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Big Data Analytics as an Organizational Mechanism: Linking Financial Literacy and Managerial Competence to Micro, Small, and Medium Enterprise Performance in Indonesia

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ABSTRACT

This study examines the role of big data analytics (BDA) as an organizational mechanism in linking individual readiness—represented by financial literacy and managerial competence—to micro, small, and medium enterprise (MSME) performance in Indonesia. Despite increasing attention to digital transformation, limited research has explored how individual readiness translates into performance within MSMEs. Using a quantitative approach with partial least squares structural equation modeling (PLS-SEM), data were collected from 204 owner-managed MSMEs in Indonesia through an online questionnaire. The findings indicate that financial literacy and managerial competence significantly influence the adoption of BDA, which in turn enhances both financial and market performance. However, the direct effects of individual readiness on performance are limited, suggesting that individual readiness alone is insufficient to generate performance improvements. The results further show that BDA serves as a key mechanism linking individual readiness and performance outcomes. This study concludes that MSME performance is achieved when individual readiness is effectively translated into data-driven practices, positioning BDA as an organizational conversion mechanism that enables the transformation of individual readiness into measurable outcomes.

Keywords: Big Data Analytics, Financial Literacy, Managerial Competence, MSMEs Performance, Technology Adoption
JEL Classifications: M15, M21, O33, L26

1. INTRODUCTION

Micro, small, and medium enterprises (MSMEs) are the backbone of economic and social development worldwide, particularly in developing countries. In Indonesia, MSMEs play a crucial role, contributing approximately 60.3% of the gross domestic product (GDP) and employing about 97% of the workforce, making them key contributors to inclusive growth and regional economic diversification (Damayanti et al., 2025; Kurniasari et al., 2023). The Indonesian government also recognizes MSMEs as a key pillar for sustaining economic expansion and promoting social inclusion (OECD, 2018), reflecting the entrepreneurial dynamism of one of the largest economies in Southeast Asia (Seraj et al., 2022). Despite this significant contribution, MSMEs continue to face structural and operational challenges, particularly in adapting to an increasingly digitalized business environment, where high levels of informality limit access to financing, regulatory protection, and the effective use of digital technologies (OECD, 2018). In this context, digital transformation has become both a necessity and a challenge, as technologies such as cloud computing, mobile platforms, and analytics tools reshape business models and create new opportunities for competitiveness and innovation (Bouwman et al., 2018). Among these, big data analytics (BDA) emerges as a strategic technology capable of generating actionable insights from large volumes of data at lower costs (Müller et al., 2016; Raguseo and Vitari, 2018)and enhancing corporate performance

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(Maroufkhani et al., 2020). For MSMEs, BDA adoption can improve market responsiveness and innovation (Gupta and George, 2016; Sen et al., 2016; Wamba et al., 2017). However, despite its potential, MSMEs in both developed and developing countries continue to lag behind large firms in adopting BDA (Maroufkhani et al., 2020; Mikalef et al., 2019).

This paradox, where MSMEs recognize the potential benefits of BDA but struggle with its implementation, highlights the primary research problem addressed in this study. Although BDA offers a pathway to improving financial and market performance (Raguseo and Vitari, 2018), adoption rates remain low, particularly in resource-constrained environments such as Indonesia. Empirical evidence indicates that MSMEs face significant challenges in adopting BDA, with technological and organizational factors consistently identified as key determinants (Maroufkhani et al., 2020), including inadequate information technology infrastructure, limited financial resources, a shortage of skilled personnel, and weak managerial support (Coleman et al., 2016; Shin, 2016). Furthermore, while organizational resources and environmental pressures have been widely examined, individual-level readiness factors such as financial literacy (FL) and managerial competence (MC) remain under-explored, despite their critical role in MSME decision-making processes. In predominantly owner-managed MSMEs, these microfoundations are likely to shape organizational readiness for technology adoption and ultimately influence performance outcomes.

