

# Maturity Level Measurement Model of MSMEs for Sustainable Economic Growth

Chandra Lukita<sup>1\*</sup> , Aditya Kurniawan Chandra<sup>2</sup> , Rifqi Fahrudin<sup>3</sup> , Niken Maria Agatha<sup>4</sup>,  
Dina Perme Suci<sup>5</sup>

<sup>1,2,3,4,5</sup>Faculty of Economy and Business, Catur Insan Cendekia University, Indonesia

<sup>1</sup>chandra.lukita@cic.ac.id, <sup>2</sup>aditya.chandra@cic.ac.id, <sup>3</sup>rifqi.fahrudin@cic.ac.id, <sup>4</sup>niken.agatha.mj.23@cic.ac.id,

<sup>5</sup>dina.suci.mj.23@cic.ac.id

\*Corresponding Author

## Article Info

### Article history:

Submission July 1, 2025

Revised November 6, 2025

Accepted January 28, 2026

Published April 1, 2026

### Keywords:

MSMEs

Measurement Model

SDGs

Cirebon City

Sustainable Economic Growth



## ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in regional economic development, particularly in the culinary sector. However, culinary MSMEs in secondary urban areas such as Cirebon City face persistent challenges in adapting to digital transformation, including limited digital literacy, weak financial management, and low integration with digital business ecosystems. The absence of a contextual and measurable framework to assess digital readiness further constrains strategic decision-making and long-term competitiveness. **This study aims** to develop a digital maturity measurement model for culinary MSMEs in Cirebon City to systematically evaluate their level of digital readiness and support sustainable economic growth. A **mixed-method research design** was applied using a sequential explanatory approach. Quantitative data were collected through Likert-scale questionnaires distributed to 150 culinary MSMEs, measuring three core dimensions: Financial Health, Market Capitalization, and Local Digital Mapping. Instrument reliability was confirmed using Cronbach's Alpha. Qualitative data were obtained through in-depth interviews and field observations to validate and contextualize the quantitative findings. The findings reveal that approximately 65% of MSMEs remain at the Survival stage, characterized by minimal adoption of digital accounting, digital marketing, and e-commerce platforms. Financial Health emerged as the weakest dimension, followed by Market Capitalization. Based on empirical evidence, MSMEs were classified into three maturity stages: Survival, Momentum, and Expansion. The proposed model offers a valid and practical tool for MSMEs and policymakers to assess digital maturity and design targeted empowerment strategies. **This study contributes** to the literature on MSME digital transformation and supports the achievement of SDG 8 and SDG 9.

*This is an open access article under the [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/) license.*



DOI: <https://doi.org/10.34306/att.v8i2.781>

This is an open-access article under the [CC-BY license](https://creativecommons.org/licenses/by/4.0/) (<https://creativecommons.org/licenses/by/4.0/>)

©Authors retain all copyrights

## 1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a very important role in supporting the national and regional economy. MSMEs contribute greatly to the absorption of labor, the creation of new jobs, and the improvement of community welfare in an inclusive manner. Based on data from the Ministry of Cooperatives and SMEs, MSMEs contribute more than 60% to the national Gross Domestic Product (GDP) and employ

more than 97% of the Indonesian workforce [1]. This contribution shows the strategic role of MSMEs as the backbone of the economy that needs to be continuously strengthened in order to be resilient and competitive, especially in the era of increasingly dynamic digital transformation [2]. Cirebon City as one of the strategic cities in the Ciayumajakuning area (Cirebon, Indramayu, Majalengka, Kuningan) has also experienced significant growth in the MSME sector, especially in the culinary sector. The growth in the number of culinary entrepreneurs in Cirebon over the past five years shows the high enthusiasm of the community for culinary business opportunities that are considered promising. This is supported by cultural diversity, tourism potential, and Cirebon's strategic geographical location as the gateway to eastern West Java. However, the growth of the number of culinary MSMEs in Cirebon City is still dominated by traditional business patterns with small scales, low levels of innovation, and limited market orientation. Many MSMEs still rely on conventional business strategies, both in financial records, marketing strategies, and operational management. These challenges are increasingly complex with the rapid digital transformation, which requires MSMEs to be able to adapt to technological developments, changes in consumer behavior, and increasingly competitive market competition [3, 4].

