

Digital Readiness Of Msmes In The Industry 4.0 Era: A Study On Culinary Sector Msmes In Tuntang Sub-District, Semarang Regency

Hardian

Universitas Borobudur

Email: ianmursito@gmail.com

Mohammad Halilintar

Universitas Borobudur

Email: mohamad_halilintar@borobudur.ac.id

Korespodensi penulis: *ianmursito@gmail.com

Abstract: This study examines the digital readiness of Micro, Small, and Medium Enterprises (MSMEs) in the culinary sector in Tuntang District, Semarang Regency in facing the Industry 4.0 era. The research employed a descriptive quantitative approach, involving 75 culinary MSME owners through questionnaires and structured interviews. The results show that the majority of culinary MSMEs in Tuntang District are at the "transition" level of digital readiness (62%), while 23% are still at the "basic" stage and only 15% have reached the "advanced" level. Factors influencing digital readiness include the digital literacy of business owners, availability of technological infrastructure, financial support, and demographic characteristics of business actors. The main challenges faced by MSME owners include limited knowledge of digital technology, minimal access to training, limited capital for technology investment, and the age of business actors who are predominantly over 40 years old. This research recommends the need for sustainable technical assistance programs, provision of special funding access for technology adoption, and development of a digital ecosystem that supports the transformation of local culinary MSMEs.

Keywords: culinary MSMEs, digital readiness, Industry 4.0, digital transformation, Semarang Regency

INTRODUCTION

The Industry 4.0 era has brought significant changes to various economic sectors, including Micro, Small, and Medium Enterprises (MSMEs). Digital transformation has become a necessity for business actors to survive and grow in an increasingly competitive business environment. According to Hamid (2021), MSMEs that are able to adopt digital technology have revenue growth opportunities up to 80% higher compared to MSMEs that have not adapted to the digital era. In Indonesia, MSMEs contribute about 60% to the Gross Domestic Product (GDP) and absorb more than 97% of the workforce (Ministry of Cooperatives and MSMEs, 2023). However, based on a survey conducted by the Ministry of Communication and Information Technology in 2022, only 16% of MSMEs in Indonesia have optimally utilized digital technology in their business operations.

This figure indicates the still low level of digital adoption among MSME actors, especially in areas far from economic centers. Semarang Regency is one of the regions with large MSME potential, particularly in the culinary sector. Tuntang Sub-district, as one area in Semarang Regency, has many culinary MSME actors who rely on flagship products based on local wisdom. Based on data from the Semarang Regency Office of Cooperatives and MSMEs (2023), there are 213 culinary MSMEs operating in Tuntang Sub-district, with the majority still using conventional marketing and business management systems. Pratama et al. (2022) showed that the digital readiness of MSMEs in rural areas is still relatively low due to various factors

such as limited infrastructure, limited digital literacy, and lack of access to funding for technology investment.

This condition is also reflected in the culinary MSMEs in Tuntang Sub-district, most of which have not maximized the utilization of digital technology in their business operations. The COVID-19 pandemic has become a catalyst that accelerates the need for digital transformation for MSMEs, including in the culinary sector. In line with Susanto et al. (2023), the pandemic forced business actors to quickly adapt to changes in consumer behavior that increasingly rely on digital platforms. This change becomes a momentum to assess how far the readiness of culinary MSMEs in Tuntang Sub-district is in facing the demands of digital transformation in the Industry 4.0 era.

Based on these phenomena, this study aims to analyze the level of digital readiness of culinary MSMEs in Tuntang Sub-district, Semarang Regency, in facing the Industry 4.0 era, identify factors influencing digital readiness, and formulate strategies to improve the digital capacity of culinary MSMEs in the area. The results of this study are expected to provide input for the development of policies and MSME assistance programs that are more aligned with local needs and conditions.

