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Digital Marketing Capability and MSME Business Resilience: The Mediating Role of Business Adaptability and The Moderating Role of Digital Literacy

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ABSTRACT

Purpose – This study examines the relationship between digital marketing capability (DMC) and business resilience (BR) among MSMEs in Indonesia, focusing on business adaptability (BA) as a mediating mechanism and managerial digital literacy (DL) as an individual-level moderating condition.
Design/methodology/approach – Using a cross-sectional survey design, data were collected from 500 owners or managers representing digitally engaged MSMEs across Indonesia. The sampling was non-probability purposive sampling. Data were analyzed using partial least squares structural equation modeling (PLS-SEM). Procedural remedies and full collinearity VIF diagnostics were applied to address common method variance concerns.
Finding/Results – DMC is positively associated with BR, BA, and BR. BA acts as a complementary mediator in the DMC–BR relationship. Furthermore, managerial DL significantly moderates the DMC–BA association, indicating that the relationship between DMC and BA is stronger at higher levels of owner/manager digital literacy. The observed empirical pattern is consistent with a moderated adaptive pathway, wherein the indirect association between DMC and BR through BA increases across levels of managerial DL.
Originality/Value – The study integrates an organizational capability perspective with an individual managerial micro-foundation. By explicitly distinguishing individual-level managerial literacy from firm-level capabilities, this study provides a theoretically bounded explanation of how marketing capabilities are transformed into adaptive routines and business resilience in resource-constrained MSMEs.

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Keywords:
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1. Introduction

Micro, small and medium enterprises (MSMEs) have a strategic position in the economy because they contribute to job creation, production activities, value creation, and local and national economic dynamics. At the same time, the characteristics of MSMEs, which are generally characterized by limited financial resources, human resources, knowledge, and technological capabilities, cause these business groups to have a higher vulnerability to changes in the business environment than larger companies (Putritamara et al., 2023; Hokmabadi et al., 2024; Higón & Bonvin, 2024; Barragan & Becker, 2025). Such vulnerabilities are increasingly relevant in an economic environment characterized by uncertainty, changes in consumer behavior, rapid technological developments, and heightened competitive pressures. Under these conditions, the ability of MSMEs to maintain business continuity increasingly depends on their capacity to utilize resources and respond appropriately to environmental changes. Bank of Indonesia also pointed out that strengthening financing, digitalization, and expanding market access are important parts in the development of MSMEs, further strengthening the linkage between the sustainability of MSMEs and their ability to adapt to the digital economy ecosystem (Bank Indonesia, 2025).

Digital transformation is then one of the key changes affecting the way MSMEs create, deliver and retain value for customers. The use of digital technology allows small businesses to expand market access, lower communication and transaction barriers, obtain market information, and interact with customers more quickly and flexibly (Khurana et al., 2022; Ashiru et al., 2023; Hokmabadi et al., 2024; Higón & Bonvin, 2024). However, the existence of digital technology it self does not guarantee that an MSME will become more resilient. The literature suggests that the benefits of digitization depend heavily on an organization's ability to integrate technology with business processes, strategies, human resources, and organizational goals (Zahoor et al., 2023; Barragan & Becker, 2025). Thus, the increasingly important issue is no longer just whether MSMEs use digital technology, but whether MSMEs have the capability to strategically utilize digital technology so as to generate value and more effective organizational responses.

In this context, the concept of digital marketing capability (DMC) becomes relevant. DMC refers not only to the use of social media, marketplaces, websites, or other digital devices, but to an organization's ability to integrate digital marketing resources and activities to understand the market, reach customers, build relationships, manage information, and respond effectively to environmental changes. Research on small companies shows that marketing capabilities are cross-functional and dynamic capabilities and play an important role in value creation and competitiveness (Gliga & Evers, 2023). Other research shows that online marketing capability is an important resource for SMEs, but the benefits do not always appear automatically because it still requires other organizational mechanisms to translate these capabilities into performance (Tolstoy et al., 2022). Studies on digital marketing at Indonesian SMEs also show that digital marketing, marketing capability, digital orientation, and information technology capability are interrelated elements in generating marketing performance (Sultoni et al., 2022). Furthermore, a systematic review of Hokmabadi et al. (2024) affirms the link between digital transformation, marketing capabilities, and business resilience in small businesses, while showing the importance of developing dynamic capabilities in dealing with turbulent environments.

However, the relationship between DMC and business resilience should not be understood as an automatic one. The ability to use digital channels may provide access to markets, customers,

and information, but this ability will only be of strategic value if MSMEs are able to translate this information and opportunities into adaptive actions. The findings of Tolstoy et al. (2022), for example, points out that online marketing capability alone is not always enough to generate higher performance because organizational mechanisms are needed that are able to transform these capabilities into strategic actions. In the dynamic capabilities perspective, digital technologies can help companies develop sensing, seizing, and transforming capabilities, which then contribute to the formation of resilience (Khurana et al., 2022). Research Putritamara et al. (2023) at MSMEs Indonesia also shows that dynamic capabilities play a role in encouraging digital transformation and business resilience. Thus, there are theoretical reasons to suspect that business adaptability could be the mechanism that explains how DMC translates into business resilience.

Business adaptability is important because the changing business environment not only requires MSMEs to maintain activities that have been running, but also make adjustments to products, processes, marketing channels, customer relationships, and business strategies. Digitization can provide information and channels that allow companies to detect market changes more quickly, while organizational capabilities determine the company's ability to turn that information into a business response (Khurana et al., 2022; Ashiru et al., 2023; Higón & Bonvin, 2024). Khurana et al. (2022) showed that during a crisis, MSMEs develop resilience through sensing, seizing, and transforming processes, while Ashiru et al. (2023) shows that the ability to adapt digital communication technology is related to the resilience of MSMEs. Thus, adaptability is an organizational process that connects the use of technology with the company's ability to maintain business continuity in changing conditions.

On the other hand, not all MSMEs have the same ability to benefit from digital technology. These differences can arise due to differences in knowledge, skills, ability to obtain and evaluate information, as well as the ability to use technology critically and strategically. In this context, digital literacy can be a determining factor in how effectively DMC translate into adaptability. Zahoor et al. (2023) shows that digital literacy at the managerial level is one of the important foundations in the MSME digital transformation process. Studies on Indonesian MSMEs also found that leaders digital literacy is related to the utilization of digital technology and the digital transformation process (Destrian & Sudarma, 2024). Meanwhile, research on digital literacy in micro enterprises shows that digital literacy plays a role in supporting the ability of small businesses to face change and maintain business activities (Suyanto et al., 2023). The findings show that digital literacy is not just a technical ability, but a human resource that allows technology to be utilized more effectively in business processes.

This problem is becoming increasingly important because access to digital platforms is relatively easy, while the quality of utilization differs between MSMEs. Two MSMEs can use the same social media platform or marketplace, but generate different adaptability due to differences in content quality, customer information management, the ability to read market information, the speed of responding to customers, as well as the ability to integrate digital activities with other business processes. Research on digital transformation in MSMEs shows that the success of digitization is not only determined by the availability of technology, but also by digital orientation, organizational skills, knowledge, and human resources (Zahoor et al., 2023; Barragan & Becker, 2025). Similarly, the research of Tolstoy et al. (2022) shows that online marketing capability does not automatically produce performance without the ability of organizations to integrate and utilize it strategically. Thus, the ownership or use of digital technology is not in itself a strategic advantage, advantages are more likely to emerge when

the technology is supported by organizational and human resource capabilities that enable SMEs to utilize it effectively.

