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ANALYSIS OF FACTORS INFLUENCING TECHNOLOGY ADOPTION TO INCREASE MSME PRODUCTIVITY IN MALANG CITY

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Abstract:
This study aims to analyze the factors influencing technology adoption by Micro, Small, and Medium Enterprises (MSMEs) in Malang City during the digitalization era, using the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) as the theoretical framework. Data were collected from 100 MSME respondents in Malang City and analyzed using Structural Equation Modeling with the Partial Least Squares (SEM-PLS) method. The UTAUT2 model was applied to examine the influence of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, and habit on technology adoption and productivity. The findings indicate that performance expectancy, facilitating conditions, and habit have a significant positive impact on productivity, highlighting the importance of efficiency, infrastructure support, and consistent technology usage. Conversely, effort expectancy, social influence, and hedonic motivation do not significantly affect technology adoption. The study emphasizes the need for policymakers and stakeholders to enhance digital infrastructure, provide technology training, and offer incentives to increase technology adoption among MSMEs. These strategies are expected to strengthen competitiveness, foster innovation, and drive sustainable economic growth in Malang City.

Keywords: Technology Adoption, MSME Productivity, UTAUT2, Digitalization, Malang City

INTRODUCTION

Technological advancements, innovation, and change have digitized and influenced business and economic development. Globally, the internet has become a crucial driver of transformation for various sectors, including micro, small, and medium enterprises (MSMEs) (OECD, 2021). In 2020, the number of MSMEs in Indonesia reached 64.2 million units. It illustrates how the MSME sector continues to be a dominant source in the national economic structure (Ministry of Cooperatives and Small and Medium Enterprises, 2020). In 2021, the number of MSMEs increased to 65.5 million units. This growth demonstrates the government's efforts to facilitate MSME development through various programs and policies (Ministry of Cooperatives and Small and Medium Enterprises, 2021). In 2022, the number of MSMEs stabilized at around 65.5 million units due to the focus on post-pandemic recovery (Ministry of Cooperatives and Small and Medium Enterprises, 2022). Moreover, in 2023, MSME units will increase to 66 million units with a contribution to GDP 2023 of 61% (Central Statistics Agency and Ministry of Cooperatives and Small and Medium Enterprises, 2023).

Of the 117 million workforce, 97% have utilized the remaining available employment capacity, demonstrating that the MSME sector plays a key role in supporting the Indonesian economy (Coordinating Ministry for Economic Affairs of the Republic of Indonesia, 2022). Diana et al. (2020) also agree that MSMEs significantly contribute to the national economy and play a role in creating employment opportunities and providing decent wages to citizens.

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However, despite its important role, the level of technology adoption in MSMEs remains relatively low. According to Venkatesh et al. (2020), low technology adoption is caused by limited digital literacy, a lack of adequate infrastructure, and difficult-to-change conventional business habits. It is further supported by research by Afonso & Sousa (2021), which found that only around 40% of MSMEs in developing countries adopt digital technology to increase their productivity. Therefore, this study aims to analyze the factors influencing MSMEs' decisions to adopt technology and how this impacts business productivity. Research from Economics (2021) notes that micro and small enterprises (MSEs) in Indonesia are classified as economic drivers.

In Tambunan's (2008) study on MSME development in Indonesia, economic growth, and government intervention, he demonstrated that MSMEs experience smaller economic 'shocks' compared to large corporations. It is due to their flexibility and smaller size. Furthermore, Sari et al. (2020), who studied the cross-sectoral role of MSMEs during the COVID-19 pandemic, referring to the sustainability of MSMEs during the 1998 economic crisis, inspire optimism regarding the role of MSMEs in post-pandemic economic recovery. Several methods for empowering and strengthening MSMEs involve changing approaches through digitalization. It is also worth noting that small and medium enterprises help improve people's living standards and contribute significantly to overall economic development in a region or country (Toman, 2023). Small and medium enterprises make a crucial contribution to increasing people's income levels and economic growth in a particular region or country (Toman, 2023).

Technology adoption can improve operational efficiency, customer communication, and access to new markets. However, MSMEs often face challenges in adopting new technologies due to a lack of resources and understanding (Tarutė & Gatautis, 2014). Those that successfully adopt new technologies are typically more responsive to market changes and more competitive (Neirrotti et al., 2018). The use of technology can enable MSMEs to increase operational efficiency, expand markets, and improve the quality of products and services offered (Ministry of Cooperatives and MSMEs, 2023).

Unfortunately, the adoption rate of new technologies by MSMEs remains low, meaning that much potential for productivity gains is being missed. Although technology offers significant opportunities for growth, Indonesian MSMEs still struggle to leverage it effectively. There are approximately 64.2 million MSMEs in Indonesia, but fewer than 46.6 million have digitized their businesses (OSS, 2022). This issue creates a significant gap between the number of people using the internet and the number of MSMEs that have adopted digital technology.

Research by Neirotti et al. (2020) in Italy showed that digital technology integration increases SME productivity by 5-7%, with a greater impact on companies that invest in employee training. Eller et al. (2020) investigated in Germany and also found that the adoption of Industry 4.0 technologies increased the productivity of manufacturing SMEs by 8-12%. Competitive pressures and government support largely drove these German SMEs. In Brazil, Ferreira et al. (2021) observed that the adoption of e-commerce platforms increased SME sales by around 30% due to the ease of use of these platforms. Li et al. (2022) in China found that AI adoption by SMEs increased labor productivity by 10-15%, driven by factors such as data availability and employee digital skills.

The rising cost of living, combined with economic growth in Indonesia, has led to an increase in the number of MSMEs in the country. East Java is one of the provinces in Indonesia with high potential for MSME development. Malang City, as one of East Java's economic centers, has an MSME sector that is strategically important to the local economy. The MSME sector in Malang also actively participates in job creation, accounting for an estimated 60 percent of the city's total workforce (BPS

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Malang City, 2021). Despite this significant potential, micro and small businesses in Malang continue to face various challenges, particularly in technology adoption. A survey conducted by the Malang City Communications and Information Service (Diskominfo) (2022) found that approximately 30 percent of Malang-based MSMEs utilize digital platforms to market their products (Diskominfo Malang City, 2022). This digital divide poses challenges for MSMEs in Malang to compete in the current economic climate. The Malang City Government has attempted to address this issue through various programs aimed at encouraging behavioral changes towards technology use among MSMEs, but in practice, many difficulties remain (Malang City Cooperatives and SMEs Office, 2022).