LITERATURE REVIEW

Digital Transformation in MSMEs

Digital transformation is the integration of digital technology into all aspects of business that results in fundamental changes in operations and the way value is delivered to customers (Schwertner, 2021). For MSMEs, digital transformation is not merely the implementation of new technology but also a change in mindset, strategy, and organizational culture oriented towards utilizing digital technology (Rachinger et al., 2019). Research conducted by Novita et al. (2021) identifies four dimensions of digital transformation in MSMEs, namely: (1) the use of digital technology in business operations, (2) changes in business models based on digital platforms, (3) optimization of customer experience through digital platforms, and (4) enhancement of human resource capabilities in digital literacy. These dimensions are interconnected and form a comprehensive digital transformation ecosystem for MSMEs. According to Suryani and Prasetyo (2023), MSMEs that successfully undergo digital transformation demonstrate operational efficiency improvements up to 30%, market reach expansion by 45%, and an average revenue increase of 57% within two years of implementation. This data indicates that digital transformation has a significant impact on MSME business performance.

Digital Readiness of MSMEs

Digital readiness refers to the ability and willingness of an organization or individual to adopt and utilize digital technology in their business activities (Rogers, 2020). In MSMEs, Firmansyah and Ramdani (2022) define digital readiness as the condition where MSME actors have sufficient knowledge, skills, infrastructure, and ecosystem to implement digital technology in their business operations. Azeez and Yaakub (2019) developed a model to measure MSME digital readiness consisting of five dimensions: (1) digital infrastructure, (2) human resource capabilities, (3) knowledge and technology skills, (4) management commitment, and (5) external support. This model has been widely used to assess MSME digital readiness in various countries, including Indonesia.

A study conducted by Wirapraja and Aribowo (2021) on MSMEs in Indonesia found that the level of digital readiness in MSMEs can be categorized into three levels: (1) basic, characterized by very limited use of digital technology; (2) transitional, showing adoption of

digital technology in several business areas; and (3) advanced, reflecting systematic integration of digital technology in all aspects of business.

MSMEs in the Industry 4.0 Era

Industry 4.0 refers to the integration of digital technologies such as the Internet of Things (IoT), artificial intelligence, big data, cloud computing, and automation technologies in production and business processes (Schwab, 2019). For MSMEs, the Industry 4.0 era opens up both opportunities and challenges in business development. Research by Ibrahim and Kusuma (2020) revealed that MSMEs that are able to adapt to Industry 4.0 have opportunities to enter global markets, increase production efficiency, and create innovative business models. However, MSMEs also face challenges such as digital divides, limited resources, and rapid changes in technology and consumer preferences.

Satriyo and Nugroho (2022) highlight that the culinary sector is one of the MSME sectors that benefits the most from the presence of digital technology in the Industry 4.0 era. Through digital platforms, culinary MSMEs can expand market reach, increase operational efficiency, and create better customer experiences. However, the study also showed that digital technology adoption among culinary MSMEs is still uneven, especially in rural areas.

Factors Affecting MSME Digital Readiness

In adopting digital technology, MSMEs are influenced by various internal and external factors. Based on research by Wijaya and Suteja (2021), internal factors influencing MSME digital readiness include business owner characteristics (age, education, experience), technological capability, financial capability, and business size. Meanwhile, external factors include technological infrastructure, government policies, support from financial institutions, and market pressure. A study conducted by Fatimah and Hasan (2023) on MSMEs in Central Java found that the most influential factors on MSME digital readiness are the digital literacy of the business owner, availability of technological infrastructure, and financial support.

The study also revealed that demographic characteristics of business actors, such as age and education level, positively correlate with the level of digital readiness. Yulianto and Prihantoro (2022) emphasize the need for government roles and supportive ecosystems to enhance MSME digital readiness. Training and mentoring programs, fiscal incentives for technology adoption, and digital infrastructure development are interventions that can significantly improve MSME digital readiness.

RESEARCH METHODS

Approach and Type of Research

This study uses a descriptive quantitative approach to measure and analyze the digital readiness level of culinary sector MSMEs in Tuntang District, Semarang Regency. The quantitative approach was chosen to obtain an objective overview of the digital readiness level based on predetermined indicators, while descriptive analysis was used to explain the phenomena and characteristics of the data obtained from the field.