The adoption of digital technology among Cirebon culinary MSMEs still faces a number of fundamental obstacles [5]. Among them are limited digital literacy [6], low human resource skills, minimal knowledge of modern financial management, and low access to technology-based financing [7, 8]. The absence of a systematic tool or framework to evaluate digital readiness is also a major inhibiting factor, because MSME actors have difficulty assessing their business position objectively [9, 10]. As a result, business development strategies are often not on target, have the potential to cause losses, and weaken business resilience in facing technology-based market dynamics. Several previous studies have emphasized the importance of increasing financial literacy [11], financial technology integration, and digital-based business adaptability as keys to the success of MSME transformation [12, 13]. However, previous studies are generally generic and have not specifically formulated measurement instruments or models that are adjusted to the culinary sector and the characteristics of secondary urban areas such as Cirebon City. In fact, each region has a unique social, cultural, and business ecosystem context, so a more contextual, flexible, and practical measurement framework is needed to be applied in the field. Answering this gap, this study attempts to develop a measurement model for the level of digital maturity of culinary MSMEs in Cirebon City, which focuses on three strategic dimensions, namely financial health, market capitalization, and local mapping based on the use of digital technology. These three dimensions are considered the most relevant because they directly reflect the readiness of MSMEs in running a business in the digital era. The financial health dimension assesses the capability of neat and digitalized financial management, the market capitalization dimension evaluates the ability to expand market share through digital strategies, and the local mapping dimension measures the extent to which MSMEs are connected to the digital ecosystem in the local community [14].

This study uses a mixed method, namely a combination of a quantitative approach with a questionnaire survey and a qualitative approach through in-depth interviews and focus group discussions. With this approach, it is expected to obtain a comprehensive picture of the factual conditions in the field, as well as model validation so that it truly fits the practical needs of culinary MSME actors [15, 16]. The resulting model is expected to not only be useful for business actors as an independent evaluation tool, but can also be used as a basis for local governments, supporting institutions, and business associations to formulate more effective and targeted MSME empowerment policies. Furthermore, this research is in line with efforts to realize the Sustainable Development Goals (SDGs), especially SDG 8 (decent work and economic growth) [17] and SDG 9 (innovation, industry, and infrastructure) [18]. Measurable digital transformation in the MSME sector is expected to be able to create better job opportunities, increase business efficiency, expand markets, and encourage sustainable innovation at the local and national levels. Thus, this digital maturity measurement model is expected to contribute as one of the strategic solutions in strengthening the competitiveness of culinary MSMEs in Cirebon City in the era of a competitive and dynamic digital economy.

Compared with prior MSME maturity models that often rely on broad digital readiness indicators or focus on isolated constructs, this study provides a more grounded contribution by adopting the Technology Organization Environment (TOE) framework as its theoretical basis [19, 20]. The proposed model integrates three interdependent dimensions Financial Health, Market Capitalization, and Local Digital Mapping into a unified maturity construct that reflects the contextual realities of culinary MSMEs in secondary urban regions. These dimensions have not been jointly operationalized in previous maturity research, thereby demonstrating clear novelty and expanding the theoretical landscape of MSME digital transformation studies [21, 22].

---

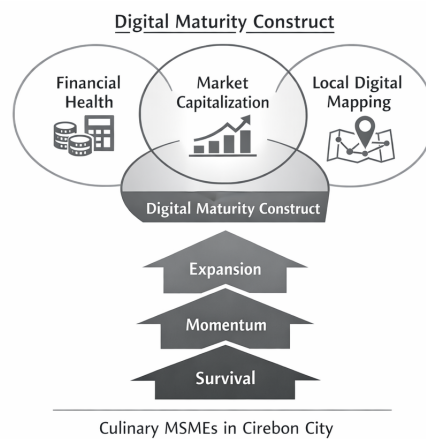


Figure 1. Conceptual Framework

This Figure 1 illustrates the proposed digital maturity measurement framework based on the TOE perspective. The model integrates three core dimensions Financial Health, Market Capitalization, and Local Digital Mapping into a unified digital maturity construct. These dimensions collectively determine the maturity progression of culinary MSMEs across three stages: Survival, Momentum, and Expansion, reflecting their level of digital readiness and capability for sustainable business growth.