In 2020, the number of MSMEs in Malang City was recorded at 9,870, indicating that the MSME sector was starting to grow, despite still recovering from the pandemic (Detik Jatim, 2023). In 2021, the number increased to more than 17,870, demonstrating significant growth as a result of local government efforts to promote MSME development through various programs and policies, including the issuance of business permits with lighter requirements and financial assistance (Diskopindag Kota Malang, 2021). In 2022, the number of MSMEs reached 19,870, a significant increase following the post-pandemic economic recovery. The issuance of Business Identification Numbers (NIB) for MSMEs also increased this year, with an estimated 10,203 business permits issued through the Online Single Submission (OSS) system (Radar Malang, 2022). In the same year, the number of MSMEs adopting digital technology also increased, with an estimated 10,203 units receiving business permits through the OSS (Online Shopping Center). It demonstrates increased awareness and utilization of technology to facilitate business management (Malang City Cooperatives Office, 2022). By 2023, the number of small and medium enterprises (SMEs) in Malang had increased to 27,652, a nearly threefold increase in three years. This growth was driven by several government initiatives to increase competitiveness and market access for MSMEs, including the introduction of local shopping apps to promote the marketing of MSME products (Public Info, 2023).

To increase technology adoption among SMEs in Malang City, a more permanent solution is needed. Malang City, through the Cooperatives and SMEs Office, has set a target of 50% SME digitalization by 2025 under the Malang City Medium-Term Development Plan 2018-2023. Joint action is needed by the government, the private sector, and academics to design appropriate training for local SMEs with an emphasis on improving digital literacy and technological skills. Providing better access to digital infrastructure, such as a stable internet connection and computer devices, is crucial in supporting the digital transformation of SMEs, such as local markets with digital payment systems that aim to support the ecosystem, although still under development, which is expected to facilitate technology adoption (Bank Indonesia Malang Representative Office, 2022).

Various internal and external factors influence the level of technology adoption among SMEs in Malang. To facilitate understanding of these factors, the UTAUT2 (Unified Theory of Acceptance and Use of Technology 2) model developed by Venkatesh et al. (2012) has been widely validated across various sectors, including the MSME context. A meta-analysis study by Tamilmani et al. (2021) confirmed that this model is capable of explaining technology adoption behavior by relying on seven main constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit. The validity of this model is further strengthened in recent research that uses a structural equation modeling approach to map significant influences on technology adoption by MSMEs (Dahri et al., 2024).

This study emphasizes that MSMEs are the largest contributors to the number of business units and employment in Indonesia. The increase in the number of MSMEs results in greater employment, which has an impact on reducing unemployment in Indonesia and dependence on a single sector

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(Ministry of Cooperatives and SMEs, 2021). MSMEs are more flexible in facing crises and market changes, as proven by their faster innovation and greater support from similar communities to survive during crises (BPS, 2020). Furthermore, by operating at the local level, MSMEs can help drive regional economic development to empower local communities and increase regional income (Sari R, 2020).

The difference in this study is based on the existing gap, namely the lack of research that specifically examines the acceptance and adoption of technology by MSMEs in Malang City, especially in the aspect of increasing productivity. Some researchers focus more on reasoning that tends to be based on existing theories, but does not comprehensively explain the acceptance and adoption process by MSMEs related to the use of technology in business. In this situation, this study seeks to determine the factors of acceptance and adoption as the scope of UTAUT 2 technology utilization in MSMEs in Malang City. The researcher hopes that the findings of this investigation can increase knowledge regarding the acceptance and adoption of UTAUT 2 technology in MSMEs in Malang City and provide understanding for actors to consider in adopting technology so that they can operate within their operational capabilities.

METHODS

Research Approach. This study uses a quantitative approach through a survey method. Quantitative analysis was chosen because it allows for measuring the relationships between variables by testing hypotheses on these variables. This study is a survey study, where data were collected by distributing questionnaires to micro, small, and medium enterprises (MSMEs) in Malang City. This quantitative study aims to obtain measurable and structured data regarding the factors influencing technology adoption and the productivity of small and medium enterprises (MSMEs).

Table 1. Operational Definition of Variables

Variable	Operational Definition	Source	Scale	Indicator
MSME Productivity (Y)	Confidence in producing an output based on input.	(Bain & David, 1992; Ardana, 2012; Banerjee & Duflo, 2023).	Skala Likert (1-5)	Increased output; Time efficiency; Reduced production costs; and Improved product quality, Increased production volume
Performance Expectation (X1)	The belief that the use of new technology will increase performance or efficiency at work.	(Tezzara Martania Clara Sutjipto, 2023; Venkatesh et al., 2022; Rezki Aguswidya Utami et al., 2022)	Skala Likert (1-5)	The use of technology improves the quality of products/services; Technology helps make work

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				easier; and Technology helps increase work productivity.
Business expectations (X2)	Individual perceptions regarding the ease of use of technology.	(Sutjipto,2023; Liu et al., 2022; Gupta dan Arora, 2023)	Skala Likert (1-5)	Technology is easy to use, and the use of technology does not require a large effort.
Social influence (X3)	Reflects the extent to which individuals feel that the people around them (coworkers, superiors, friends) support the use of new technologies.	(Sutjipto, 2023; Qureshi et al, 2022; Fajrina Amelia dan Syaefulloh, 2023)	Skala Likert (1-5)	The use of technology from friends, family or colleagues encourages the adoption of technology.
Facilitating conditions (X4)	It includes external factors such as infrastructure, technical support, and training available to help with technology adoption.	(Sutjipto, 2023; Alharthy et al., 2022; Listiana Pebriyanti et al., 2021)	Skala Likert (1-5)	Access and supporting facilities; Adequate resources for the use of technology
Hedonic Value (X5)	Relating to the pleasure or satisfaction obtained from using new technology.	(Sutjipto, 2023; Rachmawati et al., 2023; Imam AG, 2023)	Skala Likert (1-5)	Technology provides experience for business development; Feel happy and comfortable using technology in carrying out business activities.
Habits (X6)	Refers to previous behavior in using technology and how much	(Sutjipto, 2023; Cahyani, 2020; Nadrajah et al., 2022)	Skala Likert (1-5)	The use of technology is already included in the daily use of

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	influence it has on the decision to adopt new technology.	MSMEs, and MSMEs do not have to think twice because they have made technology a part of their daily activities.