Population and Sample

The population in this study includes all culinary sector MSMEs operating in Tuntang District, Semarang Regency. Based on data from the Cooperatives and MSMEs Office of Semarang Regency (2023), there are 213 registered culinary MSMEs in Tuntang District. Using the Slovin formula with a 10% margin of error, a sample size of 75 MSMEs was determined. The sampling technique employed stratified random sampling based on business categories (micro, small, and medium) to ensure representation from each business category in

the study sample. Of the 75 samples, 42 were micro businesses, 25 were small businesses, and 8 were medium businesses, in accordance with the population proportions.

Data Collection Techniques

In this study, data were collected through various techniques designed to gather information about the digital readiness of MSMEs. One technique used was a structured questionnaire, which was developed to measure the extent of digital readiness among MSME actors. This instrument covers several important dimensions, such as digital infrastructure, human resource capabilities, technology knowledge and skills, management commitment, and external support. Each statement in the questionnaire was measured using a five-point Likert scale, allowing respondents to express their level of agreement with various statements presented.

In addition to the questionnaire, the researcher also conducted structured interviews with fifteen MSME owners selected purposively. These interviews aimed to explore more deeply the experiences, challenges, and opportunities they faced in adopting digital technology. Each interview session lasted between 30 and 45 minutes, providing space for respondents to explain their perspectives more thoroughly. Observation techniques were also employed in the data collection process, particularly to directly observe how digital technology is used in the operational activities of MSMEs. Twenty randomly selected culinary MSMEs from the research sample became the objects of observation. The purpose of this technique was to validate the data previously obtained from questionnaires and interviews. As a complement, the researcher also conducted a documentation study of various relevant documents. These documents included reports from the Cooperatives and MSMEs Office, MSME profiles, and other documents related to the use of digital technology by culinary business actors in Tuntang District. Through this approach, the study is expected to present a comprehensive picture of the digital readiness conditions of MSMEs in the area.

Research Variables

This study focuses primarily on the variable of the digital readiness level of culinary MSMEs. This readiness level is measured through five main dimensions representing key aspects in the business digitalization process. The first dimension is digital infrastructure, which includes the availability of technological devices, internet connectivity, and information systems used in daily operational activities. The existence of this infrastructure is the main foundation enabling MSMEs to optimally adopt digital technology. The second dimension is human resource capability, which reflects employees' digital skills, their participation in digital training, and the extent to which a digital culture has been established within the organization. This capability plays a crucial role in ensuring that the available technology can be utilized effectively.

Next, the dimension of knowledge and technological skills focuses on the extent to which business owners understand and are able to use digital technology in their business. This dimension serves as a key indicator in assessing the readiness of individuals as the main drivers of digital transformation in small enterprises. The fourth dimension is management commitment, which measures the real support from business owners towards the digitalization process. This is reflected in how much attention and resources they allocate to encourage the adoption of technology within their business environment.

The last dimension is external support, which includes access of MSMEs to mentoring programs, training, and funding that can accelerate the process of adopting digital technology. The role of external parties is an equally important supporting factor in shaping the digital readiness of MSMEs. In addition to these main variables, this study also considers demographic characteristics of business owners such as age, gender, and education level, as well as business

characteristics including years of operation, number of employees, and turnover size. This information is analyzed to see if there is a relationship between these factors and the level of digital readiness of culinary MSMEs.

Data Analysis Techniques

The collected data were analyzed using descriptive statistics to depict the level of digital readiness of culinary MSMEs based on the predetermined dimensions. Descriptive analysis included calculating frequencies, percentages, means, and standard deviations for each digital readiness indicator. To categorize the level of digital readiness, the model developed by Wirapraja and Aribowo (2021) was used, which divides digital readiness into three levels: basic, transitional, and advanced. The determination of the digital readiness level was based on the total score from the five digital readiness dimensions.