## 2. METHOD

This study employs a mixed-method approach to develop and validate a maturity measurement [23] model tailored for culinary MSMEs in Cirebon City amid the ongoing digital transformation. The research was conducted using a sequential explanatory design, beginning with quantitative data collection followed by qualitative exploration to enrich and contextualize the findings [24, 25].

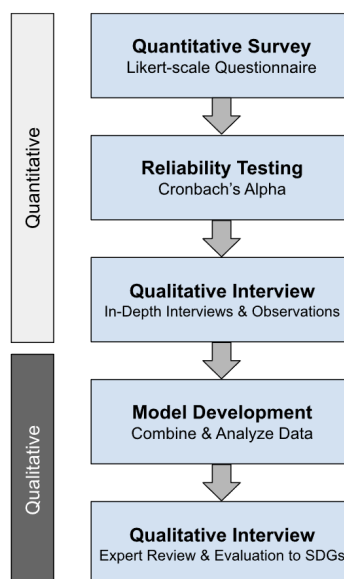


Figure 2. Mixed-Method Research Flow

Figure 2 presents the mixed-method research flow applied in this study using a sequential explanatory design. The research begins with a quantitative survey through Likert-scale questionnaires to assess the digital maturity of culinary MSMEs across three dimensions: Financial Health, Market Capitalization, and Local Digital Mapping. Reliability testing is conducted to ensure the internal consistency of the measurement instrument before further analysis.

Subsequently, qualitative data are collected through in-depth interviews and field observations to contextualize and validate the quantitative findings [26–28]. Insights from this phase provide a deeper understanding of practical challenges, behavioral patterns, and contextual factors influencing digital adoption among MSMEs [29].

Finally, quantitative and qualitative results are integrated to develop and validate the digital maturity measurement model. Expert review and triangulation are applied to strengthen the model's validity, followed by an assessment of its alignment with SDGs, particularly SDG 8 and SDG 9. This structured research flow ensures that the proposed model is empirically grounded, contextually relevant, and practically applicable.

## 2.1. Quantitative Phase

In the first phase, a structured Likert-scale questionnaire [30] was developed based on three core dimensions of MSME digital maturity: Financial Health, Market Capitalization, and Local Digital Mapping. Financial Health includes indicators such as basic accounting practices, profitability, and access to financing. Market Capitalization covers customer reach, revenue growth, and brand positioning. Local Digital Mapping reflects MSME integration with local digital ecosystems, such as e-commerce participation and use of digital marketing [31–33].

The questionnaire was distributed to 100 culinary MSMEs, selected from a population of 150 using purposive sampling to ensure representation across different maturity levels. Data were analyzed using descriptive statistics and simple inferential tests to assess the consistency and distribution of maturity levels among respondents.

### 2.1.1. Instrument Reliability and Validation

Before full deployment, the questionnaire underwent a pilot test with 20 culinary MSMEs to assess clarity, readability, and item relevance. Reliability testing using Cronbach's Alpha showed strong internal consistency across all three dimensions. The Financial Health dimension recorded  $\alpha = 0.81$ , Market Capitalization  $\alpha = 0.83$ , and Local Digital Mapping  $\alpha = 0.79$ . All values exceed the commonly accepted threshold of 0.70, indicating that the measurement items are reliable and suitable for further statistical analysis. This validation ensures that the quantitative instrument accurately measures the constructs defined in the conceptual model.

## 2.2. Qualitative Phase

To complement the quantitative findings, the study conducted in-depth interviews and field observations involving selected MSME owners and stakeholders. This qualitative data aimed to explore the practical challenges, perceptions, and strategic behaviors of MSMEs in adapting to digital changes [34]. A thematic analysis approach was used to code and interpret qualitative data, ensuring alignment with the conceptual model [35, 36].