The argument also shows that the relationship between DMC and business resilience needs to be placed in the perspective of capability, not just technology adoption. Studies on MSMEs during the crisis show that digitization can help companies change business models and operations, but that the process takes place through an organization's ability to perceive change, seize opportunities, and make transformations (Khurana et al., 2022; Ashiru et al., 2023). Research on Indonesian MSMEs also found that dynamic capabilities are related to digital transformation and business resilience, while these influences can take place through the process of organizational transformation (Putritamara et al., 2023). At a broader level, the systematic literature review by Sagala & Őri (2025) shows that dynamic capabilities, digital capabilities, learning, knowledge management, flexibility, and agility are important elements in explaining how digital transformation can generate resilience and antifragility in SMEs. Therefore, the capability perspective provides a stronger basis for explaining why digital marketing capabilities can produce resilient outcomes through specific organizational processes.

Although the literature has shown the importance of digitization and organizational capabilities for MSME resilience, there are still some research gaps. First, some studies place more digital transformation, digital technology adoption, or digital capabilities as the main constructs, while DMC as a more specific capability in the marketing function is still relatively poorly explored as a direct antecedent of business resilience (Hokmabadi et al., 2024). Second, the relationship between digitization and resilience is often explained through direct influence or digital transformation, while the internal mechanisms that explain how DMC translate into resilience are still not fully clarified (Khurana et al., 2022; Tolstoy et al., 2022). Third, the difference in digital capabilities of business actors shows that the influence of digital capabilities may not be uniform. Research Zahoor et al. (2023) showed the importance of digital literacy in the digital transformation process, whereas the study of Hokmabadi et al. (2024) emphasized the need for further research on how marketing capabilities contribute to resilience and how small companies develop dynamic capabilities to deal with turbulent environments. Thus, there is research space to examine mediation mechanisms as well as contingency conditions that explain the variation in the influence of DMC on business resilience.

Based on these gaps, this study developed a model that places DMC as an independent variable, business adaptability as a mediator, business resilience as a dependent variable, and digital literacy as a moderator variable. This Model offers the perspective that DMC do not have to generate resilience directly, but can work through the ability of MSMEs to adapt business strategies and activities to changing environments. This perspective is in line with research that shows that digitalization can generate resilience through the development of dynamic capabilities and organizational capabilities in carrying out transformations (Khurana et al., 2022; Putritamara et al., 2023). At the same time, digital literacy is seen as a condition that allows businesses to optimize the use of technology and digital capabilities more effectively (Zahoor et al., 2023; Destrian & Sudarma, 2024). Thus, the study not only questions whether DMC relates to business resilience, but also how the relationship occurs and under what conditions it becomes stronger.

On the basis of these arguments, this study aims to analyze the influence of DMC on business resilience in MSMEs, examine the role of business adaptability as a mediator in the

relationship, and examine the role of digital literacy as a moderator. These objectives also respond to research needs that have been identified in the literature on digitization, marketing capabilities, and MSME resilience (Khurana et al., 2022; Tolstoy et al., 2022; Hokmabadi et al., 2024). Theoretically, this study is expected to expand the study of digital capabilities and resilience of MSMEs by integrating the perspective of adaptive capabilities into the relationship between digital marketing and resilience. Empirically, this study is expected to provide evidence on the mechanisms and conditions that explain when DMC can contribute to the resilience of MSMEs, while enriching the understanding of the role of human and organizational capabilities in the process of digitizing small businesses (Zahoor et al., 2023; Gliga & Evers, 2023; Sagala & Őri, 2025).

2. Literature Review & Hypothesis Development

This study is grounded in Dynamic Capabilities Theory, which explains how organizations adapt to changing environments by sensing opportunities and threats, seizing opportunities, and reconfiguring resources and processes (Teece et al., 1997; Teece, 2009). In this study, DMC represents a functional digital capability, business adaptability reflects the process of translating digital resources into organizational responses, and business resilience represents the resulting capacity to respond to disruptions. Digital literacy is positioned as an enabling condition that may strengthen the conversion of DMC into adaptive actions.

2.1 Digital Marketing Capability

Conceptually, DMC refers to the ability of MSMEs to integrate digital marketing resources, knowledge, technology, and routines in order to create and maintain value for customers. DMC is different from simply using social media, marketplaces, websites, or digital platforms because it emphasizes the ability to integrate digital channels, manage marketing information, understand customers, and translate digital information into marketing decisions (Apasrawirote et al., 2022; Tolstoy et al., 2022; Wu et al., 2024). A systematic review of Apasrawirote et al. (2022) shows that DMC is a set of capabilities that connect digital technologies with marketing activities and business value creation.

In the context of MSMEs, DMC enables businesses to obtain market information, manage customers, integrate marketing channels, and respond more quickly to changing consumer needs (Sultoni et al., 2022; Mulyana et al., 2024; Masrianto et al., 2024). Mulyana et al. (2024) showed that DMC is concerned with value creation agility, while Tolstoy et al. (2022) affirms the importance of organizational capabilities in translating digital utilization into business value. Therefore, this study positions DMC as a strategic ability of MSMEs in utilizing and integrating digital marketing resources to understand the market, manage customers, and respond to changes in the business environment, which is then tested for its effect on business resilience directly or through business adaptability.

2.2 Business Adaptability

Business adaptability refers to an organization's ability to recognize changes in the environment and adapt strategies, processes, products, marketing channels, and business activities to keep pace with evolving conditions. Adaptability differs from mere operational flexibility in that it includes the ability to detect changes, evaluate their implications, and make relevant adjustments and reconfigurations of resources (Khurana et al., 2022; Xie et al., 2022; Ashiru et al., 2023). In the dynamic capabilities perspective, these capabilities are related to the processes of sensing, seizing, and transforming, that is, recognizing changes or opportunities, taking appropriate actions, and changing organizational resources and processes to respond

to environmental demands (Khurana et al., 2022). In line with this perspective, Xie et al. (2022) shows that the utilization of digital platforms can encourage capability reconfiguration and business model innovation, which shows the importance of an organization's ability to adjust resource configurations when facing change.

In the context of MSMEs, business adaptability is important because limited resources make businesses need to utilize available resources flexibly and make adjustments quickly when facing market changes and business disruptions (Putritamara et al., 2023; Ashiru et al., 2023; Zhang et al., 2024). Digital technologies can help provide information about changing markets and customers, but the benefits of such information depend on an organization's ability to translate it into adaptive decisions and actions. Therefore, this study positions business adaptability as the ability of MSMEs to recognize changes, adjust business strategies and activities, and reconfigure resources and processes based on environmental demands, which is further considered as a mechanism that connects DMC with business resilience.