Spearman's correlation analysis was used to identify relationships between demographic characteristics of business owners and business characteristics with the level of digital readiness. Meanwhile, multiple linear regression analysis was applied to identify the factors influencing the digital readiness of culinary MSMEs in Kecamatan Tuntang. Qualitative data from interviews and observations were analyzed through coding and categorization processes to identify main themes related to problems and opportunities in adopting digital technology. The results of the qualitative analysis were used to enrich and validate the findings from the quantitative analysis.

Results and Discussion

Profile of Culinary MSMEs in Kecamatan Tuntang

Based on the research results, culinary MSMEs in Kecamatan Tuntang are dominated by micro enterprises (56%), followed by small enterprises (33%), and medium enterprises (11%). In terms of products, the majority of MSMEs operate in processed foods (65%), beverages (20%), and ready-to-eat culinary (15%). The average business age is 7.3 years, ranging from 1 to 23 years. Regarding the characteristics of business owners, 62% of MSME owners are female and 38% male. Most MSME owners (45%) are aged 41-50 years, followed by the 31-40 years group (27%), over 50 years (18%), and under 30 years (10%). The education level is dominated by high school/vocational school graduates (47%), followed by bachelor's degree graduates (23%), diploma holders (15%), junior high school (12%), and elementary school (3%).

Digital Readiness Level of Culinary MSMEs

The measurement of the digital readiness level of culinary MSMEs in Kecamatan Tuntang shows that the majority of MSMEs (62%) are at the "transitional" level, 23% remain at the "basic" level, and only 15% have reached the "advanced" level. These findings indicate that most culinary MSMEs in Kecamatan Tuntang have begun their digital transformation journey but have not yet achieved full integration of digital technology into their business operations.

When viewed based on the dimensions of digital readiness, culinary MSMEs in Kecamatan Tuntang scored highest in the management commitment dimension (an average of 3.8 out of 5), followed by digital infrastructure (3.4), human resource capability (3.1), technology knowledge and skills (2.9), and external support (2.6). These results show that although MSME owners have a high commitment to adopting digital technology, they still face limitations in knowledge, skills, and external support.

The research results also show variations in digital readiness levels based on business size. Medium enterprises tend to have higher digital readiness levels (62.5% at the "advanced" level) compared to small enterprises (16% at the "advanced" level) and micro enterprises (7.1%

at the "advanced" level). This difference can be related to the availability of resources, both financial and human, which are more adequate in medium enterprises.

Implementation of Digital Technology in Culinary MSMEs

In terms of digital technology implementation, the study found that 87% of culinary MSMEs in Kecamatan Tuntang use social media for product marketing, with the most widely used platforms being WhatsApp (85%), Instagram (62%), and Facebook (47%). The use of marketplaces by culinary MSMEs is also quite significant, with 53% of MSMEs utilizing platforms such as Gojek, Grab, and Shopee to sell their products. However, the implementation of digital technology in business operations remains limited. Only 32% of MSMEs use digital payment systems, 18% apply digital inventory systems, and 12% utilize data analytics for decision-making.

These findings align with the research by Wijaya and Suteja (2021), which found that MSMEs tend to adopt digital technology first in the marketing aspect before expanding to other operational aspects. The implementation of digital technology also varies based on the age of the business owner. MSMEs owned by entrepreneurs under 40 years old tend to be more active in adopting various digital technologies compared to MSMEs owned by entrepreneurs over 40 years old. For example, 73% of MSME owners under 40 use more than one social media platform, whereas this figure is only 42% for MSME owners over 40.

Factors Influencing Digital Readiness

The results of multiple linear regression analysis show that the factors significantly affecting the digital readiness of culinary MSMEs in Kecamatan Tuntang are business owners' digital literacy ($\beta = 0.48$, $p < 0.01$), availability of technological infrastructure ($\beta = 0.39$, $p < 0.01$), financial support ($\beta = 0.32$, $p < 0.05$), and age of the business owner ($\beta = -0.29$, $p < 0.05$). This regression model explains 67% of the variance in the level of digital readiness ($R^2 = 0.67$). These findings align with the research of Fatimah and Hasan (2023), which found that digital literacy of business owners is the most influential factor on MSMEs' digital readiness. Digital literacy includes the knowledge, skills, and attitudes of business owners toward digital technology, which ultimately affects their decisions and strategies in adopting technology in their business.