Source: Data processed by researchers (2024)

Research Participants and Sample. The population in this study was all MSMEs registered with the Malang City Cooperatives and MSMEs Office, comprising over 10,000 MSMEs operating in Malang City (Central Statistics Agency, 2023). Sampling for this study was based on the number of variables being investigated. According to Hair et al., the recommended ratio is 15 to 20 observations for each independent variable. This approach is based on the principle that the more variables in a model, the larger the sample size needed to obtain consistent results. With this method, there are six independent variables (based on the UTAUT 2 construct), so the recommended minimum sample size is 6 times 15 = 90 to 6 times 20 = 120 respondents from various sectors in Malang. Ultimately, the researcher decided to select a sample size of 100 respondents as a middle ground between the minimum and maximum number of respondents.

Data Sources. This study relies on two main sources: primary and secondary data. Primary data was collected through an online survey and interviews with MSME operators in Malang City. The survey used a structured questionnaire specifically designed to gather data on factors influencing technology adoption and its impact on productivity. Secondary data for this study came from credible sources, such as reports from the Ministry of Cooperatives and Small and Medium Enterprises, the Malang City Statistics Agency (BPS), and recently published academic articles.

Data Collection Instruments and Methods. The primary instruments used to collect data were a set of questionnaires and an interview guide. The questionnaire in this study was constructed using a five-point Likert scale (1-5) to measure respondents' opinions on technology adoption. Questionnaires were distributed in two ways: face-to-face and online. Additionally, data collection was conducted through interviews with several MSMEs to obtain their perspectives and experiences on technology adoption.

Data Analysis Method. This study employed the Structural Equation Modeling (SEM) method, focusing on variance. To analyze latent variables with multiple measurement indicators, SEM is used to discover and understand the relationships between latent variables (Hair et al., 2021). Therefore, the SEM model applied in this study was Partial Least Squares (PLS) (Hair et al., 2021).

Measurement Test (Outer Model). The measurement model, also known as the outer model, shows the relationship between the indicators and the latent variables being measured. In evaluating the outer model, it is important to conduct validity and reliability tests on the data used to measure these variables. The HTMT method is used to assess convergent and discriminant validity. Additionally, Composite Reliability and Cronbach's Alpha are used to measure reliability (Ghozali & Latan, 2015).

Convergent Validity. The purpose of convergent validity is to determine the extent to which an indicator reflects the structure of the latent variable it represents. The HTMT method can be used to evaluate convergent and discriminant validity. One way to assess convergent validity is by

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calculating the Average Variance Extracted (AVE) value. A minimum AVE value of 0.5 indicates adequate convergent validity, meaning that a latent variable can explain more than half of the average variance of its indicators (Ghozali & Latan, 2015). Convergent validity is essential to ensure that the indicators applied to the investigation accurately represent the construct being measured. Researchers can simultaneously assess convergent and discriminant validity using the HTMT method, providing a deeper understanding of the reliability of the measurement instrument (Hair et al., 2019).

Discriminant Validity. This method is used to assess how well an indicator measures the intended construct and differentiates it from other constructs. Discriminant validity is based on the idea that each indicator should have a significant correlation with the construct it measures, but should not have a significant correlation with indicators of a different construct (Ghozali & Latan, 2015). Several methods, such as cross-loading, the Fornell-Larcker Criterion, and the heterotrait-monotrait ratio (HTMT), can be used to evaluate discriminant validity in analyses conducted with SmartPLS software (Henseler et al., 2015). Discriminant validity is a crucial step in ensuring that a measurement instrument in a study can differentiate between the various constructs. If an indicator's cross-loading value is higher than other indicators, the construct is considered discriminantly valid, and the HTMT ratio value should be less than 0.90 (Henseler et al., 2015).

Reliability Testing. The method used to evaluate the consistency and accuracy of indicators in measuring construct variables is known as reliability testing. In analyses conducted using PLS-SEM with SmartPLS 4 software, the reliability of variables with reflective indicators can be assessed using two approaches: Composite Reliability and Cronbach's Alpha (Henseler et al., 2015). If both values are greater than 0.7, the variable is considered credible due to its good internal consistency (Ghozali & Latan, 2015). Therefore, reliability testing is a crucial step in ensuring the reliability of research findings.

Inner Model Testing. A model that describes the relationship between latent variables using substantive research theory (Ghozali and Latan, 2015). The inner model consists of several key evaluation components during the testing process.

Path Coefficient. The path coefficient is a measure of the strength of the relationship between constructs. Values close to ±1 indicate a strong relationship, while values close to 0 indicate a weak relationship (Hair et al., 2014). In the bootstrapping approach, a t-test or critical ratio (CR) is used to evaluate the significance of the relationship. A t-statistic greater than 1.96 and a p-value less than 0.05 indicate a significant relationship (Darwin & Umam, 2020).

Coefficient of Determination or R-Square (R2). The coefficient of determination is a measure of how much of the variation in the value of an endogenous variable can be explained by exogenous variables in a research model. According to Hair et al. (2014), an R2 value close to 1 indicates that the model is able to explain the variation in the data well. An R2 value close to 0 indicates the opposite. An R2 value of 0.75 is considered strong, 0.50 moderate, and 0.25 weak. Therefore, the R-Square is an important tool for evaluating how well a model can explain the relationships between the variables involved in a study.

Structural Equation Model. In this study, SEM with PLS was used to analyze the relationship between the independent variables identified as factors influencing technology adoption and the dependent variable, in this case, MSME productivity. The structural design to test the hypotheses in this study can be formulated as follows:

$$Y=\beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\beta7X7+\epsilon$$

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Where:
Y = MSME Productivity
X1 = Performance Expectations
X2 = Business Expectations
X3 = Social Influence
X4 = Facility Conditions
X5 = Hedonistic Motivation
X6 = Price Value
X7 = Habits
β0 = Model Constant (Intercept)

β1, β2, β3, β4, β5, β6, and β7 are coefficients that show the influence of each independent variable on the dependent variable, while ε is the error term or residual, which includes variability that the model cannot explain.

RESULT AND DISCUSSION

Respondent Characteristics. Data collection was conducted using an online questionnaire via the g-form platform and through in-person interviews with several relevant MSMEs. This study involved 100 Micro, Small, and Medium Enterprises (MSMEs) operating in Malang City. Table 2 presents the characteristics of the respondents in this study.