Existing research has addressed the challenges of MSME digitalization by emphasizing structural determinants, with the technology–organization–environment (TOE) framework widely used to explain technology adoption through factors such as relative advantage, compatibility, and complexity (Oliveira and Fraga Martins, 2011), along with organizational resources and top management support (Chen et al., 2015; Premkumar and Roberts, 1999), and environmental pressures including competition, external support, and regulation (Oliveira et al., 2014; Tsai et al., 2013). However, these perspectives largely overlook the cognitive dimensions and managerial readiness of MSME owners. From a resource-based view (RBV), firm performance depends not only on tangible resources but also on intangible capabilities such as managerial skills and knowledge (Ying et al., 2019), where financial literacy enhances financial decision-making and resource allocation (Abdallah et al., 2024; Hussain et al., 2018; Owusu et al., 2019), while managerial competence strengthens strategic planning and resource utilization (Sualeh Khattak et al., 2024; Toth et al., 2022), with both creating synergistic effects on performance (Idris et al., 2023; Nurjannah et al., 2023). In the context of BDA adoption, these capabilities are critical, as decision-makers must evaluate costs, risks, and long-term benefits (Maroufkhani et al., 2020; Raguseo and Vitari, 2018). Financial literacy supports investment feasibility and resource allocation (Hussain et al., 2018; Owusu et al., 2019), while managerial competence enables effective implementation and integration (Battaglia et al., 2018a; Sualeh Khattak et al., 2024), together reflecting organizational readiness. Prior studies further show that financial literacy promotes digital adoption and enhances firm performance (Kulathunga et al., 2020), while digital and financial literacy contribute to innovation and sustainability (Krajčík et al., 2023). However, research directly linking financial literacy and managerial competence to BDA adoption remains limited, particularly in developing countries, highlighting the need to integrate micro-level factors into existing adoption models.

The resource-based view (RBV) provides a theoretical foundation for integrating individual readiness into technology adoption models, emphasizing that sustainable competitive advantage arises not only from tangible resources but also from intangible capabilities such as knowledge and managerial skills (Barney, 1991; Ying et al., 2019). In MSMEs, the cognitive and behavioral traits of owners or managers constitute critical intangible resources, particularly in developing countries where resource constraints and informality are prevalent, making these capabilities decisive for technology adoption and firm performance (Seraj et al., 2022; Ye and Kulathunga, 2019). Integrating RBV with the TOE framework enables a more comprehensive understanding of BDA adoption by capturing both structural and individual dimensions. Prior research by Maroufkhani et al. (2020) developed an integrated TOE–RBV model demonstrating that technological, organizational, and environmental factors influence BDA adoption and that BDA mediates the relationship between these factors and SME performance. However, the model does not explicitly incorporate individual readiness factors such as financial literacy and managerial competence, leaving an important gap, particularly in the Indonesian context where MSMEs are predominantly owner managed. Accordingly, this study aims to examine the mediating role of BDA adoption in the relationship between financial literacy, managerial competence, and MSME performance in Indonesia, addressing the research question of how BDA adoption translates individual readiness into improved organizational performance. This study contributes to the literature in three ways: First, by extending the TOE framework through the inclusion of individual-level readiness factors; second, by integrating RBV and microfoundations to explain the role of owner-level capabilities in technology adoption; and third, by providing empirical evidence from a developing country context, offering a more nuanced understanding of digital transformation in MSMEs.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Financial Literacy and Big Data Analytics Adoption

Financial literacy plays a critical role in enhancing managerial decision-making, particularly in the context of technology adoption among MSMEs. It enables managers to evaluate opportunities, assess risks, and allocate resources effectively when considering digital transformation strategies (Kallmuenzer et al., 2025; Kurniasari et al., 2023). By reducing information asymmetry, financial literacy also improves access to financing, supporting MSMEs in securing the capital required to adopt technologies such as BDA (Hussain et al., 2018). Furthermore, it enables MSMEs to assess financial feasibility, evaluate return on investment (ROI), and manage risks associated with integrating analytical technologies into business processes (Okello Candiya

Bongomin et al., 2017). Empirical evidence shows that financially literate MSMEs are more likely to engage in digital technology adoption and make risk-informed investment decisions (Liu et al., 2021), while also achieving better resource allocation and performance outcomes (Changwesha and Mutezo, 2023; Rahadjeng et al., 2023). From an RBV perspective, financial literacy can be understood as an intangible resource that reflects individual readiness and enhances organizational readiness by strengthening the ability of MSMEs to evaluate opportunities and allocate resources effectively (Ying et al., 2019), thereby functioning as a key enabler of big data analytics adoption. Based on these arguments and supporting empirical evidence, the following hypothesis is proposed:

- H_1: Financial literacy has a positive effect on big data analytics adoption.