The availability of technological infrastructure, such as access to high-speed internet and adequate digital devices, is also a key factor in determining MSMEs' digital readiness. Observations showed that several areas in Kecamatan Tuntang still experience limited internet infrastructure, which becomes an obstacle for MSMEs in optimizing the use of digital technology. Financial support, both in the form of own capital and access to external funding, also significantly influences the digital readiness of MSMEs. Digital technology investment often requires considerable costs, so financial limitations can become a barrier for MSMEs in optimally adopting digital technology. The age of the business owner shows a negative correlation with the level of digital readiness, meaning the younger the business owner, the higher their digital readiness level. This can be associated with the generational gap in technology use, where younger generations tend to be more familiar with and adaptive to digital technology compared to older generations.

Problems and Opportunities in Adopting Digital Technology

The results of interviews and observations conducted in this study revealed several problems still faced by culinary MSME actors in Kecamatan Tuntang in adopting digital technology. One of the main issues is the limited knowledge and skills in using technology, especially among entrepreneurs over 40 years old. As many as 68% of respondents admitted experiencing difficulties in operating digital platforms with complex features, which became an obstacle in their business digitalization process. In addition, access to training and technical

assistance remains relatively low. Only about 23% of MSME actors have attended digital technology-related training in the last two years, indicating a gap in digital capacity development. Another common problem is the limited capital to invest in technology. Fifty-seven percent of respondents stated that high costs are the main factor causing hesitation in adopting new technology.

Infrastructure conditions also affect MSMEs' digital readiness. In some areas of Kecamatan Tuntang, internet infrastructure is inadequate. Forty-two percent of respondents complained about frequent internet connection disruptions, which hinder business operations relying on digital systems. Equally important, concerns about data and online transaction security remain a prominent issue, with 35% of respondents expressing doubts about the security of digital platforms, especially in financial transactions. However, behind these various problems, there are several opportunities that can be leveraged to improve the digital readiness of culinary MSMEs.

The increasing use of smartphones and internet among the community opens pathways for MSMEs to expand market reach through digital platforms. Furthermore, the government and various non-governmental organizations have started offering digital mentoring and training programs. The high enthusiasm of MSME actors is evident from 78% of respondents expressing interest in participating in such programs if available in their area. Another opportunity comes from potential collaboration with digital business actors or tech startups, which can help design digital solutions relevant to the needs of local MSMEs. In addition, developing digital MSME clusters can serve as a means for sharing resources and knowledge among business actors. The distinctive potential of Tuntang culinary products is also an asset that can be further developed through appropriate digital marketing strategies, thereby strengthening the branding and competitiveness of local products in wider markets.

Strategies to Improve the Digital Readiness of Culinary MSMEs

Based on field findings, several strategies can be formulated to enhance the digital readiness of culinary MSMEs in Kecamatan Tuntang. First, it is necessary to develop training and technical assistance programs tailored to the characteristics and needs of local business actors. Training should focus on practical aspects of using digital technology in the daily operational activities of culinary businesses. Second, providing access to special funding for digital technology adoption is crucial. Schemes such as soft loans, grants, or fiscal incentives need to be considered to encourage more MSMEs to invest in digital transformation. This step should be accompanied by strengthening digital infrastructure, including improving the quality and equal distribution of internet connectivity across Kecamatan Tuntang.

Next, developing a local digital platform that can facilitate the marketing of Tuntang's distinctive culinary products becomes a key strategy to strengthen product identity and expand markets. Additionally, forming a digital culinary MSME community can serve as a forum for exchanging experiences, knowledge, and best practices among business actors. Another strategy is organizing cross-generational mentoring programs that enable younger, more digitally literate MSME actors to share skills and experiences with more senior business owners. This can accelerate organic knowledge transfer within the MSME community.