Table 2. Respondent Characteristics

Respondent Profile	Frequency	Percentage (%)
Gender	Male	45
	Female	55
Age	< 25 years	20
	25 - 35 years	35
	36 - 45 years	30
	> 45 years	15
Education	Junior high school or lower	10
	High School/Equivalent	50
	Diploma/Bachelor's Degree	30
Type of business	Culinary	40
	Handycrafts	20
	General Trading	25
	Other	15
Business Experience	< 3 years	25
	3 - 5 years	40
	> 5 years	35
Use of Technology	Yes	85
	No	15
Digital Platform Used	Social media	50
	Marketplace	25
	Financial Applications	15
	Not Using Technology	10

Source: Data processed by researchers (2025)

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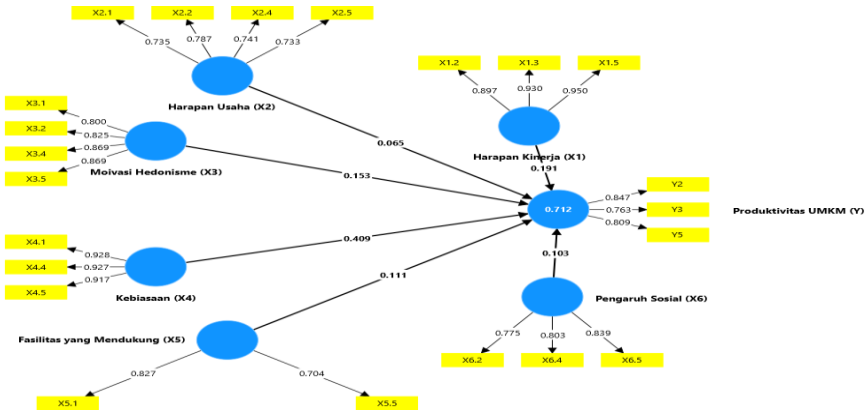
In Table 2, the majority of respondents are business owners or managers who are actively adopting digital technology to support their business operations. In terms of age, most respondents are in the productive age range, namely 25 to 45 years old, reflecting their readiness to accept and implement technological innovation. Based on education level, the majority of respondents have a high school or college education, which influences their understanding of the benefits of technology in improving business efficiency. The types of businesses run by respondents are quite diverse, including culinary, handicrafts, and general trade sectors, all of which have great potential to be supported by digital technologies such as e-commerce and digital payments.

Respondents with longer business experience tended to be more cautious in adopting new technologies, while younger entrepreneurs showed greater enthusiasm for digital innovation. Respondents' primary source of income came from product or service sales, with a small proportion also earning additional income from digital-based services, such as sales through marketplaces or social media. In terms of technology ownership, almost all respondents have used digital devices such as smartphones and computers in their business operations, although there are still differences in the level of optimal technology utilization.

In terms of technology usage, the majority of respondents are familiar with and utilize various digital platforms, such as social media, digital payment applications, and online marketplaces. However, the level of utilization varies depending on each business owner's digital readiness and skills. Some MSMEs have widely adopted technology for marketing and transactions, while others still rely on traditional methods of running their businesses.

Model Evaluation. The analysis of the model evaluation in this study used Partial Least Squares (PLS). The model evaluation was conducted in three stages: convergent validity testing, discriminant validity testing, and reliability testing.

Outer Model Testing. Research cannot test relational and causal relationships if it has not undergone a measurement purification stage. The measurement model is used to test construct validity and instrument validity. Reliability testing is used to measure the consistency of the measuring instrument in measuring a concept or the consistency of respondents in answering questions or research instruments. In the Outer Model evaluation, validity and reliability testing are conducted to ensure that the data used accurately and consistently measure latent variables. This study uses factor loading values and Average Variance Extracted (AVE) to measure convergent validity, and the Heterotrait-Monotrait Ratio (HTMT) and cross-loading values to measure discriminant validity. Composite Reliability and Cronbach's Alpha are used for reliability testing. This Outer Model test is presented in Figure 1 below:



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Source: SEM graph processed through Smart PLS 4

Figure 1. Outer Model test

Convergent Validity Test. Convergent validity measures the extent to which indicators within a construct truly describe the same concept. It is done to ensure that the indicators measuring the latent variable have a high correlation with each other. Generally, this test is conducted with an additive factor value of more than 0.7 and an AVE of more than 0.5. If convergent validity is met, it can be concluded that the indicators consistently indicate the latent variable being measured. Table 3 displays the results of the convergent validity test.

Table 3. Results of the Convergent Validity Test

Variable	Indicator	Loading Factor	AVE	Information
Performance Expectations	X1.1	-	0.857	Did not pass
	X1.2	0.897		Passed
	X1.3	0.930		Passed
	X1.4	-		Did not pass
	X1.5	0.950		Passed
Business Expectations	X2.1	0.735	0.562	Passed
	X2.2	0.787		Passed
	X2.3	-		Did not pass
	X2.4	0.741		Passed
	X2.5	0.733		Passed
Social Influence	X3.1	-	0.650	Did not pass
	X3.2	0.775		Passed
	X3.3	-		Did not pass
	X3.4	0.803		Passed
	X3.5	0.839		Passed
Facilitating Conditions	X4.1	0.827	0.590	Passed
	X4.2	-		Did not pass
	X4.3	-		Did not pass
	X4.4	-		Did not pass
	X4.5	0.704		Passed
Hedonistic Values	X5.1	0.800	0.707	Passed
	X5.2	0.825		Passed
	X5.3	-		Did not pass
	X5.4	0.869		Passed
	X5.5	0.869		Passed
Habit	X6.1	0.928	0.854	Passed
	X6.2	-		Did not pass
	X6.3	-		Did not pass
	X6.4	0.927		Passed
	X6.5	0.917		Passed
MSME Productivity	Y1	-	0.651	Did not pass
	Y2	0.847		Passed
	Y3	0.763		Passed
	Y4	-		Did not pass
	Y5	0.809		Passed

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Source: Data processed using Smart PLS 4

Based on Table 3, it can be seen that indicators with loading factor values > 0.7 and AVE values > 0.5 are declared to have passed. Meanwhile, indicators that do not have loading factor values > 0.7 are declared to have failed. It indicates that not all indicators and variables have met the convergent validity test. Thus, each indicator in the model is not able to consistently represent the latent variables being measured. These results indicate that the resulting Outer Model has poor quality in explaining the concepts of the latent variables being measured.

Discriminant Validity Test. Discriminant validity is used to ensure that a latent variable in a model differs significantly from other latent variables. Cross-loading values can be used to conduct this test. In this case, the latent variable indicator must have a higher cross-loading value on its own variable than on other variables. Furthermore, the HTMT ratio must be less than 0.9 (Henseler et al., 2015). There is no overlap or excessive similarity between latent variables if discriminant validity is met. The results of the discriminant validity test are displayed in Tables 4 and 5 below.

