Thus, the greater the Variance or diversity of the manifest variable that the latent construct can contain, the greater the representation of the manifest variable on the latent construct (Ghozali, 2014). Table 2 shows the AVE value for each variable > 0.5, and the indicator is considered valid, meaning that the latent variable can explain, on average, more than half of the Variance of the indicators. Likewise, the CR and Cronbach's alpha values for each variable > 0.70 indicate high internal consistency and good reliability in measuring.

2. Structural Model Assessment

The structural model displays the relationship between constructs and dependent variables. Before assessing structural relationships, examine the collinearity to ensure unbiased regression results (Hair et al., 2019). Table 3 showed that all VIF values were less than 5, indicating that the model was free from any possible collinearity issues.

We evaluated the structural model results after confirming that the measurement model assessment met the relevant criteria. We assessed the structural model in PLS-SEM for statistical relevance using the coefficient of determination (R^2), Stone-Geisser's predictive relevance (Q^2), and SRMR Estimated Model after checking the collinearity among variables.

As shown in Table 4, the value of R^2 was 0.789, indicating that all variables together predict 78.9% of Food MSMEs Scaling Up. From the blindfolding results, the Q^2 value for Y is 0.392. Because $Q^2 = 0.392 > 0$, it is concluded that AE, QT, LT, and SAS have predictive relevance for FMS. It is known that the Q^2 value = 0.392 ≥ 0.35, so it can be concluded that the predictive relevance is strong.

Table 3.
Variance Inflation Factor

	VIF
AE1	1.689

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AE2	1.689
FMS1	1.211
FMS2	1.327
FMS3	1.461
FMS4	1.400
LC1	1.587
LC2	1.587
QT1	2.381
QT2	2.497
QT3	2.098
SAS1	1.296
SAS2	1.296

Source: primary data, 2023

Table 4.
Results of R^2, Q^2 and SRMR

	R^2	R^2 Adjusted	Q^2	SRMR Estimated Model
Food MSME's Scaling Up	0.789	0.783	0.392	0.105

Note: R2 = Coefficient of determination, Q2 = Predictive Relevance, SRMR = Standardized Root Mean Square Residual.
Source: primary data, 2023

Table 5.
Results of f square (f^2)

Path	f^2	Effect
Asset Efficiency → Food MSME's Scaling Up	0.028	Small
Lower Cost → Food MSME's Scaling Up	0.217	Medium
Quality → Food MSME's Scaling Up	0.868	Large
Safety & Sustainability → Food MSME's Scaling Up	0.058	Small

Source: primary data, 2023

The f^2 impact size quantifies the extent to which an exogenous construct contributes to the R^2 explanation of an endogenous construct. If the f^2 value is $0.02 \leq f^2 < 0.15$, it is included in the small effect. If the f^2 value is $0.15 \leq f^2 < 0.35$, it is included in the medium effect. Moreover, if the f^2 value $f^2 \geq 0.35$, it is included in the high effect. As shown in Table 5, the relationship between asset efficiency and food MSME's scaling up is small ($f^2 = 0.028$). The relationship between lower Cost and food MSME's scaling up is medium ($f^2 = 0.217$). The relationship between quality and food MSME's scaling up is significant ($f^2 = 0.868$). The relationship between Safety and Sustainability and food MSME's scaling up is large ($f^2 = 0.058$).

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Figure 1. Structural model assessment results
Source: primary data, 2023

Table 6.
Path Coefficients

Hypotheses	Path	Coefficient	T-Statistics	P-Values	Conclusion
H1	Asset Efficiency → Food MSME's Scaling Up	0.106	1.714	0.087	Insignificant H1 rejected
H2	Lower Cost → Food MSME's Scaling Up	0.303	4.287	0.000	Significant H2 accepted
H3	Quality → Food MSME's Scaling Up	0.519	8.676	0.000	Significant H3 accepted
H4	Safety & Sustainability → Food MSME's Scaling Up	0.150	2.548	0.011	Significant H4 accepted

Source: primary data, 2023

Table 7.
Result of testing the hypothesis with multiple linear regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.204	4	6.051	407.855	.000[b]
	Residual	2.077	140	.015		
	Total	26.281	144			

a. Dependent Variable: *Food MSME's Scaling Up*

b. Predictors: (Constant), *Safety & Sustainability, Quality, Asset Efficiency, Lower Cost*

