



Structural modeling analysis of digital literacy and entrepreneur on sustainability performance through innovation capability in MSMEs

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ABSTRACT

MSMEs in Indonesia, including in Mamuju City, face major challenges in improving their sustainability performance amidst global competition and rapid technological developments. The purpose of this study is to examine the significance of digital literacy and entrepreneur literacy in improving sustainability performance through innovation capability among Micro, Small, and Medium Enterprises (MSMEs). The research object is focused on MSME actors in the Manakarra Beach Pavilion area of Mamuju City, which is the largest MSME area in Mamuju City, West Sulawesi Province. This study employed a cross-sectional survey and a quantitative methodology method by developing a path analysis model. The population was all MSME actors in the area, and a purposive sampling method was employed to choose the sample. This study had 215 samples or respondents. This study used validity and reliability tests to ensure data accuracy. The study used statistical analytic methods and multiple linear regression using the SPSS version 20 software. The results of the research that has been conducted found that digital literacy and entrepreneurial literacy play a significant role in improving the sustainability performance of MSMEs, both directly and indirectly through innovation capability as a mediating variable. According to the study's findings, digital literacy and, Entrepreneur Literacy, and Innovation Capability on Sustainability Performance among MSME actors in Mamuju City.

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1. INTRODUCTION

Amidst the increasingly dynamic digital world, MSMEs face significant challenges in surviving and growing sustainably (Zahwa et al., 2025). Sustainability performance is a crucial aspect that MSMEs must consider to achieve not only short-term economic success but also long-term success (Dekeng Setyo Budiarto et al., 2023) (Violeta et al., 2024).

Sustainability performance is becoming increasingly crucial in MSME management, as MSMEs with strong sustainability performance will be able to withstand market dynamics and adapt to technological changes (Gao et al., 2023) (Kurniawan et al., 2023). Furthermore, implementing sustainability performance can open MSMEs up to broader market access, including opportunities to collaborate with larger businesses (Permata Sari et al., 2022).

In practice, MSME sustainability performance is often hampered by limited resources and capabilities, with many MSMEs still focused solely on financial gain (Setiani et al., 2024) (Malikhah et al., 2024). The success of MSMEs in improving sustainability performance is now key to attracting customers, business partners, and even access to greater funding (Rasjid, 2022).

Previous research has highlighted various factors related to sustainability performance in the digital era, including digital literacy among MSMEs (Lilya & Pasaribu, n.d.) (Priambodo et al., 2024) and entrepreneurial literacy among MSMEs (Ahmad et al., 2024) (Kristiawati et al., 2024) (Efendi & Mariyai, 2023). Furthermore, previous research has shown that achieving sustainability performance in MSMEs is inseparable from the role of innovation capability (Panjaitan et al., 2022). This role enables MSMEs to create new value, develop better products or services, and improve operational efficiency (Sari et al., 2023) (Kussudyarsana et al., 2023).

However, there is still a need to further explore these factors, which have not been investigated further by previous researchers, especially in the context of MSMEs in Mamuju City. It is within this context that this study is introduced. Therefore, the purpose of this study is to determine how digital literacy and entrepreneurial literacy influence sustainability performance, mediated by innovation capability, among MSMEs in Mamuju City. This research is important because MSMEs in Indonesia, including those in Mamuju City, face significant challenges in improving their sustainability performance amidst global competition and rapid technological developments. Micro, Small, and Medium Enterprises (MSMEs) in Mamuju City face significant challenges, particularly in terms of utilizing digital technology and accessing capital. The Trade Sector's Significant Potential: MSMEs in Mamuju are dominated by the trade sector (comprising 76% of business units), demonstrating strong economic potential in this sector.

The urgency of this research lies in its potential implications in formulating more effective policies to encourage digital transformation for MSMEs and contributing to developing models and strategies for improving sustainability performance that will impact the competitiveness of MSMEs in the digital era to support national research priorities in the digital economy and government aspirations, especially in developing entrepreneurship. This study aims to analyze the influence of the important role of digital literacy and entrepreneur literacy in improving sustainability performance through innovation capability in MSMEs.