## 2.3. Model Development and Validation

Based on both data streams, a maturity model was constructed and tested through limited implementation. The model classifies MSMEs into three stages:

- Survival Stage: Characterized by limited digital adoption and financial instability.
- Momentum Stage: Showing moderate integration of technology and structured operations.
- Expansion Stage: Indicating a strong digital presence, scalable business strategies, and innovation potential.

The initial model was validated through expert review and triangulation from multiple data sources. Adjustments were made to enhance its applicability and reliability as a self-assessment and strategic planning tool.

## 2.4. Alignment with SDGs

Finally, the model's contribution to SDGs particularly SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure) was assessed. This was done by mapping model indicators to key SDG metrics and evaluating the potential of each maturity stage to contribute toward sustainable business development.

---

### 3. RESULT AND DISCUSSION

This study produces a measurement model of the level of digital maturity of culinary MSMEs in Cirebon City that considers three main dimensions: Financial Health, Market Capitalization, and Technology-based Local Mapping. Through the process of analyzing data from 150 culinary MSME respondents, it is clear that the majority of MSMEs are still in the Survival Stage, with an average overall maturity value of 2.9 (scale 1–5).

#### 3.1. Quantitative Results

From the questionnaire data, it was found that the Financial Health dimension obtained the lowest average score, which was 2.7, with the weakest indicator being the use of a digital accounting system (mean = 2.4). In the Market Capitalization dimension, the average value reached 3.0, but was still low in the digital marketing indicator (mean = 2.6). Meanwhile, the Local Mapping dimension obtained an average score of 3.1, with an indicator of the use of e-commerce platforms that was still limited (mean = 2.8). The following is a summary of the descriptive scores for each indicator:

Table 1. Quantitative Results

Dimensions	Indicator	Mean	Std. Dev.
Financial Health	Simple financial report	3.0	0.8
	Cash flow	2.9	0.9
	Profit margin	2.8	0.8
	Access to financing	2.7	0.9
	Digital accounting record keeping	2.4	1.0
Market Capitalization	Number of customers	3.2	0.7
	Turnover growth	3.1	0.7
	Market expansion potential	3.0	0.8
	Digital marketing strategy	2.6	0.9
Local Mapping	Utilization of social media	3.3	0.7
	Local e-commerce participation	2.8	0.8
	Collaboration with local communities	3.0	0.8
	Integration of local supply chains	3.2	0.7

Table 1 presents the descriptive statistical results of the digital maturity assessment of culinary MSMEs in Cirebon City across three main dimensions: Financial Health, Market Capitalization, and Local Digital Mapping. The results indicate clear disparities in digital adoption levels among the assessed dimensions, highlighting critical areas requiring intervention.

In the Financial Health dimension, the overall mean scores range between 2.4 and 3.0, indicating relatively low digital maturity. While basic financial reporting shows a moderate mean value of 3.0, more advanced indicators such as digital accounting record keeping exhibit the lowest score (mean = 2.4, SD = 1.0). This suggests that although some MSMEs perform basic financial documentation, most still rely on manual systems and have not adopted digital financial tools. Limited access to financing (mean = 2.7) further reflects weak financial readiness, which constrains business scalability and digital investment.

The Market Capitalization dimension demonstrates slightly higher maturity levels, with mean scores ranging from 2.6 to 3.2. The number of customers and turnover growth indicators show moderate performance, indicating stable market presence. However, the relatively low score for digital marketing strategy (mean = 2.6) reveals that most MSMEs have not effectively leveraged digital platforms to expand market reach. This gap limits brand visibility and restricts opportunities for broader market penetration.

In the Local Digital Mapping dimension, MSMEs display comparatively better performance, with mean values between 2.8 and 3.3. Utilization of social media records the highest mean score (3.3), suggesting that social platforms are the most accessible entry point for digital adoption. Nevertheless, participation in local e-commerce platforms (mean = 2.8) remains limited, indicating weak integration with technology-based local supply chains and digital ecosystems.

Overall, the findings in Table 1 confirm that the majority of culinary MSMEs remain at an early stage of digital maturity, particularly in financial digitalization and structured digital marketing. These results justify

the classification of MSMEs into Survival, Momentum, and Expansion stages and emphasize the need for targeted digital capacity-building programs.