2.2. Managerial Competence and Big Data Analytics Adoption

Empirical evidence shows that managerial competence significantly influences BDA adoption, as MSMEs led by capable managers are more likely to adopt analytical technologies (Ferraris et al., 2019; Hussain et al., 2022; Nasrollahi et al., 2021). Managerial competence refers to the ability to coordinate and utilize organizational resources to achieve strategic objectives (Chandler et al., 1992) and in MSMEs, it supports informed decision-making, knowledge management, and the integration of data-driven processes (Tawil et al., 2024). It also enhances organizational readiness by fostering a data-driven culture and aligning strategic and operational activities with analytical practices (Beltramino et al., 2020; Jalali et al., 2024; Kumar et al., 2025; Sualeh Khattak et al., 2024). From an RBV perspective, managerial competence can be viewed as an intangible resource that reflects managerial readiness and strengthens the ability of MSMEs to leverage resources, adapt to technological change, and achieve competitive advantage (Ying et al., 2019). In this sense, managerial competence represents a form of individual readiness that enables MSMEs to effectively implement and utilize analytical technologies. Empirical findings further confirm its role in facilitating technology adoption and enabling analytics-driven operations (Aldossari et al., 2023; Alshahrani et al., 2024; Ramírez-Solis et al., 2022; Sucena et al., 2025), positioning it as a key enabler of organizational readiness in technology adoption. Based on these arguments, the following hypothesis is proposed:

- H_2: Managerial competence has a positive effect on big data analytics adoption.

2.3. Financial Literacy and MSME Performance

Financial performance reflects the ability of MSMEs to sustain operations and generate returns through indicators such as profitability, revenue growth, return on investment (ROI), cost efficiency, and liquidity (Maroufkhani et al., 2020), while market performance captures their capacity to compete and adapt in dynamic environments through market share, innovation, customer satisfaction, and retention (Kumar et al., 2025). Financial literacy enhances MSME performance by improving decision-making quality and financial management practices, enabling managers to conduct effective financial monitoring, cost control, and budgeting, which increase operational efficiency and profitability (Idris et al., 2023; Tian et al., 2022). It also strengthens liquidity management and access to capital, supporting business sustainability and growth (Okello Candiya Bongomin et al., 2017). In addition, financial literacy contributes to market performance by enhancing the ability to interpret market data, design competitive strategies, and allocate resources effectively for innovation and marketing, thereby improving adaptability and competitiveness (Akhtar et al., 2024; Kallmuenzer et al., 2025). Overall, financial literacy, as an intangible resource that reflects individual readiness, enhances MSMEs performance by improving decision-making, financial management, and strategic adaptability. However, its effect on performance may not always be direct, as knowledge-based resources often require organizational mechanisms to be translated into measurable outcomes. This highlights its dual role in strengthening both financial stability and market competitiveness in MSMEs. Therefore, the following hypotheses are proposed:

- H_3: Financial literacy has a positive effect on the financial performance of MSMEs.
- H_4: Financial literacy has a positive effect on the market performance of MSMEs.

2.4. Managerial Competence and MSME Performance

Managerial competence is widely associated with improved MSME performance by improving financial planning, decision-making, and resource allocation, enabling managers to control costs, implement strategies effectively, and achieve better profitability, efficiency, and revenue growth (Maharaj and Doorasamy, 2024; Sakib et al., 2022). It also supports differentiation and strengthens financial outcomes in competitive environments, particularly when combined with entrepreneurial orientation (Ngo, 2023), and plays a critical role in ensuring organizational resilience, especially in post-crisis contexts (Maharaj and Doorasamy, 2024). In addition, managerial competence contributes to market performance by enhancing innovation, customer responsiveness, and competitiveness, as competent managers are able to assess market conditions, understand customer needs, and adapt strategies accordingly (Battaglia et al., 2018b). It further strengthens organizational flexibility and supports the integration of strategic tools such as performance management systems, which enhance innovation and customer satisfaction (Malagueño et al., 2018; Sualeh Khattak et al., 2024). From an RBV perspective, managerial competence can be understood as an intangible resource that reflects managerial readiness in coordinating and utilizing organizational resources. However, its effect on performance may not always be direct, as managerial competence often require appropriate organizational mechanisms to be translated requires measurable outcomes. Based on these arguments, the following hypotheses are proposed:

- H_5: Managerial competence has a positive effect on the financial performance of MSMEs.
- H_6: Managerial competence has a positive effect on the market performance of MSMEs.