2.3 Business Resilience

Business resilience is an organization's ability to deal with disruption, maintain key business functions, adapt to change, and recover and re-develop business activities in uncertain conditions. In the context of SMEs, resilience not only denotes the ability to survive (survival), but also includes the ability to respond to disruptions, make adjustments, restore activities, and develop business configurations that allow companies to remain operational in a changing environment (Khurana et al., 2022; Ashiru et al., 2023; Hokmabadi et al., 2024; Sagala & Őri, 2025). Thus, resilience is understood as an ability of a dynamic nature since the organization not only faces disturbances that have occurred, but also needs to adapt its resources and activities to face continuous changes. Sagala & Őri (2025) show that flexibility, agility, learning, and dynamic capabilities are important elements in building the resilience of SMEs.

The dynamic capabilities perspective provides a foundation for understanding how resilience is formed. Khurana et al. (2022) views resilience as a second order dynamic capability that develops through the process of sensing, seizing, and transforming, so that organizations are able to respond to change and transform resources and business processes. The findings of Ashiru et al. (2023) and Hokmabadi et al. (2024) also shows that adaptability, digital capabilities, marketing capabilities, and dynamic capabilities are related to the formation of resilience in SMEs. In the Indonesian context, Putritamara et al. (2023) found that dynamic capabilities play a role in the process of digital transformation and business resilience in MSMEs. Based on this perspective, this study positions business resilience as the ability of MSMEs to maintain key business functions, respond to disruptions, adjust activities, and restore and redevelop businesses through the use of available resources and capabilities.

2.4 Digital Literacy

Digital literacy refers to the ability to access, understand, evaluate, process, generate, and use digital information effectively to support individual and organizational activities. In the context of MSMEs, digital literacy includes not only the technical ability to operate digital devices and platforms, but also the cognitive and practical ability to understand information, evaluate its quality, select relevant technologies, and use them in business decision making (Zahoor et al., 2023; Masrianto et al., 2024). Zahoor et al. (2023) shows that managerial digital literacy is one of the important micro foundations in the digital transformation of SMEs, which shows that the effectiveness of technology depends not only on the availability of technology, but also on the ability of humans to use it appropriately.

In marketing activities, digital literacy allows MSMEs to understand customer and market information, choose the appropriate platform, evaluate digital information, develop content, and use data as a basis for decision making (Sultoni et al., 2022; Zahoor et al., 2023; Santoso et al., 2024). Thus, access to digital platforms does not necessarily produce the same benefits for every MSME because the quality of utilization is influenced by the ability of business actors to understand and use technology strategically. Research Sultoni et al. (2022) showed the relationship between digital marketing, digital orientation, marketing capability, and information technology capability in Indonesian SMEs, while Santoso et al. (2024) and Trisninawati & Sartika (2024) emphasized the importance of literacy and digital competence in supporting the use of technology and marketing activities of MSMEs.

Based on this perspective, this study positions digital literacy as a human resource capability that allows MSMEs to effectively utilize digital technology and information, not as a substitute for DMC. Digital literacy is seen as an enabling condition that can affect the effectiveness of DMC in generating organizational responses to change. This conceptualization is the basis for examining the role of digital literacy as a moderator in the relationship between DMC and business adaptability.

2.5 Inter Variable Relationships & Hypothesis Development

2.5.1 Digital Marketing Capability & Business Resilience

DMC enables MSMEs to obtain and utilize market information, manage customer relationships, integrate various marketing channels, and develop alternatives in reaching the market. This capability can increase the flexibility of MSMEs in responding to changing customer needs and business environment conditions (Tolstoy et al., 2022; Apasrawirote et al., 2022; Mulyana et al., 2024). In an uncertain environment, the ability to manage digital marketing information and resources can help MSMEs maintain interactions with customers, find new opportunities, and adjust marketing activities when disruptions occur. Thus, DMC can be a source of capabilities that support the ability of MSMEs to face change, not just a means to improve marketing effectiveness.

This relationship is supported by research showing that digital and marketing capabilities can contribute to business resilience. Khurana et al. (2022) showed that digital technology can support the resilience of SMEs through sensing, seizing, and transforming processes, while Ashiru et al. (2023) found that adaptability to digital technologies supports SMEs' resilience in the face of disruption. In the Indonesian context, Putritamara et al. (2023) shows the importance of dynamic capabilities in the process of digital transformation and business resilience in MSMEs. Furthermore, the systematic review Hokmabadi et al. (2024) identified digital transformation, marketing capabilities, digital skills, and dynamic capabilities as important factors in the formation of SME resilience. Mulyana et al. (2024) also shows that DMC is related to value creation agility in SMEs. The findings provide the basis that the higher an MSME's ability to utilize and integrate digital marketing resources, the greater its capacity to sustain business activity and respond to disruptions. Therefore, this study put forward a hypothesis:

H1: DMC is positively associated with business resilience in MSMEs.

2.5.2 Digital Marketing Capability & Business Adaptability

DMC enables MSMEs to obtain and integrate market information, manage customer data, utilize various digital channels, and adjust marketing activities based on changing consumer needs (Apasrawirote et al., 2022; Tolstoy et al., 2022; Wu et al., 2024; Mulyana et al., 2024). Such capabilities support the sensing process through the identification of market and customer

changes as well as the seizing process through the translation of such information into the adjustment of business strategies and activities (Khurana et al., 2022; Xie et al., 2022). Mulyana et al. (2024) showed that DMC is related to value creation agility in SMEs, whereas Xie et al. (2022) shows that the utilization of digital platforms can encourage capability reconfiguration and business model innovation. The findings suggest that DMCs can be a source of capabilities that enable MSMEs to transform information and digital resources into more adaptive responses to environmental changes.

Thus, the higher the DMC owned by MSMEs, the greater the ability of businesses to recognize market changes, utilize relevant information, and adjust business strategies and activities. DMC not only reflects the ability to use technology, but also the ability to integrate technology and digital information into the organization's decision making and response processes. Therefore, this study put forward a hypothesis:

H2: DMC is positively associated with business adaptability in MSMEs.

2.5.3 Business Adaptability & Business Resilience

Business adaptability enables MSMEs to recognize changes in the environment and adjust strategies, processes, products, marketing channels, and business activities according to evolving conditions. These capabilities are important because limited resources make MSMEs need to utilize available resources flexibly and make adjustments quickly when facing market changes and business disruptions (Khurana et al., 2022; Ashiru et al., 2023; Putritamara et al., 2023). In the dynamic capabilities perspective, the ability to make adjustments is part of the sensing, seizing, and transforming process that allows organizations to respond to changes and reconfigure resources according to environmental demands (Khurana et al., 2022). Thus, more adaptive MSMEs have a greater ability to change business strategies and activities when environmental conditions change.

This relationship is supported by research that shows the link between adaptive ability and resilience of SMEs. Khurana et al. (2022) showed that SMEs can build resilience through the development of dynamic capabilities, while Ashiru et al. (2023) found that adaptability to digital technology supports resilience in the face of disruption. In the Indonesian context, Putritamara et al. (2023) also shows the importance of dynamic capabilities in supporting digital transformation and business resilience in MSMEs. Furthermore, Sagala & Őri (2025) identified flexibility, agility, learning, and dynamic capabilities as important elements in building SMEs resilience. The findings suggest that the ability to adjust strategies and resources can improve the capacity of MSMEs to maintain business functions, respond to disruptions, and restore business activities. Therefore, this study put forward a hypothesis:

H3: Business adaptability is positively associated with business resilience in MSMEs.