### 3.2. Qualitative Result

The results of in-depth interviews with 15 key informants (MSME owners) strengthen the quantitative findings. Respondents conveyed their main challenges including:

- Lack of digital technology literacy for accounting and marketing.
- Limited human resources with an understanding of digital platforms.
- Dependence on traditional markets without expanding networks through digital marketplaces.
- Lack of assistance from government and private institutions.

Several respondents showed a clear interest in adopting digital technology to support business development; however, this intention has not yet been translated into practice due to limited technical competence and low operational confidence. Participants indicated the need for structured training in areas such as digital accounting, online marketing tools, and e-commerce management, accompanied by continuous mentoring rather than one-off workshops. Ongoing guidance is considered essential to facilitate gradual adaptation, reduce implementation errors, and ensure effective integration of new digital systems into daily business operations.

### 3.3. Discussion

Based on a combination of quantitative and qualitative data, this maturity level model is considered suitable to be used as a practical assessment tool by MSMEs. By grouping MSMEs into three levels of Survival, Momentum, and Expansion, business actors can more easily formulate development strategies that are appropriate to their respective conditions. Theoretically, these results are consistent with the literature which emphasizes that the digital transformation of MSMEs does not only depend on technology, but also on the readiness of the organization, human resources, and market networks. Therefore, this study provides a practical contribution to mapping the position of culinary MSMEs, while also helping policy makers design more targeted MSME digital capacity building programs.

This model is also in line with the agenda of SDG 8 (decent work and economic growth) and SDG 9 (innovation and infrastructure), because it encourages MSMEs to be more inclusive, innovative, and resilient in facing market changes. With the right digital assistance strategy, culinary MSMEs in Cirebon City have the potential to move up to the Momentum and Expansion stages in a relatively short time, increasing their contribution to the regional economy in a sustainable manner.

The overall findings indicate that Cirebon's culinary MSMEs remain at the early stages of digital maturity, particularly in financial management and digital marketing. This condition reflects limited digital literacy and constrained access to technology-based tools. When compared with MSMEs in Southeast Asia, the digital readiness of Cirebon culinary MSMEs remains relatively lower. For example, Malaysian MSMEs report a 44% adoption rate of digital accounting tools, while the present study finds only 30%. Similarly, Vietnam and Thailand demonstrate higher integration with e-commerce platforms due to national digitalization programs. These comparisons highlight the urgency of strengthening local interventions in Cirebon and reinforce the model's relevance beyond the Indonesian context.

This comparison suggests that the digital maturity challenges identified in this study are not only local but reflect broader gaps between Indonesian MSMEs and their regional counterparts.

## 4. MANAGERIAL IMPLICATIONS

The findings of this study have a number of managerial implications that are relevant to various parties, especially culinary MSME owners, local governments, business assistance institutions, and business associations in Cirebon City. First, the digital maturity measurement model developed can be utilized by MSME actors as a self-diagnosis tool to assess the position and digital readiness of their businesses. Thus, MSMEs can systematically identify weaknesses, such as lack of digital financial records, suboptimal digital marketing strategies, or minimal connectivity with the local e-commerce ecosystem. Second, the results of this study provide strategic priority guidelines for culinary MSMEs at each stage of maturity. At the Survival stage, MSMEs are advised to focus on improving digital financial literacy and basic understanding of technology.

---

At the Momentum stage, interventions can be directed at expanding marketing through digital channels and improving the efficiency of the local supply chain. Meanwhile, at the Expansion stage, MSMEs need to start building product innovation and a wider cross-regional partnership network so that their business scalability is stronger. Third, local governments and MSME assistance institutions can utilize this model as an evaluation tool for empowerment programs, for example to assess the effectiveness of digital training, business assistance, or incubation programs that have been implemented so far. With structured measurements, the evaluation of mentoring programs will be more data-based and can be directed to areas that really need intervention. Overall, this model not only provides theoretical contributions to the development of literature on the level of digital maturity of MSMEs, but also opens up real opportunities for stakeholders to improve the competitiveness, resilience, and sustainability of culinary MSMEs in the digital economy era.