Table 4. Cross-Loading Results

	Supporting Facilities (X5)	Performance Expectation (X1)	Business Expectations (X2)	Habits (X4)	Hedonism Motivation (X3)	Social Influence (X6)	MSME Productivity (Y)
X1.2	0.009	**0.897**	0.488	0.695	0.586	0.519	0.622
X1.3	0.021	**0.930**	0.595	0.773	0.647	0.628	0.710
X1.5	0.066	**0.950**	0.661	0.786	0.692	0.568	0.712
X2.1	0.039	0.554	**0.735**	0.554	0.545	0.440	0.436
X2.2	0.085	0.486	**0.787**	0.521	0.457	0.344	0.483
X2.4	0.231	0.425	**0.741**	0.471	0.506	0.301	0.455
X2.5	0.179	0.436	**0.733**	0.446	0.533	0.382	0.511
X3.1	0.080	0.496	0.481	0.499	**0.800**	0.397	0.508
X3.2	0.103	0.548	0.584	0.587	**0.825**	0.438	0.539
X3.4	0.059	0.700	0.653	0.668	**0.869**	0.469	0.604
X3.5	0.091	0.583	0.564	0.663	**0.869**	0.438	0.655
X4.1	0.218	0.773	0.650	**0.928**	0.640	0.687	0.771
X4.4	0.112	0.742	0.604	**0.927**	0.702	0.636	0.781
X4.5	0.119	0.740	0.579	**0.917**	0.666	0.698	0.691
X5.1	**0.827**	0.113	0.184	0.182	0.133	0.203	0.197
X5.5	**0.704**	-0.091	0.083	0.055	0.004	0.106	0.156
X6.2	0.233	0.504	0.392	0.591	0.397	**0.775**	0.557
X6.4	0.131	0.569	0.435	0.676	0.502	**0.803**	0.560
X6.5	0.127	0.396	0.339	0.459	0.331	**0.839**	0.437
Y2	0.188	0.595	0.476	0.661	0.559	0.646	**0.847**
Y3	0.168	0.586	0.534	0.604	0.550	0.537	**0.763**
Y5	0.204	0.606	0.519	0.696	0.562	0.398	**0.809**

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Source: Data processed using Smart PLS 4 (2025)

Based on Table 4, it is known that each indicator has a higher cross-loading value on its own variable compared to other variables. It indicates that each indicator is more effective in explaining its own variable than in explaining other variables.

Table 5. HTMT Ratio Results

	Supporting Facilities (X5)	Performance Expectation (X1)	Business Expectations (X2)	Habits (X4)	Hedonism Motivation (X3)	Social Influence (X6)	MSME Productivity (Y)
Supporting Facilities (X5)							
Performance Expectation (X1)	0.254						
Business Expectations (X2)	0.408	0.765					
Habits (X4)	0.288	0.886	0.806				
Hedonism Motivation (X3)	0.255	0.776	0.849	0.809			
Social Influence (X6)	0.423	0.739	0.655	0.873	0.639		
MSME Productivity (Y)	0.482	0.900	0.856	0.989	0.864	0.878	

Source: Data processed using SMART PLS 4 (2025)

Then, in Table 5, it can be seen that each variable has an HTMT ratio <0.9, and only one variable has an HTMT value>0.9, which means that each latent variable in the model has clear differences from the others, and one variable has similarities with the other latent variables. Therefore, this model meets the discriminant validity test, which shows that each construct discussed can be interpreted and shows that there is no overlap between latent variables, except for the MSME productivity variable against Habits, which shows overlap between latent variables.

Reliability Testing. Reliability testing is conducted to ensure that the indicators measuring the latent variables provide consistent and stable results when used repeatedly. Reliability testing is conducted using a composite reliability value and Cronbach's alpha value, which must be greater than 0.7. The results of the reliability testing indicate that all indicators consistently measure the

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latent variables and that the questionnaire has been well-structured. The results of the reliability testing are shown in Table 6 below:

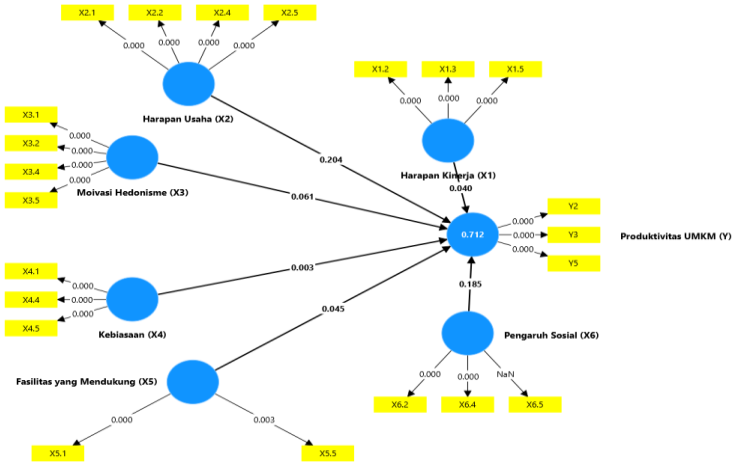
Table 6. Cronbach's Alpha and Composite Reliability Values

Variable	*Cronbach Alpha*	*Composite Reliability*
Performance Expectations	0.917	0.947
Business Expectations	0.740	0.837
Social Influence	0.732	0.848
Conditions that facilitate	0.309	0.741
Hedonistic Motivation	0.862	0.906
Habit	0.915	0.946
MSME Productivity	0.731	0.848

Source: Data Processed via Smart PLS 4 (2025)

Based on Table 6, it can be seen that all latent variables have Composite Reliability and Cronbach Alpha values greater than 0.7, except for the facilitating condition variable, which has a value of less than 0.7. It indicates that the reliability test for the facilitating condition variable has not been completed, while other variables have been completed. Therefore, each indicator included in the measurement model shows good internal consistency in indicating the measured latent variables, except for the facilitating condition variable. These results indicate that the facilitating condition variable is not yet reliable for further analysis.