2.5.4 Mediation Role of Business Adaptability

The relationship between DMC and business resilience is not always straightforward. DMC enables MSMEs to obtain market information, understand customer changes, expand market access, and use various digital channels in marketing activities (Tolstoy et al., 2022; Mulyana et al., 2024; Masrianto et al., 2024). However, such resources and information only provide strategic value when translated into adjustments to business strategies and activities. In the dynamic capabilities perspective, the process is concerned with sensing, seizing, and transforming, i.e. the ability to recognize change, take action, and reconfigure resources to respond to the environment (Khurana et al., 2022; Xie et al., 2022). Thus, business adaptability can be a mechanism that connects DMC with resilience.

Empirical evidence supports the view that resilience is formed through an organization's ability to make changes and adjustments. Khurana et al. (2022) showed that SMEs build resilience through the development of dynamic capabilities, while Ashiru et al. (2023) found that adaptability to digital technologies supports SMEs ' resilience in the face of disruption. In the Indonesian context, Putritamara et al. (2023) also shows the importance of dynamic capabilities in the process of digital transformation and business resilience in MSMEs. Further, systematic reviews by Hokmabadi et al. (2024) and Sagala & Őri (2025) identified digital capabilities, marketing capabilities, agility, flexibility, learning, and dynamic capabilities as factors related to the resilience of SMEs. The findings suggest that the benefits of digital capabilities to resilience can take place through an organization's ability to adjust its strategy and resources. Therefore, this study put forward a hypothesis:

H4: Business adaptability mediates the association between DMC and Business Resilience in MSMEs.

2.5.5 Moderation Role of Digital Literacy

The effect of DMC on business adaptability can be different between MSMEs because it is influenced by the ability of business actors to understand and utilize digital technology and information. DMC provide the ability to obtain market information, manage digital channels, interact with customers, and utilize digital resources, but their effectiveness depends on the competence of the individual carrying out such activities (Sultoni et al., 2022; Zahoor et al., 2023; Masrianto et al., 2024). In the micro foundations perspective, Zahoor et al. (2023) pointed out that managerial digital literacy is an important factor in the digital transformation process of SMEs, indicating that technology and organizational capabilities require human capabilities to be effectively utilized. Thus, the level of digital literacy can determine the extent to which DMC can be translated into adaptability.

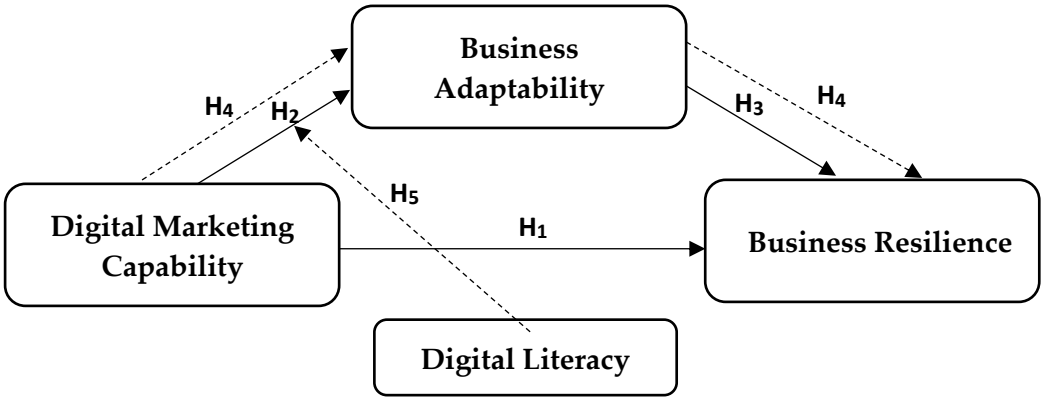
MSMEs with higher levels of digital literacy are estimated to be better able to understand and evaluate digital information, interpret customer data, choose relevant technology, and use the information as a basis for adjusting business strategies and activities (Sultoni et al., 2022; Zahoor et al., 2023; Santoso et al., 2024; Trisninawati & Sartika, 2024). Conversely, limited digital literacy can reduce the ability of MSMEs to optimize resources and information generated through digital marketing activities. Thus, digital literacy is seen as an enabling condition that strengthens the ability of MSMEs to convert DMC into an adaptive response to environmental changes. The higher the level of digital literacy, the stronger the influence of DMC on Business Adaptability. Based on these arguments, this study proposes a hypothesis:

H5: Digital literacy moderates the association between DMC and business adaptability in MSMEs.

2.6 Research Models

Based on the overall argument, the research model offered as follows:

Figure 1. Research Model



3. Methodology

This study employed a quantitative approach using a survey research design. Data were collected through a structured online questionnaire administered to MSMEs in Indonesia that met the predetermined research criteria. The collected data were analyzed using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 4.0. The analysis comprised assessment of the measurement model, structural model collinearity, direct and indirect associations, explanatory power, effect sizes, and the DMC × DL interaction in predicting business adaptability. The interaction term was evaluated together with the corresponding lower-order effects and conditional DMC–BA associations.

Table 1. Variable Measurement

No.	Variables	Indicators	Statement Items	Sources
1	Digital Marketing Capability (DMC)	Digital information capability	My MSME is able to provide and manage product information through digital platforms effectively.	(Apasrawirote et al., 2022)
		Digital customer capability	My MSME is able to use digital media to understand customer needs and preferences.	
		Digital communication capability	My MSMEs are able to communicate and respond to customers quickly through digital channels.	
		Digital channel integration	My MSME is able to integrate various digital channels to support marketing activities.	
2	Business Adaptability (BA)	Strategic adaptation	My MSME quickly adjusts its strategies to environmental changes	(Xie et al., 2022)
		Process adaptation	My MSMEs are able to adapt business processes to meet changing market needs.	
		Market responsiveness	My MSMEs are able to respond quickly to changing trends and customer needs.	
		Resource reconfiguration	My MSME can reorganize resources in response to changes or disruptions.	
3	Business Resilience (BR)	Business continuity	My MSME can maintain core activities during disruptions.	(Khurana et al., 2022)
		Response capability	My MSMEs are able to respond quickly to business disruptions and changes.	
		Recovery capability	My MSME was able to restore business activities after experiencing disruption.	
		Opportunity exploitation	My MSMEs are able to take advantage of new opportunities that arise from changes or uncertain conditions.	
4	Digital Literacy (DL)	Information literacy	I am able to search, select, and evaluate digital information that is relevant to the business.	(Zahoor et al., 2023)
		Digital communication and collaboration	I am able to use digital technology to communicate and collaborate in running a business.	
		Digital content creation	I am able to create and manage digital content to support business and marketing activities.	

No.	Variables	Indicators	Statement Items	Sources
		Digital problem solving	I am able to use digital technology to find solutions when facing problems in business.	

Source: Data processed in 2026

The unit of analysis in this study is the MSME. Digital marketing capability (DMC), business adaptability (BA), and business resilience (BR) were operationalized at the organizational level constructs using firm referent items (e.g., "My MSME..."). Each firm was represented by a single key informant either the owner (70%) or a key manager (30%) involved in strategic decision making. This key informant approach is appropriate for small firms in which owners or managers typically hold substantial decision making authority and can report on organization level routines and outcomes.