## 5. CONCLUSION

This study successfully designed and developed a digital maturity measurement model for culinary MSMEs in Cirebon City, focusing on three main dimensions: financial health, market capitalization, and technology-based local mapping. Based on the results of a survey of 150 MSMEs, it was found that around 65% of respondents were still at the Survival stage, with an average digital maturity score below 3 on a scale of 5. Meanwhile, around 25% of MSMEs were at the Momentum stage, starting to implement digital marketing and simple digital financial records, and only 10% had reached the Expansion stage with the use of more integrated technology and more advanced market expansion strategies. Specifically in the financial health dimension, 70% of respondents still had not utilized digital financial recording applications, and only 20% routinely conducted cash flow evaluations. In the market capitalization dimension, 60% of MSMEs had not actively used digital marketing platforms for promotion, while in the local mapping dimension, around 55% of MSMEs had not been connected to local e-commerce or technology-based supply chain networks.


The model developed in this study has been proven to have adequate validity and reliability, and can be used as a practical evaluation tool for MSMEs to understand their business position in a measurable manner and develop relevant development strategies. In addition to contributing to academic literature related to MSME digital transformation, these findings can also help local governments, supporting institutions, and business communities in designing empowerment programs that are more targeted and measurable. In the future, this model is expected to be adapted in other MSME sectors by considering the characteristics of their respective industries, thus further strengthening the digital transformation and empowerment strategy of MSMEs at the national level. In addition, the implementation of this model is also expected to support the achievement of the SDGs, especially SDG 8 (decent work and economic growth) and SDG 9 (industry, innovation, and infrastructure), by increasing innovation, sustainability, and competitiveness of MSMEs in the digital economy era.

## 6. DECLARATIONS

### 6.1. About Authors

Chandra Lukita (CL)  <https://orcid.org/0009-0006-6035-8241>

Aditya Kurniawan Chandra (AK)  <https://orcid.org/0009-0007-0377-0149>

Rifqi Fahrudin (RF)  <https://orcid.org/0000-0001-9782-7204>

Niken Maria Agatha (NM)  -

Dina Perme Suci (DP)  -

### 6.2. Author Contributions

Conceptualization: CL; Methodology: CL and RF; Software: AK; Validation: AK and RF; Formal Analysis: NM and DP; Investigation: AK; Resources: RF; Data Curation: AK; Writing Original Draft Preparation: AK and RF; Writing Review and Editing: CL, NM, and DP; Visualization: AK; All authors, CL, AK, RF, NM, and DP, have read and agreed to the published version of the manuscript.