Source: primary data, 2023

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The regression analysis results to be used in the direct influence hypothesis test are presented in Figure 1 and Table 6. The results showed that three hypotheses (H2, H3, H4) of direct influence are accepted, and one hypothesis (H1) is rejected. H1, which states that Asset Efficiency significantly influences food MSME's scaling up, was rejected; this is indicated by the calculated p-value of 0.087 ≥ 0.05. So, it can be concluded that asset efficiency does not significantly influence food MSME scale-up. H2, which states that Lower Cost significantly influences Food MSME's Scaling Up, is accepted; this is seen from a p-value of 0,000 ≤ 0,05. So, it can be concluded that lower costs significantly influence food MSMEs' scaling up. H3, which states that Quality significantly influences Food MSME's Scaling Up, is accepted; this is seen from a p-value of 0,000 ≤ 0,05. So it can be concluded that quality significantly affects food msme's scaling up. H4, which states that Safety and sustainability significantly influence Food MSME's Scaling Up, is accepted; this is seen from a p-value of 0,011 ≤ 0,05. So, it can be concluded that safety and sustainability significantly influence the scaling up of food mSMEs. The results of multiple linear regression in Table 7 have a significant p-value of 0.000 ≤ 0.05, indicating that H5 is accepted, which states that technology adoption (X1, X2, X3, X4) simultaneously affects food MSME's scaling up (Y).

c. Discussion

Three study variables, namely quality (QT), lower Cost (LC), and Safety & Sustainability (SAS), were found to have a significant relationship with food MSME's scaling up (FMS). One variable, namely asset efficiency (AE), was found to have no significant relationship with food MSME's scaling up (FMS).

H1 evaluated whether asset efficiency significantly impacted food MSMEs scaling up. The results revealed that asset efficiency digital technologies did not significantly impact food MSMEs' scaling up. This finding contrasts with previous research, which confirmed asset efficiency digital technologies have a positive and significant impact on the scaling up of food MSMEs. Digital technologies can enhance productivity, resilience, and efficiency in agri-food processing by improving resource utilization efficiency and specialization in production (Townsend, 2019). Furthermore, adopting digital technologies in food MSMEs can optimize business capacity by improving efficiency, increasing revenue streams, and fostering sustainable growth (Aminullah et al., 2022).

H2 evaluated whether quality significantly impacted food MSME's scaling up. The results revealed that quality digital technologies significantly impacted food MSMEs' scaling up. The digitization of MSMEs in the food sector has shown various benefits, such as sustaining businesses during the pandemic, simplifying payment procedures, collaborating with local enterprises, and enabling food delivery to customers' doorsteps (Kawane et al., 2024).

H3 evaluated whether lower Costs significantly impacted food MSMEs' scaling up. The results revealed that lower Costs had significant implications for food MSMEs scaling up. The use of digital technology makes the marketing process cost-effective and more predictable, and it also makes financial inventory easier, thereby impacting increasing MSMEs. Various research findings support this. Digital marketing is essential in enhancing visibility and reach, reducing expenses on physical infrastructure, and improving resource utilization (Kawane et al., 2024). Another study shows that digital marketing practices can significantly impact MSMEs' sales performance and Sustainability (Venkat et al., 2022).

H4 evaluated whether Safety and sustainability significantly impacted food MSME's scaling up. The results revealed that safety and sustainability digital technologies significantly impacted food MSMEs scaling up. Digital technology supports environmental Sustainability (go green). It reduces the potential for human error in marketing activities, particularly in the food industry, by leveraging data and digital solutions to improve resource efficiency, reduce waste, and promote sustainable practices. Companies that strategically prioritize digital technologies tend to have a more remarkable ability to adapt to changing market conditions

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and identify opportunities for innovation, leading to lower costs and reduced environmental impact (Javaid et al., 2022).

H5 evaluated whether asset efficiency, quality, lower Cost, and Safety & Sustainability simultaneously significantly impacted food MSME's scaling up. The results revealed that simultaneously, it significantly impacted food MSMEs scaling up. The finding means these factors were necessary for the growth and expansion of small and medium-sized enterprises in the food industry. The results suggest that improving these areas can help food MSMEs achieve tremendous success and scaling goals.Therefore, there is a need for digitalization awareness and training for the community in Food MSMEs.

4. CONCLUSIONAND RECOMMENDATIONS

From the results of hypothesis testing, it can be concluded that quality (QT), lower Cost (LC), and Safety and sustainability (SAS) were found to have a significant impact on food MSME's scaling up (FMS). However, asset efficiency (AE) was found to have no significant impact on food MSME's scaling up (FMS). Overcoming challenges associated with digital adoption is crucial for these businesses to thrive in a rapidly evolving business landscape. The researcher's recommendation to embrace the adoption of digital technologyempowers food MSMEs in the Borobudur area by enhancing marketing efforts, reducing costs, improving communication, enabling better decision-making, fostering adaptability, and providing access to global markets.

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