Finally, developing an integrated digital ecosystem becomes a primary long-term step. This ecosystem includes marketing platforms, digital payment systems, and logistics networks that support smooth business operations. The success of these strategies heavily depends on synergy among various parties—local government, academia, and the private sector—in developing and implementing capacity-building programs to enhance the digital readiness of culinary MSMEs in Kecamatan Tuntang.

Impact of Increasing Digital Readiness on the Performance of Culinary MSMEs

This study also analyzes the relationship between the level of digital readiness and the business performance of culinary MSMEs in Tuntang Subdistrict. The analysis results show a significant positive correlation between digital readiness levels and revenue growth ($r = 0.63$, $p < 0.01$), market reach expansion ($r = 0.58$, $p < 0.01$), and operational efficiency ($r = 0.51$, $p < 0.01$). MSMEs at the "advanced" digital readiness level showed an average revenue increase of 47% over the last two years, compared to 28% for MSMEs at the "transition" level and 12% for those at the "basic" level. These findings emphasize the necessity of digital transformation to enhance competitiveness and sustainability of culinary MSMEs in the Industry 4.0 era.

Regarding market expansion, MSMEs with higher digital readiness levels are able to reach consumers outside Semarang Regency. Eighty-two percent of MSMEs at the "advanced" level reported having customers from outside the regency, while this figure was only 45% for MSMEs at the "transition" level and 15% for those at the "basic" level. Increased operational efficiency is also evident among MSMEs with higher digital readiness, particularly in inventory management, ordering processes, and product delivery. MSMEs at the "advanced" level reported a reduction of up to 35% in business process time after implementing digital systems in their operations.

These results align with the findings of Suryani and Prasetyo (2023), which show a positive correlation between the adoption of digital technology and improved MSME business performance. This strengthens the argument that digital transformation is no longer merely an option but a necessity for MSMEs to survive and thrive in the Industry 4.0 era.

CONCLUSION

This study examines the level of digital readiness of culinary MSMEs in Tuntang Subdistrict, Semarang Regency, in facing the Industry 4.0 era. The results show that the majority of culinary MSMEs in the area are at the "transition" digital readiness level (62%), while 23% are still at the "basic" stage and only 15% have reached the "advanced" level. These findings indicate that although most MSMEs have begun their digital transformation journey, there is still ample room for improvement. Factors that significantly influence the digital readiness of culinary MSMEs in Tuntang include the digital literacy of business owners, availability of technological infrastructure, financial support, and demographic characteristics of the entrepreneurs. The age of business owners shows a negative correlation with digital readiness level, indicating a generational gap in adopting digital technology.

The main problems faced by MSME actors in adopting digital technology are limited knowledge and skills in technology, limited access to training and technical assistance, lack of capital for technology investment, uneven internet infrastructure, and concerns over data security and online transactions. On the other hand, opportunities to improve digital readiness are opening up due to increased smartphone and internet usage in the community, assistance and training programs, collaboration with digital business actors, development of digital MSME clusters, and the potential for developing local specialty culinary products that can be marketed more widely through digital platforms. To improve the digital readiness of culinary MSMEs in Tuntang, strategies are needed that include developing ongoing training and technical assistance programs, providing special funding access for technology adoption, strengthening digital infrastructure, developing local digital platforms, establishing digital culinary MSME communities, and fostering collaboration among various stakeholders to develop a digital ecosystem that supports MSME transformation.

The study also shows that increased digital readiness positively correlates with improved MSME business performance, reflected in revenue growth, market expansion, and

increased operational efficiency. These findings affirm the necessity of digital transformation as a strategy to enhance the competitiveness and sustainability of culinary MSMEs in the Industry 4.0 era. This research provides theoretical contributions in developing a digital readiness model tailored to culinary MSMEs in rural Indonesia, as well as practical contributions in the form of policy recommendations and programs to enhance the digital capacity of MSMEs. For future research, it is recommended to broaden the scope to other MSME sectors and wider geographic areas, as well as to conduct longitudinal studies to observe the development of MSMEs' digital readiness over a longer period.