### 6.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

#### 6.4. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

#### 6.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

#### REFERENCES

- [1] R. Arifin, A. A. T. Ningsih, and A. K. Putri, "The important role of msme in improving the economy," *East Asia Journal of Contemporary Business, Economics and Law*, vol. 24, no. 6, pp. 52–59, 2021.
  - [2] U. Janah and F. Tampubolon, "The role of micro, small, and medium enterprises in economic growth: Analysis of the contribution of the msme sector to national income in indonesia," *PENG: Journal of Economics and Management*, vol. 1, no. 2, pp. 739–746, 2024.
  - [3] L. Wang and J. Shao, "Digital economy, entrepreneurship and energy efficiency," *Energy*, vol. 269, p. 126801, 2023.
  - [4] D. Wuisan, J. W. Manurung, C. Wantah, and M. E. Yuliana, "Entrepreneurial self-employment and work engagement in msme through autonomy and rewards," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 1, pp. 264–281, 2025, <https://www.doi.org/10.34306/att.v7i1.448>.
  - [5] I. K. Pratiwi and I. Istirawati, "Strategy for development of micro/small/medium enterprises (msme) based on a circular economy: Case study msme in mataram," *IQTISHADUNA*, vol. 15, no. 1, pp. 83–101, 2024.
  - [6] W. Golden and L. Cordie, "Digital financial literacy," *Adult Literacy Education*, vol. 4, no. 3, pp. 20–26, 2022.
  - [7] A. A. Purwati, L. H. Suriyanti, Y. Desnelita, and S. S. Sitompul, "Technology-based financial management of batik riau msme," in *E3S Web of Conferences*, vol. 513. EDP Sciences, 2024, p. 02008.
  - [8] R. L. Putri, S. Hidayat, E. Wahyono, L. Rahmawati *et al.*, "Big data and strengthening msme after the covid-19 pandemic (development studies on batik msme in east java)," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 4, no. 2, pp. 83–100, 2023.
  - [9] Y. T. Rachman, E. Kartadjumena, B. Asikin, R. Ait Novatiani, D. Christine, Y. H. Prayitno, and R. A. H. Rachmat, "Analysis of micro business management strategies in efforts to maintain business sustainability (case study on genki yoghurt micro business)," *Turkish Journal of Computer and Mathematics Education*, vol. 12, no. 8, pp. 1584–1589, 2021.
  - [10] D. M. K. Kadaba, P. Aithal, and S. KRS, "Government initiatives and digital innovation for atma nirbhar msme/sme: To achieve sustainable and inclusive economic growth," *International Journal of Management, Technology, and Social Sciences (IJMTS)*, vol. 8, no. 1, pp. 68–82, 2023.
  - [11] D. Widyaningsih, E. Siswanto, and E. Zusrony, "the role of financial literature through digital financial innovation on financial inclusion (case study of msme in salatiga city)," *International Journal of Economics, Business and Accounting Research (IJEBAAR)*, vol. 5, no. 4, 2021.
  - [12] S. Dawadi, S. Shrestha, and R. A. Giri, "Mixed-methods research: A discussion on its types, challenges, and criticisms," *Journal of Practical Studies in Education*, vol. 2, no. 2, pp. 25–36, 2021.
  - [13] E. Sulistyarningsih, W. Murti, and C. Ratnasih, "Analysis of e-marketing strategy and business innovation in optimizing improvement of service quality and its effect on msme income," *ADI Journal on Recent Innovation*, vol. 5, no. 2, pp. 155–167, 2024.
  - [14] D. A. Prabowo, C. Tariazela, and A. Birgithri, "An examination of the impact of using marketplaces to promote the growth of micro, small, and medium enterprises (msme) in indonesia," *Startupreneur Business Digital (SABDA Journal)*, vol. 3, no. 1, pp. 26–33, 2024.
  - [15] S. Philbin, R. Viswanathan, and A. Telukdarie, "Understanding how digital transformation can enable smes to achieve sustainable development: A systematic literature review," *Small Business International Review*, vol. 6, no. 1, p. e473, 2022.
  - [16] R. Siegel, J. Antony, K. Govindan, J. A. Garza-Reyes, B. Lameijer, and A. Samadhiya, "A framework for the systematic implementation of green-lean and sustainability in smes," *Production Planning & Control*, vol. 35, no. 1, pp. 71–89, 2024.
-