2.5. Big Data Analytics Adoption and MSME Performance

Previous research highlights a positive relationship between BDA adoption and MSME performance, as it enables the integration of data-driven insights into decision-making processes, improving

operational efficiency, resource allocation, and profitability (Kumar et al., 2025; Maroufkhani et al., 2020; Nasrollahi et al., 2021). BDA adoption also strengthens financial outcomes by aligning analytics with strategic orientation and relational capital (Ramírez-Solis et al., 2022). Beyond financial performance, BDA adoption enhances market performance by driving innovation, improving competitiveness, and increasing customer retention through personalized services and data-driven strategies (Kumar et al., 2025; Maroufkhani et al., 2020). MSMEs adopting analytics are better positioned to develop new products, respond to evolving customer needs, and optimize customer engagement, thereby strengthening loyalty and market expansion (Akhtar et al., 2024; Battaglia et al., 2018b; Bertello et al., 2021; Malagueño et al., 2018). Consistent with the RBV, prior studies suggest that BDA enables firms to transform data into valuable insights and improve performance (Gupta and George, 2016; Maroufkhani et al., 2020; Wamba et al., 2017). Overall, the literature indicates that the adoption of BDA provides dual benefits for MSMEs, improving financial performance through profitability, sales growth, and cost efficiency, as well as enhancing market performance through competitiveness, innovation, and customer retention. These findings position BDA as a strategic asset that supports value creation and long-term growth. Based on these reasons, the following hypotheses are proposed:

- H_7: The adoption of big data analytics has a positive effect on the financial performance of MSMEs.
- H_8: The adoption of big data analytics has a positive effect on the market performance of MSMEs.

2.6. Mediating Role of Big Data Analytics Adoption

The integration of BDA into MSMEs has attracted significant attention due to its role not only in enhancing performance but also as a mediating mechanism linking individual readiness to firm outcomes. The TOE framework emphasizes that technology adoption is shaped by technological readiness, organizational capacity, and environmental pressures (Lutfi et al., 2022; Maroufkhani et al., 2020), while the RBV highlights the role of internal resources in creating competitive advantage. In this context, financial literacy and managerial competence can be viewed as intangible resources that reflect individual readiness, which in turn shapes organizational readiness (Kumar et al., 2025; Sualeh Khattak et al., 2024). However, the impact of such individual readiness on MSME performance is often indirect, as its influence becomes more effective when facilitated through analytical technologies adoption. Financial literacy enhances risk assessment and resource allocation, while managerial competence supports planning and coordination, but without the integration of BDA, this readiness may not translate into optimal performance outcomes (Ramírez-Solis et al., 2022). Empirical studies further support this mediation mechanism, showing that MSMEs with higher levels of financial literacy and managerial competence are more likely to adopt BDA, which in turn enhances both financial and market performance (Anwar et al., 2020; Eniola and Entebang, 2017; Jalali et al., 2024; Mangla et al., 2020; Maroufkhani et al., 2020; Nasrollahi et al., 2021; Orero-Blat et al., 2025; Tawil et al., 2024).

The mediating role of BDA is reflected in its ability to transform individual readiness into data-driven business processes that improve organizational outcomes. In terms of financial performance, BDA enables MSMEs to forecast trends, manage cash flow, and optimize pricing strategies, leading to improved profitability and efficiency (Kumar et al., 2025; Maroufkhani et al., 2020). For market performance, BDA facilitates the analysis of customer data, allowing firms to tailor offerings, enhance customer retention, and strengthen competitiveness (Hussain et al., 2022). Managerial competence further benefits from BDA integration, as managers are able to interpret analytical insights and translate them into strategic actions that improve both financial and market outcomes (Ferraris et al., 2019). Moreover, the combination of managerial readiness and BDA enhances strategic agility, enabling MSMEs to respond effectively to dynamic environments (Kumar et al., 2025; Ramírez-Solis et al., 2022). Overall, BDA adoption functions as a critical organizational mechanism that enables the conversion of individual readiness into measurable organizational outcomes, reinforcing its role in driving value creation in MSMEs. Thus, the following hypotheses are proposed:

- H_9: Big data analytics adoption mediates the relationship between financial literacy and the financial performance of MSMEs.
- H_{10}: Big data analytics adoption mediates the relationship between financial literacy and the market performance of MSMEs.
- H_{11}: Big data analytics adoption mediates the relationship between managerial competence and the financial performance of MSMEs.
- H_{12}: Big data analytics adoption mediates the relationship between managerial competence and the market performance of MSMEs.