REFERENCES

- Azeez, N. D., & Yaakub, K. B. (2019). Factors Affecting Digital Technology Adoption by Small and Medium Enterprises in Malaysia. *Journal of Technology Management and Business*, 6(2), 1-12.
- Fatimah, S., & Hasan, M. (2023). Analisis Faktor-Faktor yang Mempengaruhi Kesiapan Digital UMKM di Jawa Tengah. *Jurnal Manajemen dan Kewirausahaan*, 25(1), 42-57.
- Firmansyah, R., & Ramdani, D. (2022). Model Kesiapan Digital UMKM: Studi Kasus pada UMKM di Pulau Jawa. *Jurnal Teknologi Informasi dan Ilmu Komputer*, 9(3), 287-298.
- Hamid, A. (2021). Transformasi Digital UMKM sebagai Strategi Pemulihan Ekonomi Pasca Pandemi. *Jurnal Ekonomi dan Pembangunan Indonesia*, 22(1), 15-28.
- Ibrahim, S., & Kusuma, H. (2020). UMKM di Era Industri 4.0: Peluang dan Tantangan. *Jurnal Ilmiah Bisnis dan Ekonomi Asia*, 14(1), 89-102.
- Kementerian Koperasi dan UKM. (2023). *Perkembangan Data Usaha Mikro, Kecil, Menengah (UMKM) dan Usaha Besar (UB) Tahun 2020-2022*. Jakarta: Kementerian Koperasi dan UKM.
- Novita, D., Wijaya, S. W., & Kasenda, L. M. (2021). Dimensi Transformasi Digital pada UMKM: Sebuah Kerangka Konseptual. *Jurnal Sistem Informasi*, 17(2), 126-139.
- Pratama, A. H., Santoso, B., & Wijaya, D. R. (2022). Kesiapan Digital UMKM di Wilayah Rural: Studi Kasus di Jawa Barat. *Jurnal Pengembangan Wiraswasta*, 24(1), 53-68.
- Rachinger, M., Rauter, R., Müller, C., Vorraber, W., & Schirgi, E. (2019). Digitalization and Its Influence on Business Model Innovation. *Journal of Manufacturing Technology Management*, 30(8), 1143-1160.
- Rogers, E. M. (2020). *Diffusion of Innovations* (6th ed.). New York: Free Press.
- Satriyo, T., & Nugroho, A. (2022). Pemanfaatan Teknologi Digital pada UMKM Kuliner: Studi Kasus di Yogyakarta. *Jurnal Ekonomi dan Bisnis*, 25(2), 178-192.
- Schwab, K. (2019). *The Fourth Industrial Revolution*. Geneva: World Economic Forum.
- Schwertner, K. (2021). Digital Transformation of Business. *Trakia Journal of Sciences*, 15(1), 388-393.
- Suryani, E., & Prasetyo, Y. T. (2023). Dampak Transformasi Digital terhadap Kinerja UMKM di Indonesia. *Jurnal Manajemen Kewirausahaan*, 25(1), 42-57.
- Susanto, A., Sari, R., & Hendrayati, H. (2023). Adaptasi UMKM di Era Pasca Pandemi: Peran Teknologi Digital. *Jurnal Ilmu Manajemen dan Bisnis*, 14(1), 85-98.
- Wijaya, S., & Suteja, B. R. (2021). Determinan Adopsi Teknologi Digital pada UMKM di Indonesia. *Jurnal Manajemen dan Kewirausahaan*, 23(2), 153-165.
- Wirapraja, A., & Aribowo, H. (2021). Model Kesiapan Digital UMKM di Indonesia. *Jurnal Teknologi Informasi dan Manajemen*, 8(1), 33-45.
- Yulianto, H., & Prihantoro, E. (2022). Peran Pemerintah dalam Meningkatkan Kesiapan Digital UMKM. *Jurnal Administrasi Publik*, 12(2), 287-299.