- [17] United Nations / The Global Goals, “Goal 8: Decent work and economic growth,” <https://globalgoals.org/goals/8-decent-work-and-economic-growth/>, 2025, accessed: 2025-10-20.
- [18] United Nations, “Infrastructure, industrialization and innovation,” <https://www.un.org/sustainabledevelopment/infrastructure-industrialization/>, 2025, accessed: 2025-10-20.
- [19] A. Gunawan and R. K. Hudiono, “Industrial revolution 4.0’s information technology’s impact on the growth of msme in the manufacturing industries sector,” *International Transactions on Education Technology*, vol. 1, no. 2, pp. 157–164, 2023.
- [20] N. Lutfiani, A. Ivanov, N. P. L. Santoso, S. V. Sihotang, and S. Purnama, “E-commerce growth plan for msme’s sustainable development enhancement,” *CORISINTA*, vol. 1, no. 1, pp. 80–86, 2024.
- [21] K. D. Hartomo and C. Arthur, “Enhanced msme support allocation with integrated k-means and tukey’s outlier detection,” in *Intelligent Systems Conference*. Springer, 2024, pp. 241–257.
- [22] A. Pambudi, N. Lutfiani, M. Hardini, A. R. A. Zahra, and U. Rahardja, “The digital revolution of startup matchmaking: Ai and computer science synergies,” in *2023 Eighth International Conference on Informatics and Computing (ICIC)*. IEEE, 2023, pp. 1–6.
- [23] I. Kusmaryono, D. Wijayanti, and H. R. Maharani, “Number of response options, reliability, validity, and potential bias in the use of the likert scale education and social science research: A literature review,” *International Journal of Educational Methodology*, vol. 8, no. 4, pp. 625–637, 2022.
- [24] D. Coldwell, R. Venter, T. Joosub, and H. Duh, “The tension between smes’ growth and sustainability in emerging and developed countries’ internationalization: towards a conceptual model,” *Sustainability*, vol. 14, no. 8, p. 4418, 2022.
- [25] V. Kaftan, W. Kandalov, I. Molodtsov, A. Sherstobitova, and W. Strielkowski, “Socio-economic stability and sustainable development in the post-covid era: Lessons for the business and economic leaders,” *Sustainability*, vol. 15, no. 4, p. 2876, 2023.
- [26] H. Hamsinah, U. Rusilowati, and D. Sunarsi, “Analysis of lecturer competency and knowledge in technopreneurship development of student msme in pts,” *Aptisi Transactions on Technopreneurship (ATT)*, vol. 6, no. 3, pp. 623–638, 2024, <https://www.doi.org/10.34306/att.v6i3.365>.
- [27] N. Wiwin, P. A. Sunarya, N. Azizah, D. A. Saka *et al.*, “A model for determine upgrades for msme using analytical hyrarcy process,” *ADI Journal on Recent Innovation*, vol. 5, no. 1Sp, pp. 20–32, 2023.
- [28] N. E. Cahyawati, K. H. Nantunga, and Y. K. Tumewang, “The influence of financial technology & literacy on msme sustainability with financial inclusion as a mediating variable,” *Journal of Contemporary Accounting*, pp. 71–82, 2023.
- [29] C. Phonthanukitithaworn, W. A. Srisathan, C. Ketkaew, and P. Naruetharadhol, “Sustainable development towards openness sme innovation: taking advantage of intellectual capital, sustainable initiatives, and open innovation,” *Sustainability*, vol. 15, no. 3, p. 2126, 2023.
- [30] A. Pangarso, K. Sisilia, R. Setyorini, Y. Peranginangin, and A. A. Awirya, “The long path to achieving green economy performance for micro small medium enterprise,” *Journal of Innovation and Entrepreneurship*, vol. 11, no. 1, pp. 1–19, 2022.
- [31] L. M. Grejo and R. J. Lunkes, “Does sustainability maturity contribute to sustainable goals? a look at resource efficiency,” *Revista de Gestao Social e Ambiental*, vol. 16, no. 3, pp. 1–17, 2022.
- [32] Y. Sun, P. Gao, W. Tian, and W. Guan, “Green innovation for resource efficiency and sustainability: Empirical analysis and policy,” *Resources Policy*, vol. 81, p. 103369, 2023.
- [33] M. R. Aulia, Z. Lubis, I. Effendi *et al.*, “Leveraging quality management and partnership programs for technopreneurial success: Exploring their impact on msme performance,” *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 2, pp. 157–168, 2023.
- [34] M. Spremić, H. Zentner, and R. Zentner, “Measuring digital business models maturity: Theory, framework, and empirical validation,” *IEEE transactions on engineering management*, vol. 71, pp. 6553–6567, 2022.
- [35] A. A. Setyawan and B. W. Saputra, “Impact of marketing events on customer satisfaction mediated by digital marketing and moderate green marketing on msme in banyumas district,” *Jurnal Riset Ekonomi Manajemen (REKOMEN)*, vol. 7, no. 2, pp. 339–356, 2024.
- [36] Q. Aini, M. Yusup, N. P. L. Santoso, A. R. Ramdani, and U. Rahardja, “Digitalization online exam cards in the era of disruption 5.0 using the devops method,” *J. Educ. Sci. Technol*, vol. 7, no. 1, pp. 67–75, 2021.