The proposed relationships among the study constructs are summarized in Figure 1.

3. RESEARCH METHODOLOGY

3.1. Research Design

This study adopted a quantitative research approach with mediation model testing using partial least squares structural equation modeling (PLS-SEM). This method was selected since it is able to analyze complex relationships among latent constructs, does not require normal data distribution, and is suitable for relatively small sample sizes (Hair et al., 2022; Kumar et al., 2025). The respondents consist of owners or managers of MSMEs in Indonesia, who act as primary decision-makers in financial, managerial, and technology adoption processes. To ensure data relevance, the inclusion criteria require that MSMEs have been operating for at least 1 year, maintain financial records, and possess basic knowledge of digital tools. Data were collected through an online questionnaire using a five-point Likert scale. The instrument was distributed electronically through online platforms and was pilot tested prior to the main survey to ensure validity and reliability. This study employs a one-stage cluster sampling technique, with island regions (Sumatra, Java, Bali-Nusa Tenggara, Kalimantan, Sulawesi, and Maluku-Papua) serving as primary clusters. Sample allocation was conducted proportionally to ensure adequate geographic representation.

A total of 214 responses were initially collected. After data screening, which involved removing incomplete responses and those that did not meet the predefined criteria, 204 valid responses were retained for further analysis.

3.2. Measurement

All variables were measured using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). This study employed 40 indicators across five constructs: financial literacy (Ye and Kulathunga, 2019), managerial competence (Chandler et al., 1992), big data analytics (Maroufkhani et al., 2020), and MSME performance, comprising financial performance and market performance (Kumar et al., 2025). The measurement items and their respective sources are presented in Table 1.

4. EMPIRICAL RESULTS

4.1. Respondent Profile

The respondent profile, as shown in Table 2, indicates that the majority of MSME owners or managers are male (67%), with most respondents aged between 35 and 44 years (49%), followed by those aged 25-34 years (27%). In terms of education, the majority hold a bachelor's degree (75%), indicating a relatively well-educated sample. Most businesses have been operating for 5-10 years (30%) or more than 10 years (27%), suggesting a predominance of established enterprises. Regarding firm size, the majority of MSMEs employ between one and five employees (41%), followed by those that employ between six and ten employees (26%), reflecting the dominance of small-scale

Table 1: Measurement items

Items	Sources
Financial Literacy	
I regularly analyze my business's financial performance.	Ye and Kulathunga, 2019
My team or I prepare monthly income statements to monitor financial conditions.	
I understand how to calculate the cost of borrowing used to business activities.	
My business has a dedicated bank account for business transactions.	
I know the documents required to apply for business financing.	
I understand the costs and benefits of using business credit facilities.	
I can accurately calculate loan interest rates and repayment estimates.	
I have the skills to assess my business's future financial prospects.	
My team or I can minimize losses by reducing uncollectible receivables.	
I possess basic accounting knowledge that supports financial decision-making.	
Managerial Competence	
I can effectively organize and motivate my work team.	Chandler et al., 1992
I can effectively delegate tasks to team members.	
I maintain smooth day-to-day business operations.	
I can organize and coordinate employees' tasks effectively.	
I can supervise, influence, and lead employees.	
I maximize the utilization of business resources.	
I effectively allocate resources to achieve business objectives.	
I collaborate with individuals or organizations that support business growth.	
I build teams or networks with complementary expertise.	
I receive external support from suppliers, major customers, or financial institutions.	
Big data analytics adoption	
I use big data to respond more quickly to market changes.	Maroufkhani et al., 2020
I use big data to create competitive advantages.	
I use big data to improve customer relationships.	
I use big data to reduce supply chain or distribution costs.	
I use big data to reduce operational costs.	
I use big data to reduce customer communication costs.	
I use big data to improve employee productivity.	
I use big data to improve my own or my team's business management skills.	
I use big data to identify new business opportunities.	
I use big data to strengthen business capabilities and competitiveness.	
I use big data to improve business processes and organizational structure.	
I use big data to access information more quickly.	
I use big data to manage business information and reports more effectively.	
I use big data to improve the accuracy of business information and decision-making.	
Financial Performance	
I believe that effective use of big data can improve business profitability.	Kumar et al., 2025
I believe that big data helps retain customers for a longer period.	
I believe that big data helps increase sales growth.	
Market Performance	
I believe that big data helps my business enter new markets more quickly.	Kumar et al., 2025
I find that big data helps increase market share.	
I find that big data improves the success of new products and services.	