2 RESEARCH METHOD

This research adopts a positivist paradigm and uses a quantitative approach with a cross-sectional survey method, applying a path analysis model. This multivariate statistical technique is very suitable for testing complex cause-and-effect relationships between variables (requiring data that meet certain statistical assumptions, such as normality and the absence of multicollinearity). This research will be conducted in the Manakarra Beach Pavilion area of Mamuju City, the largest MSME area in Mamuju City, over a 12-month period (a fairly long period, possibly including preparation, data collection, analysis, and report writing). Purposive random sampling was used to choose the 215 MSMEs in the area that make up the study's population. This is a combination of purposive and random sampling. This means you set specific inclusion criteria for

eligible MSMEs (e.g., they must be officially registered, have been operating for at least 1 year, etc.), and then randomly sample those MSMEs that meet these criteria. The sample size was calculated using the Slovin formula. The Slovin formula is a commonly used method for determining the minimum sample size from a known population, especially in survey research with a certain level of precision (margin of error) (usually 5% or 10%). The following is the calculation result of the Slovin formula:

$$n = \frac{N}{1+N.e^2} = \frac{215}{1+215.(0,05)^2} = 139,83$$

The Slovin formula calculation indicates a minimum sample size of 140 MSMEs in the Manakarra Beach Pavilion area. A Likert scale questionnaire was employed as the data gathering tool. Additionally, the produced instrument was processed through (Srikarsa et al., 2024):

Three experts evaluated the instrument's content validity using the Aiken V formula; if the V index is more than 0.60, the instrument satisfies the requirements for content validity. Confirmatory factor analysis was used to verify construct validity; items were deemed valid if the factor loading value was ≥ 0.40 . The Cronbach's alpha formula was used to assess reliability. The instrument's reliability was satisfied with an alpha value greater than 0.70.

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3 RESULTS AND DISCUSSIONS

Using the SPSS version 20 software, an inferential analysis technique called path analysis was employed to address the issue formulation and accomplish the goals of this study. An overview of the analysis findings and path diagrams from this study is provided below.

Tabel 1. Summary of Analysis Results

Independent variables	Dependent variable	Mediating variables	Direct influence value	Sig-P	Indirect influence value	Total value
Digital Literacy	<i>Innovation Capability</i>		0.42	0.00		
Entrepreneur Literacy	<i>Innovation Capability</i>		0.20	0.00		
Digital Literacy	Sustainability Performance	<i>Innovation Capability</i>	0.39	0.00	0.42 x 0.17 = 0.04	0.39+0.04 = 0.43
Entrepreneur Literacy	Sustainability Performance	<i>Innovation Capability</i>	0.14	0.02	0.20 x 0.17 = 0.03	0.14+0.03 = 0.17
<i>Innovation Capability</i>	Sustainability Performance		0.17	0.01		

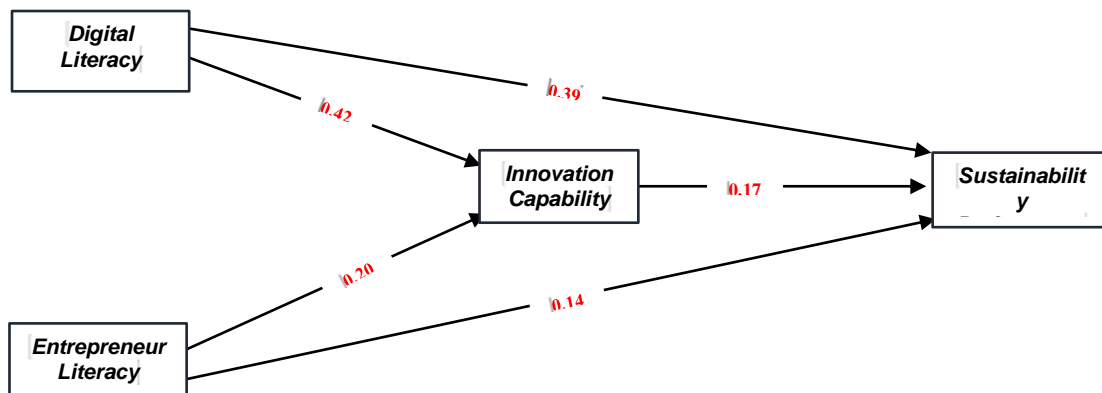


Figure 1. Path Diagram

3.1 The influence of digital literacy on innovation capability among MSMEs in Mamuju City

The aforementioned table indicates that the direct influence of the digital literacy variable on innovation capability in MSMEs in Mamuju City has a coefficient value of 0.42 (positive). This suggests that innovation capability is positively impacted by digital literacy and that an increase in the value of the digital literacy variable will be followed by an increase in innovation capability. The null hypothesis (H_0) in this test is rejected and the working hypothesis (H_1) is accepted when the significance value of $p\text{-sig } 0.00 < \alpha (0.05)$ is attained. This suggests that digital literacy directly influences innovative capability in MSMEs in Mamuju City and is significant.