In contrast, Digital Literacy (DL) was conceptualized and measured strictly as an individual level attribute of the owner or manager. Consistent with a micro foundational framework, DL reflects the key decision maker's cognitive and technical capability to evaluate, select, and process digital information for strategic actions. This study does not imply or claim that the observed DL score represents an aggregated organizational capability; rather, it evaluates how the decision maker's personal digital literacy conditions the translation of firm level DMC into organizational adaptability. Because single respondent data preclude true empirical multilevel modeling, the micro-foundational mechanism is interpreted theoretically as a cross level enabling condition rather than a statistical multi level model.

A purposive sampling strategy was utilized to reach digitally engaged MSMEs in Indonesia. The target population was defined by specific inclusion criteria: (1) active MSMEs operating for at least two years, (2) actively using digital media/marketplaces for marketing, and (3) represented by an owner or senior manager directly managing digital marketing and strategic operations. These criteria define the empirical population more narrowly as digitally engaged Indonesian MSMEs represented by eligible owner or manager key informants. The study involved 500 respondents, with each respondent representing one MSME. The sampling approach was purposive rather than probability based; therefore, the findings are not generalized to all Indonesian MSMEs, especially firms that do not use digital marketing.

Data collection was executed online over a three-month period (May to July 2026) via distributed links through regional MSME business associations, entrepreneurship networks, and targeted social media channels. A total of 680 questionnaire entries were initially recorded. Screening protocols were applied: 42 responses were eliminated due to incomplete entries or failing screening/attention check items, and 138 entries were excluded for not meeting the minimum two-year operation or platform criteria. Duplication controls (monitoring IP addresses and business identifier checks) ensured unique firm submissions. The final analyzed sample comprised 500 valid MSME key informants. Although geographically concentrated in Sumatra (40%) and Java (36%), the sample offers broad coverage across sectors and size classifications, though it is interpreted descriptively rather than as a nationally representative probability sample.

Sample adequacy was evaluated in relation to established PLS-SEM guidelines and the complexity of the structural model (Hair et al., 2021). Because the study did not employ probability sampling or a formal national quota, the geographic and MSME-size composition of the sample is interpreted descriptively rather than as evidence of national

representativeness. The empirical scope is therefore limited to digitally engaged MSMEs that met the specified eligibility criteria and were represented by eligible owners or managers.
Because all constructs were measured cross sectionally using self-reported questionnaires from a single key informant per firm, potential Common Method Variance (CMV) was addressed procedurally and statistically. Procedurally, respondent anonymity was guaranteed, item wording was kept simple and unambiguous, and construct items were separated in different survey sections to minimize consistency motives. Statistically, a Full Collinearity Test was conducted by evaluating the Variance Inflation Factors (VIF) for all latent constructs in the structural model. As reported in Table 6, all inner VIF values ranged between 1.673 and 2.284, well below the conservative threshold of 3.3 (Kock, 2015). This confirms that single source common method bias does not substantially distort the estimated relationships in this study.

4. Result and Discussion

This section presents the empirical results of the relationships among DMC, BA, BR, and DL in Indonesian MSMEs, including assessment of the measurement model, structural model collinearity, direct and indirect associations, explanatory power, effect sizes, and the interaction between DMC and DL. The findings are discussed in relation to dynamic capabilities theory and previous research to explain their theoretical and empirical implications.

4.1. Respondent Profile

Respondent profiles describe the demographic and business characteristics of the 500 MSME respondents, including respondent status (owner or manager), gender, age, business age, business sector, digital platform use, geographic distribution, and MSME size classification.

Table 2. Respondent Characteristics

Characteristics	Category	Frequency	Percentage (%)
Respondent Status	Owner	350	70
	Manager	150	30
Gender	Male	284	56.8
	Female	216	43.2
Age	< 25 years	74	14.8
	25–34 years	171	34.2
	35–44 years	156	31.2
	≥ 45 years	99	19.8
Business Age	< 5 years	132	26.4
	5–10 years	207	41.4
	> 10 years	161	32.2
Business Sector	Food & Beverage	171	34.2
	Retail/Trade	145	29
	Services	116	23.2
	Manufacturing/Crafts	68	13.6
Digital Platform	Social Media	91	18.2
	Marketplace	78	15.6
	Website	31	6.2
	Multiple platforms	300	60
Geographic Distribution	Sumatra	200	40
	Java	180	36
	Kalimantan	50	10

	Sulawesi	40	8
	Bali & Nusa Tenggara	20	4
	Maluku & Papua	10	2
MSME Size	Micro	300	60
	Small	150	30
	Medium	50	10

Source: Data processed in 2026

4.2. Measurement Model Assessment

The measurement model was assessed for indicator reliability, internal consistency, convergent validity, and discriminant validity. DMC, BA, and BR were conceptualized as multidimensional organizational constructs and specified as reflective constructs at the construct level. The DMC indicators capture a firm's ability to manage digital information, customers, communication, and digital channel integration. The BA indicators capture the firm's ability to adapt its strategies, processes, market responses, and resources to changing conditions. The BR indicators capture business continuity, response, recovery, and opportunity exploitation during and following disruption. These indicators were specified as manifestations of their respective underlying constructs and were expected to covary with variation in the underlying capability or resilience. DL was specified separately and measured at the individual level among MSME owners or managers.

Table 3. Measurement Model Result

Variable	Indicator	Outer Loading	Cronbach's Alpha	Rho_A	Composite Reliability	AVE
Digital Marketing Capability (DMC)	DMC1	0.812	0.889	0.893	0.923	0.749
	DMC2	0.876				
	DMC3	0.851				
	DMC4	0.913				
Business Adaptability (BA)	BA1	0.821	0.867	0.871	0.911	0.720
	BA2	0.857				
	BA3	0.874				
	BA4	0.841				
Business Resilience (BR)	BR1	0.795	0.878	0.882	0.916	0.733
	BR2	0.864				
	BR3	0.889				
	BR4	0.871				
Digital Literacy (DL)	DL1	0.823	0.884	0.887	0.921	0.745
	DL2	0.862				
	DL3	0.891				
	DL4	0.875				

Source: Data processed in 2026

Table 3 reports outer loadings above 0.70, while Cronbach's alpha, rho_A, and composite reliability exceed 0.70, indicating adequate indicator reliability and internal consistency. AVE values range from 0.720 to 0.749, exceeding 0.50 and supporting convergent validity.

DMC, BA, and BR were specified as reflective constructs at the construct level. Theoretically, reflective specification for Business Adaptability (BA) assumes that a firm's underlying

adaptive orientation causes co-movements across its core dimensions strategic adjustment, process adaptation, market responsiveness, and resource reconfiguration. Similarly, Business Resilience (BR) reflects an underlying organizational capacity to withstand disruptions, manifesting simultaneously through business continuity, rapid response, recovery capability, and opportunity exploitation.

4.2.1 Discriminant Validity

Table 4. HTMT Results

Constructs	DMC	BA	BR	DL
DMC	—			
BA	0.782	—		
BR	0.806	0.841	—	
DL	0.758	0.721	0.774	—

Source: Data processed in 2026

Table 4 presents the Heterotrait–Monotrait (HTMT) results. All point estimates are below 0.85, with the highest value between BA and BR (0.841). The reported bootstrapped HTMT interval for BA–BR is [0.791, 0.887], which does not include 1.00 and therefore remains compatible with discriminant validity under the inferential criterion. Nevertheless, the proximity of the point estimate to 0.85 warrants conceptual caution. BA focuses on the firm's capacity to adjust strategies, processes, markets, and resources, whereas BR focuses on maintaining core functions, responding to disruption, recovering from disruption, and exploiting opportunities. The distinction is therefore framed as adaptive process/capability versus broader continuity and recovery capability.