Inner Model Testing. The purpose of the inner model test is to investigate the causal relationships between latent variables in the model. The path coefficient and R-square values are tested in the inner model test. Furthermore, this test can also include a significance test for the relationships between variables using T-statistics and P-values to determine whether the relationships in the model are statistically significant. Therefore, the inner model test helps ensure that the analyzed relationships are not only well-founded but also correctly interpretable. The inner model test graph is shown in Figure 2 below:



Source: Data Processed with Smart PLS 4 (2025)

Figure 2. Inner Model Test

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Based on Figure 2, the results of the SEM-PLS model analysis are shown in the figure. This analysis examines the relationship between MSME productivity (Y) and technology adoption variables (based on UTAUT2). From the data listed, Business Expectations (X2) and Performance Expectations (X1) show an insignificant influence value (0.000), indicating that the perception of ease of use of technology and confidence in performance improvement have not had a direct impact on MSME productivity. Meanwhile, Hedonistic Motivation (X3) has the highest path coefficient value (0.714), which indicates a significant positive influence on productivity, although there are inconsistencies. In addition, habits (X4), social influence (X6), and supporting facilities (X5) are not significant (0.000), indicating that these components have not been the main drivers of technology adoption. In contrast, productivity indicators Y2, Y3, and Y5 show a partial influence (0.185), indicating that internal factors such as hedonic motivation have a greater influence on MSME productivity increases than external factors or habits.

Path Coefficient Testing. Path coefficient testing is a process for evaluating the strength and significance of the relationship between latent variables in a model. The path coefficient test itself indicates the extent of influence of one latent variable on another, but to ensure that the relationship is truly significant, further statistical testing is required. This test can be performed using a t-test. The test results are shown in Table 7 as follows:

Table 7. Path Coefficient (Mean, STDEV, T-statistic, and P-values)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	*T statistics* (|O/STDEV|)	*P values*
Supporting Facilities (X5) -> MSME Productivity (Y)	0.111	0.113	0.066	1.693	0.045
Performance Expectations (X1) -> MSME Productivity (Y)	0.191	0.184	0.109	1.750	0.040
Business Expectations (X2) -> MSME Productivity (Y)	0.065	0.074	0.079	0.826	0.204
Habits (X4) -> MSME Productivity (Y)	0.409	0.404	0.146	2.806	0.003
Hedonism Motivation (X3) -> MSME Productivity (Y)	0.153	0.150	0.099	1.550	0.061
Social Influence (X6) -> MSME Productivity (Y)	0.103	0.111	0.115	0.895	0.185

Source: Data Processed by SEM PLS 4 (2025)

In testing this research hypothesis, the researcher used a one-tailed hypothesis test. A T-statistic >1.64 indicates the hypothesis is supported. A T-statistic <1.64 indicates the hypothesis is not supported. Based on the data processed, the researcher obtained the following results: Table 8

Table 8. Test Results

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	Hypothesis	T-statistic	Results
X1	There is a significant positive influence of performance expectations on MSME productivity.	1.750	Accepted
X2	There is a significant positive influence of business expectations on MSME productivity.	0.826	Rejected
X3	There is a significant positive influence of social influence on MSME productivity.	0.895	Rejected
X4	There is a significant positive influence of facilitating conditions on MSME productivity.	1.693	Accepted
X5	There is a significant positive influence of hedonic values on MSME productivity.	1.550	Rejected
X6	There is a significant positive influence of habits on MSME productivity.	2.806	Accepted

Source: Data processed by researchers (2025)

Inner Model Evaluation. The inner model evaluation was conducted using the R-Square value, or coefficient of determination. The R-Square value indicates how much the independent variables are able to explain the dependent variable in the research model. The higher the R-Square value, the greater the model's ability to interpret the factors influencing technology adoption and MSME productivity. Table 9 displays the results of the R-Square Value evaluation.

Table 9. Results of the R-Square Value Evaluation

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
MSME Productivity (Y)	0.712	0.732	0.048	14.694	0.000

Source: Data processed by researchers (2025)

Based on Table 9, the R-Square (R^2) value for the MSME Productivity variable (Y) is 0.712, which means that 71.2% of the variation in MSME Productivity can be explained by the independent variables in the research model, while 28.8% is influenced by other factors outside this model, such as government regulations, access to capital, and macroeconomic conditions. With an R^2 of 0.712, this model can be categorized as moderate to strong according to Hair et al. (2014), which indicates that the model is quite good at explaining the factors that influence MSME productivity.

The Relationship between Technology Adoption and MSME Productivity. Technology adoption in the business world, particularly for Small and Medium Enterprises (SMEs), is a key factor in increasing efficiency and competitiveness. Technology empowers SMEs to optimize operational activities, expand markets, and increase productivity by digitizing various aspects of the business, such as marketing, inventory management, and payment systems. In their research, Gupta et al. (2024) stated that direct technology adoption by SMEs leads to increased efficiency, given the readiness of human resources and supporting infrastructure, which can also have a significant impact. Externally, research by Smith and Anderson (2023) found that SMEs that adopted digital technology experienced an average increase in output productivity per unit of input by 12%, although the impact was greater when combined with digital training for employees. It demonstrates that while technology can increase productivity, its use must be accompanied by supporting strategies to achieve greater results. In the case of SMEs in Malang, although many

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businesses have begun using technology, not all are able to leverage this technology to increase productivity. Therefore, the adoption of technology by SMEs does not only depend on the availability of technology, but also on the readiness of human resources, habit patterns, and the existence of an adequate business environment (Heykal et al., 2024).

However, technology adoption in MSMEs faces various obstacles that limit its significant impact on productivity. Limited access to technology, inadequate digital skills, and resistance to change create barriers for small business owners to adopt technology effectively. A study conducted by Kim et al. (2022) in South Korea found that 60 percent of MSMEs still face difficulties in implementing digital technology due to a lack of access to adequate infrastructure and relatively high implementation costs. Furthermore, Kumar et al. (2024) in India found that although MSMEs are familiar with various platforms, only 40 percent actually use them to improve their productivity due to a lack of support from the government and financial institutions. Based on these findings, technology adoption in MSMEs is not only based on ease of use or infrastructure availability, but also on factors such as habits, external support, and organizational readiness to integrate technology into the business.