3.2 The direct influence of entrepreneur literacy on innovation capability among MSMEs in Mamuju City

Based on The aforementioned table indicates that the entrepreneur literacy variable has a direct impact on innovation capability in MSMEs in Mamuju City with a coefficient value of 0.20 (positive). This suggests that entrepreneur literacy has a positive impact on innovation capability and that an increase in the value of the entrepreneur literacy variable will be followed by an increase in the value of innovation capability. The null hypothesis (H_0) in this test is rejected and the working hypothesis (H_2) is accepted when the significance value of $p\text{-sig } 0.00 < \alpha (0.05)$ is attained, indicating that there is a direct influence of entrepreneur literacy on innovation capability in MSMEs in Mamuju City and is significant.

3.3 The influence of digital literacy on the sustainability performance of MSMEs in Mamuju City

The aforementioned table indicates that the direct influence of the digital literacy variable on the sustainability performance of actors in MSMEs in Mamuju City has a coefficient value of 0.39 (positive). This suggests that digital literacy has a positive effect on the sustainability performance of actors in MSMEs in Mamuju City. Additionally, it can be inferred that an increase in the value of the digital literacy variable will be followed by an increase in the sustainability performance of actors in MSMEs in Mamuju City. The null hypothesis (H_0) in this test is rejected and the working hypothesis (H_3) is accepted when the significance value $p\text{-sig } 0.00 < \alpha (0.05)$ is attained. This suggests that there is a direct influence of digital literacy on the sustainability performance of actors in MSMEs in Mamuju City and significant

3.4 The influence of entrepreneurial literacy on sustainability performance of MSMEs in Mamuju City

The aforementioned table indicates that the entrepreneur literacy variable has a direct impact on sustainability performance in MSMEs in Mamuju City with a coefficient value of 0.14 (positive). This suggests that entrepreneur literacy has a positive impact on sustainability performance and that an increase in the value of the entrepreneur literacy variable will also result in an increase in sustainability performance. The null hypothesis (Ho) in this test is rejected and the working hypothesis (H4) is accepted when the significance value of $p\text{-sig } 0.00 < \alpha (0.05)$ is attained. This means that there is a direct influence of entrepreneur literacy on sustainability performance in MSMEs in Mamuju City and is significant.

3.5 The influence of innovation capability on sustainability performance of MSMEs in Mamuju City

The aforementioned table indicates that the direct influence of the innovation capability variable on sustainability performance in MSMEs in Mamuju City has a coefficient value of 0.17 (positive). This suggests that innovation capability has a positive impact on sustainability performance and that an increase in the value of sustainability performance will follow an increase in the value of the innovation capability variable. The null hypothesis (Ho) in this test is rejected and the working hypothesis (H5) is accepted when the significance value of $p\text{-sig } 0.00 < \alpha (0.05)$ is attained. This suggests that innovation capability directly affects sustainability performance in MSMEs in Mamuju City and is significant.

3.6 The influence of digital literacy on sustainability performance through innovation capability in MSMEs in Mamuju City

The aforementioned table illustrates the impact of digital literacy variables on sustainability performance through innovation capability on MSMEs in Mamuju City. The coefficient value of 0.04 (positive), an indirect influence value, indicates that either positive innovation capability mediates the impact of digital literacy on sustainability performance, or innovation capability as a mediating variable strengthens the impact of digital literacy on sustainability performance. After obtaining a $p\text{-sig sobel value of } 0.00 < \alpha (0.05)$, which indicates that the alternative hypothesis (H6) is accepted and the null hypothesis (Ho) in this test is rejected, it can be concluded that digital literacy has an indirect impact on sustainability performance through innovation capability on MSMEs in Mamuju City. Additionally, it can be said that the innovation capability variable plays a key role in mediating how digital literacy affects sustainability performance, or innovation capability significantly plays a role as a variable that mediates the indirect influence of digital literacy on sustainability performance, so it can be concluded that There is an indirect influence of digital literacy on sustainability performance through innovation capability on MSMEs in Mamuju City.