Regarding discriminant validity, the HTMT value between BA and BR was 0.841 (Table 4). While close to the strict 0.85 threshold, the bootstrapped 95% confidence interval [0.791, 0.887] strictly excludes 1.00 (Table 5), supporting empirical distinction. Conceptually, BA represents the adaptive process/capability (adjusting strategy and reconfiguring routines), whereas BR represents the broader outcome/state of continuity and recovery following shocks.

Table 5. Bootstrapped HTMT Confidence Intervals

Constructs Pair	HTMT	95% CI Lower	95% CI Upper
DMC–BA	0.782	0.724	0.831
DMC–BR	0.806	0.751	0.851
BA–BR	**0.841**	**0.791**	**0.887**
DMC–DL	0.758	0.699	0.813
BA–DL	0.721	0.652	0.784
BR–DL	0.774	0.708	0.829

Source: Data processed in 2026

As shown in Table 5, the bootstrapped 95% confidence intervals for all construct pairs did not include 1.00. For business adaptability and business resilience, which exhibited the highest HTMT value, the confidence interval ranged from 0.791 to 0.887. The corresponding intervals for DMC–BA, DMC–BR, DMC–DL, BA–DL, and BR–DL also remained below 1.00. These findings provide additional support for discriminant validity and indicate that the constructs are empirically distinguishable.

The relatively high HTMT value between BA and BR can be explained by their related but distinct conceptual roles. BA reflects the MSME's capacity to adjust strategies, processes,

markets, and resources in response to changing conditions, whereas BR emphasizes business continuity, response to disruptions, recovery, and the exploitation of emerging opportunities. Thus, BA represents an adaptive capability, while business resilience reflects a broader capacity for continuity and recovery. This distinction supports the empirical evidence that the two constructs remain sufficiently distinct.

4.3 Structural Model Assessment

Structural model assessment included inner model collinearity, coefficient of determination (R^2), effect size (f^2), direct and indirect path estimates, and moderation and moderated-mediation analysis. Because the data are cross-sectional and based on a single key informant per MSME, structural coefficients are interpreted as associations consistent with the proposed theoretical model rather than proof of temporal causality.

4.3.1 Inner Model Collinearity

Table 6. Inner VIF Results

Endogenous Construct	Predictor	VIF
BA	DMC	1.842
BA	DL	1.673
BA	DMC x DL	1.918
BR	DMC	2.137
BR	BA	2.284

Source: Data processed in 2026

Table 6 presents the inner VIF values for assessing collinearity among the predictors in the structural model. The VIF values ranged from 1.673 to 2.284, remaining below the threshold of 3.30. For BA, the VIF values were 1.842 for DMC, 1.673 for DL, and 1.918 for the DMC × DL interaction. For BR, the VIF values were 2.137 for DMC and 2.284 for BA. These results indicate that collinearity among the predictors was not problematic and that the structural model was suitable for subsequent hypothesis testing.

4.3.2 Coefficient of Determination

Table 7. Coefficient of Determination

Endogenous Construct	R^2	Adjusted R^2	Interpretation
BA	0.367	0.358	Moderate
BR	0.512	0.508	Moderate

Source: Data processed in 2026

Table 7 presents the coefficient of determination for the endogenous constructs. The R^2 value of 0.367 for BA indicates that 36.7% of the variance in BA is explained jointly by DMC, DL, and the DMC × DL interaction included in the BA structural equation, with an adjusted R^2 of 0.358. BR has an R^2 value of 0.512, indicating that approximately 51.2% of its variance is explained jointly by DMC and BA, with an adjusted R^2 of 0.508. The remaining variance may be attributable to other organizational and environmental factors not included in the present model.

4.3.3 Effect Size

Table 8. Effect Size

Relationship	f^2	Effect
DMC → BA	0.361	Large
DMC → BR	0.118	Small

Relationship	f^2	Effect
BA → BR	0.296	Medium
DL × DMC → BA	0.041	Small

Source: Data processed in 2026

Based on the results of the effect size (f^2) test in Table 8, DMC has a major influence on BA with an f^2 value of 0.361. Meanwhile, the effect of DMC on BR showed a small effect with an f^2 value of 0.118, while BA to BR had a moderate effect with an f^2 value of 0.296. The interaction of DMC × DL to BA produces a value of f^2 of 0.041, which is included in the category of small effects. Overall, these results indicate that the greatest contribution in the model is found in the DMC → BA relationship, while the effect of DMC on BR and the effect of DL moderation is relatively more limited.

4.3.4 Direct and Indirect Path Estimates, and Moderation Analysis

Table 9. Structural Model and Hypothesis Testing

Hypothesis	Relationship	β	STDEV	t-value	p-value	95% CI	Decision
H1	DMC → BR	0.286	0.057	5.018	< 0.001	[0.174, 0.398]	Supported
H2	DMC → BA	0.552	0.051	10.824	< 0.001	[0.452, 0.652]	Supported
H3	BA → BR	0.467	0.058	8.052	< 0.001	[0.353, 0.581]	Supported
H4	DMC → BA → BR	0.258	0.038	6.789	< 0.001	[0.184, 0.332]	Supported
H5	DL × DMC → BA	0.118	0.047	2.511	0.012	[0.026, 0.210]	Supported

Source: Data processed in 2026

Table 9 shows support for H1, with a positive association between DMC and BR ($\beta = 0.286$, $t = 5.018$, $p < 0.001$, 95% CI [0.174, 0.398]). This indicates that MSMEs reporting stronger DMC also tend to report stronger resilience. The result is interpreted as an association because the cross-sectional design does not establish temporal ordering or rule out alternative explanations.

H2 is supported by the reported results, with a positive association between DMC and BA ($\beta = 0.552$, $t = 10.824$, $p < 0.001$, 95% CI [0.452, 0.652]). This is the largest reported direct path in the model and suggests that MSMEs with stronger DMC tend to report stronger abilities to adjust strategies, processes, market responses, and resources.

H3 is supported by the reported results, with a positive and statistically significant association between BA and BR ($\beta = 0.467$, $t = 8.052$, $p < 0.001$, 95% CI [0.353, 0.581]). This result is consistent with the proposed pathway in which adaptive organizational responses are associated with stronger business continuity, response, recovery, and opportunity exploitation. The BA–BR HTMT value of 0.841 remains below the commonly used threshold of 0.85, although its proximity to the threshold indicates that the empirical distinction between the two constructs warrants careful interpretation.

The mediation analysis supports H4, indicating a positive and statistically significant indirect association between DMC and BR through BA ($\beta = 0.258$, $t = 6.789$, $p < 0.001$, 95% CI [0.184, 0.332]). The direct association between DMC and BR also remains positive and statistically significant ($\beta = 0.286$, $p < 0.001$, 95% CI [0.174, 0.398]), resulting in a pattern consistent with complementary mediation. The indirect coefficient is consistent with the product of the DMC → BA and BA → BR path coefficients ($0.552 \times 0.467 \approx 0.258$). Given the cross-sectional design, the findings support the proposed adaptive pathway as an indirect association rather than establishing a temporal causal sequence.