1. Performance Expectations on Increasing MSME Productivity. The results show that performance expectations have a positive effect on MSME productivity, but this is not statistically significant (path coefficient 0.191, t-statistic 1.750, p-value 0.080). It means that although MSMEs believe that technology can improve their business efficiency and performance, other factors, such as workforce readiness and technological infrastructure, remain major obstacles to increasing productivity. These results align with research by Li et al. (2022), who found that while technology adoption can increase MSME productivity in China by 10-15%, the effect is more significant when accompanied by training programs for workers. Furthermore, research by Ferreira et al. (2021) in Brazil showed that e-commerce increases MSME productivity by up to 30%, but only for businesses that are digitally prepared. In Germany, Eller et al. (2020) found that the implementation of Industry 4.0 technology in manufacturing MSMEs increased productivity by 8-12%, with the main driving factors being competitive pressure and government support. Furthermore, these findings are supported by interviews conducted by the researchers, as follows:

"*Do you think using technology in your business actually improves productivity? If not, what challenges do you face?*"

"*I have tried a digital bookkeeping system, but because I was not used to it, it took longer than manual recording. Without training or mentoring, it is hard to see an immediate increase in productivity...*" (Mr. A, Food Vendor, Klojen).

The insignificant results on performance expectations can be explained by the lack of readiness of MSMEs to adopt technology directly. Many believe that technology can improve efficiency, but without adequate skills, the benefits are difficult to experience. The majority of respondents in this study were aged 25-45 and had a high school or bachelor's degree, indicating they had a sufficient understanding of how technology could help their business operations. Furthermore, most of them had used social media (50%) and marketplaces (25%) for marketing, indicating that technology does play a significant role in their business expansion. This finding implies that although MSMEs believe that technology can improve work efficiency, they have not yet fully experienced significant tangible benefits. Consequently, many MSMEs are hesitant to invest their resources in new technology due to uncertainty about the results. If performance expectations are not accompanied by technical

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support and training, the potential for increased productivity through technology will be difficult to achieve.

2. Business Expectations for Increasing MSME Productivity. Business expectations showed an insignificant relationship with MSME productivity (path coefficient 0.065, t-statistic 0.826, p-value 0.409). It indicates that although MSMEs perceive technology as easy to use, this does not necessarily increase their productivity. A more influential factor is how the technology can provide concrete benefits to their businesses. These results are supported by research by Gupta et al. (2024), who found that ease of use of technology is not sufficient to boost MSME productivity unless the technology is proven to improve efficiency and profitability. Smith and Anderson (2023) also found that MSMEs are more likely to adopt technology if they perceive direct economic benefits rather than based on ease of use. Furthermore, Kumar et al. (2024) showed that MSMEs in India are more interested in technology that can help them reduce operational costs than technology that is simply easy to use. Furthermore, these findings are also supported by interviews conducted by researchers, namely:

"*Do you feel that the technology currently available is easy enough to use? If so, why are some MSMEs still reluctant to use it?*"

"*...Many business applications claim to be easy to use, but for me, who is used to manual methods, it still takes time to learn. Sometimes I am confused about where to start, especially without guidance. So even if the technology is easy, if there is no guidance, I still choose the old way...*" (Mrs. M, General Trader, Blimbing).

These interviews revealed insignificant results, suggesting that even though the technology is considered easy to use, MSMEs still require guidance and support to utilize it effectively. The majority of respondents had more than three years of business experience and were already familiar with their work systems. Therefore, even though the technology was easy to use, they were reluctant to use it unless it provided a direct benefit to their business.

The implication is that governments and industry players must place greater emphasis on economic benefits and increased efficiency over mere ease of use. Consequently, MSMEs may remain reluctant to adopt technology despite the availability of various digital platforms designed for ease of use.

3. Social Influence on Increasing MSME Productivity. The results of the study indicate that social influence does not have a significant impact on MSME productivity (path coefficient 0.103, t-statistic 0.895, p-value 0.371). It suggests that while social environments, such as friends, family, and the business community, can influence MSMEs' decisions to adopt technology, they do not directly increase their business productivity. A study by Raza et al. (2023) found that while social influence can encourage individuals to try new technologies, the decision to continue using them is more dependent on functional and economic factors. Furthermore, research by Al-Azzam and Al-Sharari (2023) in the Middle East showed that social influence has a greater impact on technology adoption among young individuals and start-ups, but is less significant in the context of established businesses. Another study by Chia-Ming Chang et al. (2021) showed that social support can accelerate technology adoption, but without adequate infrastructure and training, productivity will not increase significantly.

The following interview results also support this finding:

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"*How much influence do the people around you, such as friends, family, or the business community, have in encouraging you to use technology in your business?*"

"*...My neighbor already uses a digital cashier application, saying it is more practical. However, for me, as long as manual recording is still possible and there are no problems, I will stick with the old method. Besides, I am not entirely sure whether technology can actually increase revenue or is just a trend...*" (Mrs. A, Racket Craftsman, Sukun).

The interviews may reinforce this finding, suggesting that social influence is not strong enough to increase MSME productivity because technology adoption decisions rely more on perceived benefits than simply following trends or recommendations from others. In the context of MSMEs in Malang City, the majority of respondents had a high school or bachelor's degree (80%), indicating that they prioritize rational considerations. This finding implies that MSMEs do not always adopt technology solely based on recommendations from their peers or the business community. Consequently, strategies that rely solely on community-based approaches to encourage technology adoption may be ineffective.

4. Adequate Facilities for Increasing MSME Productivity. Supportive facilities have a positive effect on MSME productivity, although not significant (path coefficient 0.111, t-statistic 1.693, p-value 0.091). These results indicate that the availability of technological infrastructure, such as internet access, hardware, and technical support services, has an impact on MSME productivity, but is not strong enough to be a primary factor in increasing productivity. Research by Beck et al. (2021) found that good digital infrastructure can improve business efficiency, but only if MSMEs have the human resources ready to utilize it. Furthermore, Kim et al. (2022) showed that although the government provides various technology initiatives for MSMEs in South Korea, only around 45% actually utilize them due to limited digital skills. A study by Brynjolfsson and McAfee (2022) also confirmed that supportive facilities will only have a significant impact on productivity if supported by intensive technology training. This finding is supported by the results of interviews conducted by researchers as follows:

"*Do you think access to facilities like the internet and digital devices is enough to help increase your business productivity? Why?*"

"*...I already have a laptop and an internet connection at my shop, but I do not know how to use them to improve my business. Sometimes I do not know where to start, and if I have technical problems, I do not know who to ask. So, even though the facilities are there, I cannot necessarily use them right away.*" (Mr. D, Blimbing).

These results suggest that available technological facilities may not necessarily increase productivity if MSMEs lack the knowledge or skills to utilize them optimally. In practice, many MSMEs in Malang City still face challenges in terms of internet access, technological devices, and a lack of training in digital technology utilization. It is consistent with a 2022 report from the Malang City Communication and Information Service (Diskominfo), which stated that only 30% of MSMEs have optimally utilized technology. Therefore, increased support in the form of training and access to digital devices is essential.