3.7 The influence of entrepreneurial literacy on sustainability performance through innovation capability in MSMEs in Mamuju City

The aforementioned table illustrates the impact of the entrepreneur literacy variable on sustainability performance through innovation capability on MSMEs in Mamuju City. The coefficient value of 0.03 (positive), which is an indirect influence value, indicates that either positive innovation capability mediates the influence of entrepreneur literacy on sustainability performance, or innovation capability as a mediating variable strengthens the influence of entrepreneur literacy on sustainability performance. After obtaining a $p\text{-sig sobel value of } 0.00 < \alpha (0.05)$, which indicates that the alternative hypothesis (H6) is accepted and the null hypothesis (Ho) in this test is rejected, it can be concluded that entrepreneur literacy has an indirect impact on sustainability

performance through innovation capability on MSMEs in Mamuju City. Therefore, it can be concluded that there is an indirect influence of entrepreneur literacy on sustainability performance through innovation capability on MSMEs in Mamuju City. It can also be said that the innovation capability variable is significant in mediating the influence of entrepreneur literacy on sustainability performance, or that innovation capability significantly plays a role as a variable that mediates the indirect influence of entrepreneur literacy on sustainability performance.

According to the study's findings, both directly and indirectly through innovation capability as a mediating variable, digital literacy and entrepreneurial literacy significantly enhance MSMEs' sustainability performance. Innovation capability has been shown to play a significant influence as a mediating variable (Firmansyah et al., 2024). The results show that digital literacy and entrepreneurial literacy not only have a direct but also an indirect influence on sustainability performance through increased innovation capability (Bramantyo & Wahyu Eko Pujiyanto, 2025). MSMEs that have innovation capability, whether in the form of new product development, technology application in business processes, adaptation to market trends, or investment in research and development, are better able to transform their digital and entrepreneurial knowledge into a sustainable competitive advantage (Kurniawan et al., 2023).

Thus, innovation capability functions as a bridge that connects digital literacy skills and entrepreneurial literacy with achieving sustainability performance (Permata Sari et al., 2022) Without innovation capabilities, the digital literacy possessed by MSMEs has the potential to stop at knowledge and not produce real advantages in business practices. (Setiani et al., 2024).

A key finding of this study is that innovation capability acts as a mediating variable, strengthening the relationship and influence between literacy (digital and entrepreneurial) and sustainability performance. MSMEs with innovation capabilities in the form of new product development, technology implementation in business processes, adaptation to market trends, and a commitment to research and development are better able to convert their digital literacy into a competitive advantage. (Malikhah et al., 2024) (Rasjid, 2022) In other words, strong digital literacy without innovation capabilities will not fully impact business sustainability.

Overall, the results of this study confirm that digital literacy and entrepreneurial literacy are important foundations for MSMEs in achieving sustainability (Firmansyah et al., 2024). However, true added value emerges when both literacies are managed and implemented in the form of consistent innovation capabilities (Novianti, 2025). These findings not only strengthen previous literature but also provide a new perspective that the sustainability of MSMEs in the era of digital disruption is highly dependent on the synergy between literacy and innovation. (Lilya & Pasaribu, n.d.). Thus, the results of this study confirm that the success of MSMEs in achieving sustainable performance in the digital era is not sufficient with digital literacy and entrepreneurial literacy alone, but must be accompanied by consistent strengthening of innovation capabilities (Novianti, 2025). Therefore, based on the research that has been conducted, it is concluded that there is a significant role of digital literacy and entrepreneurial literacy in improving sustainability performance through innovation capability in MSME actors, especially in MSMEs in Mamuju City.

The digital literacy coefficient tends to be higher than entrepreneurial literacy, primarily due to fundamental differences in accessibility, daily practical needs, and the complexity of the two fields. Here are some of the main reasons:

a. Accessibility and Daily Needs

Digital Literacy: Digital skills are almost universally necessary in modern life. Most people, including those in rural areas, use digital devices for communication (social

media, email), entertainment, and accessing basic information. These daily interactions naturally increase exposure and basic digital skills (Ridlo, Sofiana, et al., 2025).

Entrepreneurship Literacy: Entrepreneurship is a specific career path or activity that is not available to everyone. These skills, such as complex financial management, business planning, and market research, are only necessary for those actively involved in or intending to start a business (Ridlo, Arsila, et al., 2025).

b. Nature of Skills

Digital Literacy: Many digital skills can be learned independently and gradually through everyday use, often starting at an early age. Individuals can easily search for information and learn independently.