H5 is supported by the reported results. The moderation analysis indicates a positive interaction between DMC and DL in predicting BA ($\beta = 0.118$, $t = 2.511$, $p = 0.012$, 95% CI [0.026,

0.210]). The lower-order DL → BA association is positive and statistically significant (β = 0.320, t = 4.206, p < 0.001, 95% CI [0.171, 0.469]). At one standard deviation below the mean, the mean, and one standard deviation above the moderator, the estimated DMC → BA associations are approximately 0.434, 0.552, and 0.670, respectively. These estimates indicate an increasing positive association between DMC and BA as the reported DL of the owner or manager increases. The interaction effect is small in practical magnitude ($f^2 = 0.041$).

To evaluate whether managerial digital literacy conditions the indirect pathway from DMC to BR via BA, conditional indirect effects were computed at low (-1 SD), mean, and high (+1 SD) levels of DL. The calculated conditional indirect associations were 0.203 at low DL, 0.258 at mean DL, and 0.313 at high DL. The calculated index of moderated mediation was approximately 0.055 (0.118×0.467). While the first-stage interaction (DMC × DL → BA) is statistically significant (β=0.118,p=0.012), these algebraic conditional values provide descriptive insight into the pattern. To maintain strict inferential caution, the current evidence is characterized as an empirical pattern consistent with a moderated adaptive pathway rather than a definitively confirmed moderated mediation, pending further multi wave bootstrapped index validation.

4.4 Discussion

4.4.1 Digital Marketing Capability and Business Resilience

The results indicate a positive association between DMC and BR. MSMEs reporting stronger DMC also report stronger capacity to maintain activities, respond to disruption, and identify alternative opportunities. This pattern is consistent with the dynamic capabilities perspective, according to which digital capabilities can support sensing, seizing, and transformation. However, the present cross-sectional design does not establish that DMC causes resilience; the finding should therefore be understood as empirical evidence consistent with the proposed relationship.

Theoretically, this finding supports the dynamic capabilities perspective, which emphasizes the importance of organizational capabilities in responding to changing environments. DMC enables MSMEs to sense changes in customer needs and market conditions, seize opportunities through digital channels, and maintain customer relationships when conventional business channels are disrupted. This finding is consistent with Khurana et al. (2022), who showed that digital technologies can contribute to SME resilience through sensing, seizing, and transforming processes. It is also consistent with Ashiru et al. (2023) and Hokmabadi et al. (2024), who emphasize the contribution of digital and marketing capabilities to SME resilience.

An important explanation for the relatively small direct effect is that DMC alone does not automatically create resilience. Digital platforms may provide access to customers and information, but the benefits depend on the firm's ability to transform those resources into appropriate organizational responses. This explains why the direct effect of DMC on resilience is smaller than its effect on business adaptability. In other words, DMC provides the resources and information required for responding to change, while organizational adaptability determines how effectively those resources are translated into action. Therefore, MSMEs should not view digital marketing merely as a promotional instrument, but as a capability that needs to be integrated with decision making, customer management, market intelligence, and business strategy.

4.4.2 Digital Marketing Capability and Business Adaptability

The results indicate a positive and statistically significant association between DMC and BA. The effect size is relatively large ($f^2 = 0.361$), indicating that DMC has substantial explanatory relevance for BA within the structural model. This finding suggests that the strategic value of digital marketing is reflected in the ability of MSMEs to detect market changes, understand customer needs, and adjust their marketing activities accordingly.

This finding can be explained through the sensing and seizing dimensions of dynamic capabilities. Digital marketing provides MSMEs with continuous access to customer responses, market trends, competitor information, and digital performance data. Such information enables businesses to identify changes more quickly and subsequently adjust products, promotional strategies, communication, and marketing channels. The finding is consistent withs Tolstoy et al. (2022), who emphasized the importance of online marketing capability in enabling SMEs to utilize digital markets, and Mulyana et al. (2024), who found that DMC is associated with value creation agility. Xie et al. (2022) similarly demonstrated that digital platforms can facilitate capability reconfiguration and business model innovation.

The relatively large effect of DMC on BA also provides an important explanation of why digital marketing is increasingly strategic for resource constrained MSMEs. Unlike large firms, MSMEs generally have limited financial and organizational resources to respond to environmental changes. Digital marketing allows them to obtain information and modify market facing activities without requiring extensive physical infrastructure. Therefore, the capability to integrate digital information, customer interaction, content, and marketing channels becomes an important mechanism through which MSMEs can respond to environmental changes more rapidly.

From a managerial perspective, MSMEs should therefore focus not merely on the adoption of digital platforms but on developing the ability to interpret digital information and convert it into marketing and business decisions. This includes monitoring customer responses, evaluating digital performance, adjusting content and offerings, and diversifying digital channels when market conditions change.

4.4.3 Business Adaptability and Business Resilience

The results further indicate a positive and statistically significant association between BA and BR, with a medium effect size ($f^2 = 0.296$). This finding indicates that the ability of MSMEs to adjust their strategies, processes, products, marketing channels, and customer relationships is substantively associated with their capacity to maintain continuity, respond to disruptions, recover from disruptions, and exploit emerging opportunities.

This finding reinforces the dynamic capabilities perspective, particularly the role of sensing, seizing, and transforming in maintaining organizational viability under changing environmental conditions. Adaptability allows firms not only to recognize changes but also to translate those changes into adjustments in their resources and business activities. Khurana et al. (2022) conceptualized SME resilience as a higher order capability developed through processes of sensing, seizing, and transforming. Similarly, Ashiru et al. (2023) highlighted the importance of technological adaptation in supporting SME resilience, while Sagala & Őri (2025) identified flexibility, agility, learning, digital capabilities, and dynamic capabilities as important elements of SME resilience.

The medium effect size of business adaptability on resilience is particularly meaningful because it suggests that resilience is not simply a consequence of possessing resources but of being able to change how those resources are used. An MSME may have access to digital technologies, customers, and market information, but if its strategies and operations remain

rigid, those resources may not protect the business from disruption. Conversely, adaptive MSMEs can modify their offerings, marketing channels, customer engagement, and operational processes in response to changing conditions.

This finding has important practical implications. MSMEs should develop organizational routines that encourage continuous market monitoring, rapid decision making, experimentation, and resource reconfiguration. Adaptability should therefore be treated as a strategic capability rather than merely a short-term operational response.

4.4.4 The Mediating Role of Business Adaptability

The mediation results indicate a positive and statistically significant indirect association between DMC and BR through BA. The significant indirect association suggests that MSMEs with stronger DMC also tend to report stronger BA, which in turn is associated with stronger BR. The direct association between DMC and BR remains positive and statistically significant, resulting in a pattern consistent with complementary mediation. This finding indicates that the DMC–BA–BR pathway represents an important indirect association within the structural model, while the cross-sectional design does not establish a temporal causal sequence.