The implication is that investment in digital infrastructure must be accompanied by increased digital literacy to maximize the use of available facilities. Consequently, MSMEs with access to digital facilities but lacking the skills to use them will still face challenges in increasing productivity.

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5. The Effect of Hedonism on Increasing MSME Productivity. The results of this study indicate that hedonic motivation has a positive but insignificant effect on MSME productivity (path coefficient 0.153, t-statistic 1.550, p-value 0.121). While enjoyment and satisfaction in using technology can drive adoption, these factors are not strong enough to increase productivity directly. This finding aligns with research by Tamilmani et al. (2019), which found that while hedonic motivation plays a role in technology adoption, its impact on business performance is limited. Furthermore, a study by Nikolopoulou et al. (2021) showed that users are more interested in using technology if it offers concrete benefits, rather than simply being enjoyable. Merhi et al. (2019) also found that in the context of mobile banking, hedonic motivation only has an impact in the initial stages of adoption but does not contribute to long-term productivity gains. These findings are further supported by the following interview results:

"*Do the convenience and enjoyment of using technology influence your decision to adopt it in your business?*"

"*...I enjoy using digital marketing apps because they are attractive and easy to use. However, if they do not actually increase sales, I prefer more effective promotional methods, such as word of mouth or direct marketing...*" (Mrs. E, Flower Bouquet Seller, Lowokwaru).

It means that while technology provides a pleasant experience, the primary factor in increasing productivity remains economic benefits, not simply convenience. In the context of dominant business sectors in Malang City, such as culinary (40%), general trade (25%), and handicrafts (20%), technology is used as a tool to increase efficiency, not as a means of entertainment. Many MSMEs still focus on financial gain rather than satisfaction in using technology, so hedonistic motivation is not a primary factor in technology adoption decisions. This finding implies that technology adoption programs should emphasize functional and economic benefits rather than the enjoyment aspect of use. Consequently, MSMEs that focus more on business benefits will be more likely to continue using technology in the long term compared to those who are attracted solely by pleasure or trends. If hedonistic motivation is the primary factor in technology adoption, then technology use can be temporary and unsustainable.

6. Habits for Increasing MSME Productivity. Habits have a positive and significant influence on MSME productivity (path coefficient 0.409, t-statistic 2.806, p-value 0.005). It indicates that MSMEs accustomed to using technology tend to be more productive than those still using conventional methods. This finding is supported by research by Zhang et al. (2021), who found that the habit of using technology in business operations can increase the effectiveness of small businesses in facing digital competition. Furthermore, Raka et al. (2022) found that MSMEs that habitually use social media and digital platforms have higher competitiveness than those that still rely on traditional methods. Mohammad Rizal (2018) also showed that habits play a significant role in technology adoption by MSMEs in developing countries, where entrepreneurs accustomed to using technology are quicker to adapt to market changes. Furthermore, these findings are also supported by interviews conducted by researchers as follows:

"*Do you think your technology habits affect your business productivity? If so, how was your experience in developing those habits?*"

"*... I am used to receiving orders directly, so if another app offers a digital ordering system, I am confused and reluctant to learn...*" (Dila Nur, Warung Owner, Kedungkandang)

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It suggests that habits play a significant role in technology adoption by MSMEs. Once business owners are accustomed to a particular method, they are less likely to switch to new technology unless there are clear benefits. This finding supports the UTAUT2 theory, which states that habits are a crucial factor in the sustainability of technology adoption. The majority of respondents (75%) had more than three years of business experience, indicating a stable work pattern. Those accustomed to using technology such as digital cashiers, stock management applications, or digital payments tend to be more efficient in managing their businesses than those who still rely on manual methods.

These findings imply that digital habits must be formed through continuous practice, not just one-time training. Consequently, MSMEs accustomed to using technology are quicker to adapt to market changes and more efficient in managing their businesses. If digital habits are not well-formed, MSMEs will fall behind competitors who adapt more quickly to technology.

Analysis of Results with Research Objectives. The analysis found that performance expectations, facilitating conditions, and habits are the main factors driving MSMEs to adopt technology. In other words, business owners are more likely to use technology if they believe it can increase their productivity, if there is adequate infrastructure support, and if they are already accustomed to using it in their daily lives. Conversely, business expectations, social influence, and hedonistic motivation were not shown to have a significant impact on technology adoption among MSMEs. It means that even if technology is easy to use, it does not necessarily make business owners immediately interested in using it. Similarly, the influence of others and social support did not play a significant role in MSMEs' decisions to adopt technology.

Furthermore, personal satisfaction in using technology was not a primary factor for MSMEs; they focused more on the tangible benefits it could bring to their businesses. These findings provide important insights for the government and technology service providers. If MSMEs want to increase digitalization, it is important to focus not only on providing easy-to-use technology but also on building supporting infrastructure, providing broader technology training, and ensuring a habit of sustainable technology use.

CONCLUSION

The results of this study indicate that performance expectations have a positive impact on MSME productivity, but are not statistically significant, indicating that, although business actors believe in the benefits of technology, the lack of human resources and infrastructure readiness is a major obstacle. Business expectations also do not have a significant impact on productivity, indicating that the ease of technology adoption is not enough to increase productivity without a deeper understanding of the business benefits. Meanwhile, social influence also does not show a significant relationship, indicating that recommendations from business colleagues or colleagues are not strong enough to encourage technology adoption in MSMEs. On the other hand, habits were found to have a positive and significant impact on productivity, indicating that business actors who have used technology are able to utilize it optimally. Furthermore, supporting facilities have a positive but not significant impact, indicating that although digital infrastructure is available, its utilization is very limited. Hedonic motivation also does not have a significant impact on MSME productivity, indicating that the enjoyment aspect of using technology is not a major factor in increasing business efficiency.

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This study has several limitations that require further consideration. First, the limited number of respondents in Malang City makes the results unable to be broadly generalized to MSMEs in other regions. Second, this study used only a quantitative approach, thus not delving deeper into the psychological and social factors that may influence technology adoption. Third, this study focused solely on the variables contained in the UTAUT2 model, without considering external factors such as government policies, the availability of technology subsidies, or market competition, which can also influence MSME productivity. Therefore, future research is expected to use a qualitative approach to gain a deeper understanding, expand the scope of respondents to various regions, and consider other variables that may contribute to increasing MSME productivity through technology adoption.

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