Entrepreneurship Literacy: Entrepreneurship often requires more structured and in-depth knowledge, typically acquired through formal education, specialized training, or real-world business experience. There are inherent financial and operational risks, so many people are reluctant to start without adequate knowledge.

Practical implications for MSMEs, based on research conducted through research results, show that digital literacy and entrepreneurial literacy will only provide maximum impact if accompanied by strengthening innovation capability (Rahmani et al., 2025). Therefore, MSMEs need to increase technology adoption to expand market reach through digital platforms, e-commerce, and social media (Q.A et al., 2024). Then, entrepreneurial literacy must continue to be honed, especially in terms of risk management, digital marketing strategies, and financial management, so that MSMEs can survive amid market uncertainty (Firmansyah et al., 2024). Including the ability to innovate needs to become a business culture of MSMEs, such as the development of new products relevant to market trends, the application of production technology, and modest research investments to understand consumer needs (Putra et al., 2023).

Sustainability performance in the context of MSMEs goes beyond financial performance, encompassing three pillars: economic, social, and environmental. It measures the ability of MSMEs to survive and grow in the long term while creating a positive impact for stakeholders. **Stakeholder Theory:** Sustainability involves creating value not only for owners, but also for employees, customers, and local communities. **Triple Bottom Line (TBL):** This framework is often used to measure sustainability based on People (social), Planet (environmental), and Profit (economic).

Theoretically, this model proposes that MSME owners in Mamuju with high levels of digital literacy and entrepreneurship will be better able to develop their innovation capabilities. This innovation capability, in turn, will be a key driver in achieving overall business sustainability performance. This model examines how human resources (literacy) are transformed through organizational processes (innovation capabilities) into sustainable business outcomes (sustainability performance).

Furthermore, policy implications for the government include expanding the digital literacy program for MSMEs, not only training in basic technology use but also covering aspects of digital security, business data processing, and digital marketing strategies (Heliani & Iskandar, 2024). The government can also provide innovation-based business incubation that encourages collaboration between MSMEs, universities, and the private sector to accelerate the development of new products and services. Furthermore, MSME funding policies should be directed at incentivizing innovation, for example through simple research subsidies, production technology support, and access to capital based on environmentally friendly innovations.

General Weaknesses of the Study: Limited Generalizability: Due to its focus on one region (Mamuju), findings may be difficult to generalize to MSME populations in other regions with different economic characteristics or levels of digital infrastructure. Self-report data on literacy, capabilities, and performance are often collected through surveys or questionnaires that rely on respondents' perceptions, which can lead to

response bias (such as social desirability bias or subjective perceptions of performance). Variable Limitations: This study may overlook other important external factors that also influence MSME performance, such as local government support, access to capital, or volatile market conditions. Measurement Challenges: Quantitatively measuring concepts such as "sustainable performance" (covering economic, social, and environmental aspects) and "innovation capability" in the MSME context can be complex and may not be fully comprehensive in its operationalization of variables.

4 CONCLUSION

According to the study's findings, MSMEs' sustainability performance is significantly improved by digital and entrepreneurial literacy, both directly and indirectly through innovation capabilities acting as a mediating variable. The role of innovation capability has proven to be an important factor as a mediating variable. The results show that digital literacy and entrepreneurial literacy not only have a direct but also an indirect influence on sustainability performance through increased innovation capability. MSMEs that have innovation capability, whether in the form of new product development, technology application in business processes, adaptation to market trends, or investment in research and development, are better able to transform their digital and entrepreneurial knowledge into a sustainable competitive advantage (Kurniawan et al., 2023).

Overall, the results of this study confirm that digital literacy and entrepreneurial literacy are important foundations for MSMEs in achieving sustainability. However, true added value emerges when both literacies are managed and implemented in the form of consistent innovation capabilities. These findings not only strengthen previous literature but also provide a new perspective that the sustainability of MSMEs in the era of digital disruption is highly dependent on the synergy between literacy and innovation. (Lilya & Pasaribu, n.d.) .Thus, the results of this study confirm that the success of MSMEs in achieving sustainable performance in the digital era is not sufficient with digital literacy and entrepreneurial literacy alone, but must be accompanied by consistent strengthening of innovation capabilities. Therefore, According to the study that has been done, digital literacy and entrepreneurial literacy play important roles in improving sustainability performance through innovation capability in MSME actors, especially in MSMEs in Mamuju City.

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