The mediation pattern is consistent with the dynamic capabilities perspective. DMC can support the organization's ability to sense changes by providing information about customers, competitors, market trends, and digital interactions. However, sensing alone does not establish resilience. Such information needs to be seized through appropriate decisions and translated into changes in products, processes, marketing channels, or customer relationships. In this model, BA represents the organizational capability through which DMC is associated with more responsive adaptation to environmental changes. This interpretation is consistent with Khurana et al. (2022), who explain SME resilience through sensing, seizing, and transforming processes, as well as Xie et al. (2022), who show that digital platforms can facilitate capability reconfiguration.

The mediation finding also provides an explanation for the relatively smaller direct association between DMC and BR. If DMC primarily provides access to information, customers, and alternative channels, its association with resilience depends in part on how the organization mobilizes and adapts these resources and capabilities. Accordingly, DMC represents a digital resource and functional capability, BA represents the organizational capability through which these resources are translated into responsive adaptation, and BR represents the resulting organizational capability for continuity, response, recovery, and opportunity exploitation. This interpretation is also consistent with Hokmabadi et al. (2024), who emphasize that the relationship between digital transformation, marketing capabilities, and SME resilience can be understood through organizational capabilities such as agility and dynamic capabilities.

The finding extends previous research that has frequently examined digital transformation or digital technology adoption as a broad antecedent of SME resilience. By focusing specifically on DMC, this study highlights the role of BA in the association between DMC and BR, rather than viewing resilience solely in relation to digital technology adoption. For MSMEs, the findings suggest that investment in digital marketing can be complemented by the development of organizational routines that support rapid adjustment and resource reconfiguration.

4.4.5 The Moderating Role of Digital Literacy

The moderation results indicate that DL positively conditions the association between DMC and BA. The corresponding calculations indicate an increasing pattern in the DMC–BA–BR pathway across low, mean, and high levels of DL. This pattern is consistent with a moderated

adaptive pathway in which the organizational capability represented by DMC is more strongly associated with BA when the owner or manager representing the MSME reports higher DL. This interpretation reflects the micro-foundational role of DL, which is measured at the individual level among MSME owners or managers.

From a micro-foundations perspective, DL can shape how effectively digital information and tools are interpreted and translated into organizational action. The conditional indirect calculations indicate that the association between DMC and BR through BA becomes stronger at higher levels of DL. This interpretation is consistent with Zahoor et al. (2023), who position DL among managers as a micro-foundational capability supporting SME digital transformation. The finding represents an association rather than evidence that higher DL causes a stronger adaptive response.

The practical meaning of the interaction is proportional to its effect size. The interaction coefficient is positive, while the reported f^2 of 0.041 indicates a small incremental contribution. Thus, DL conditions the association between DMC and BA, although the magnitude of this conditioning is limited relative to the broader variation explained by the model.

This finding also has practical implications for MSME development policies. Digitalization programs need not focus exclusively on providing platforms, infrastructure, or access to digital tools. Training can also strengthen the ability of MSME owners and managers to interpret digital information, evaluate online sources, analyze customer data, develop relevant content, and make strategic decisions based on digital insights. Such human-capability development may help MSMEs derive greater value from their existing DMC.

Taken together, the mediation and moderation findings provide an integrated view of the DMC–BA–BR pathway across different levels of DL. The mediation results indicate a positive indirect association between DMC and BR through BA, while the moderation results indicate that the association between DMC and BA becomes stronger as DL increases. Based on the reported path coefficients, the conditional indirect association is approximately 0.203 at low DL, 0.258 at mean DL, and 0.313 at high DL. The corresponding index of moderated mediation is approximately 0.055, derived from the interaction coefficient for DL × DMC → BA (0.118) and the BA → BR coefficient (0.467). These conditional values are algebraic calculations from the reported path coefficients and therefore do not substitute for bootstrap confidence intervals. Taken together, the pattern is consistent with a stronger DMC–BA–BR association at higher levels of individual-level DL among the owner or manager representing the MSME.

From a managerial standpoint, while managerial digital literacy (DL) significantly conditions the translation of DMC into business adaptability, its incremental effect size is modest (f^2 =0.041). Therefore, practitioners and policymakers should avoid treating owner/manager digital literacy as a standalone "panacea" or sole decisive factor. Instead, DL should be viewed as an enabling micro-foundation that complements organizational capability building. Digitalization support programs for MSMEs must balance individual skill training with organizational routine building encouraging firms to pair digital platforms with agile operational reconfiguration and market sensing routines.

5. Conclusion and Suggestion

This study examined the association between DMC and BR among digitally engaged Indonesian MSMEs, with BA as a mediator and DL as a moderating condition. The findings indicate positive and statistically significant associations between DMC and BR, DMC and BA, and BA and BR. BA also shows a positive indirect association in the relationship between DMC

and BR, resulting in a pattern consistent with complementary mediation. In addition, the positive interaction between DMC and DL indicates that the association between DMC and BA varies across levels of DL reported by the owner or manager representing the MSME. The integrated mediation and moderation findings further indicate an increasing pattern in the DMC–BA–BR pathway across levels of DL. Overall, the findings highlight the role of BA as an important organizational capability linking DMC with BR, while DL represents an individual-level micro-foundational condition associated with the strength of this pathway. These findings are bounded by the cross-sectional, purposive, and single key informant design of the study and therefore do not establish temporal causality.

For MSME practitioners and development programs, strengthening DMC can be accompanied by the development of BA and DL among owners and managers. Digitalization initiatives can therefore combine access to digital platforms and tools with practical training in evaluating digital information, understanding customer needs, developing relevant content, and adapting business strategies to changing market conditions.

6. Limitations and Future Research

This study has several limitations. First, the cross-sectional design prevents firm conclusions about temporal ordering or causality among DMC, BA, BR, and DL. Second, all constructs were measured through self-reported responses from one key informant per MSME using the same questionnaire, creating potential common-source and common-method bias. Because the available study record does not document a separate marker-variable, unmeasured-latent-method-factor, or other statistical common-method assessment, the study does not claim that common-method bias has been eliminated. Third, the moderation model combines an individual-level capability with organizational-level constructs. Although this cross-level specification is theoretically consistent with a micro-foundational perspective, the findings do not establish DL as a characteristic of the entire firm. Fourth, the purposive sampling frame focuses on digitally engaged MSMEs and therefore does not represent MSMEs that have not adopted digital marketing. Fifth, because the study did not employ probability sampling or a formal national quota, the geographic and MSME-size composition of the sample does not establish national representativeness.

Future research can address these limitations through longitudinal or multi-wave designs to examine the temporal sequence proposed in the mediation model and through objective or multi-informant measures of resilience and digital capability where feasible. Future studies can also involve multiple informants within each MSME and assess within-firm agreement before aggregating individual-level DL measures. Comparative analyses across regions, MSME size classes, business sectors, levels of digital platform use, and owner versus manager respondents can further examine whether the proposed relationships vary across contexts, with measurement invariance established before substantive comparisons are made. Additional variables, such as digital leadership, innovation capability, organizational learning, and digital infrastructure, may also help explain heterogeneity in how DMC is translated into BA and BR.

Declaration of AI and AI-assisted technologies in the writing process

During the preparation of this manuscript, the authors used ChatGPT to assist with writing structure and language revision. The authors reviewed and edited the generated material,

verified the substantive content to the extent possible, and take full responsibility for the final published work.

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