businesses in the sample. Overall, these characteristics suggest that the sample is largely composed of experienced and moderately educated MSME owners operating small-sized enterprises.

4.2. Measurement Model Assessment

Convergent validity is assessed using outer loadings and average variance extracted (AVE), where indicators are considered valid if outer loadings exceed 0.70 and AVE values are above 0.50 (Hair et al., 2022). As shown in Table 3, most indicators meet the recommended loading threshold, while several indicators with loadings between 0.40 and 0.70 are retained, as all constructs achieve AVE values above 0.50, indicating acceptable convergent validity. Reliability is also established, as all constructs report Cronbach's alpha and composite reliability values exceeding 0.70.

Discriminant validity is evaluated using the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT). As presented in Table 4, the Fornell–Larcker results confirm that each construct shares more variance with its indicators than with other constructs. Similarly, as shown in Table 5, most HTMT values are below the recommended threshold of 0.85, supporting discriminant validity. However, the HTMT value between financial performance (FP) and market performance (MP) exceeds the threshold, indicating a high conceptual overlap. This can be explained by the close relationship between financial and market outcomes in MSMEs, where improvements in market performance are often reflected in financial performance. Despite this, both constructs are retained as distinct variables due to their different conceptual domains, with financial performance reflecting internal financial outcomes and market performance representing external competitive outcomes (Kumar et al., 2025; Maroufkhani et al., 2020). Overall, the measurement model demonstrates satisfactory validity and reliability.

4.3. Structural Model Assessment

The results of the structural model and hypothesis testing are presented in Table 6. Following Hair et al. (2022), bootstrapping with 5,000 resamples was conducted to assess the significance of the path coefficients. Decision-making is performed by comparing the p-value with a significance level of 5% ($\alpha = 0.05$). Based on the results of the hypothesis testing, FL and MC

Table 2: Respondent profile

Variables	Profile	Frequency	Percentage
Gender	Male	136	67
	Female	68	33
Age	<25 years	2	1
	25-34 years	55	27
	35-44 years	100	49
	45-54 years	42	21
	≥55 years	5	2
Education	Senior high school	28	14
	Bachelor's degree	152	75
	Master's degree	24	12
Business age	1-3 years	39	19
	3-5 years	48	24
	5-10 years	62	30
	>10 years	55	27
Number of employees	1-5 employees	84	41
	6-10 employees	53	26
	11-20 employees	34	17
	20-50 employees	26	13
	>50 employees	7	3

Table 3: Results of validity and reliability test

Variable	Indicator	Outer loadings	AVE	Cronbach's alpha	Composite reliability
Financial literacy	FL1	0.752	0.508	0.893	0.911
	FL2	0.661			
	FL3	0.761			
	FL4	0.587			
	FL5	0.723			
	FL6	0.705			
	FL7	0.688			
	FL8	0.757			
	FL9	0.743			
	FL10	0.732			
Managerial competence	MC1	0.769	0.567	0.912	0.928
	MC2	0.778			
	MC3	0.67			
	MC4	0.803			
	MC5	0.822			
	MC6	0.862			
	MC7	0.864			
	MC8	0.621			
	MC9	0.733			
	MC10	0.542			
Big data analytics	BDA1	0.867	0.793	0.980	0.982
	BDA2	0.89			
	BDA3	0.888			
	BDA4	0.879			
	BDA5	0.908			
	BDA6	0.882			
	BDA7	0.9			
	BDA8	0.888			
	BDA9	0.895			
	BDA10	0.92			
	BDA11	0.902			
	BDA12	0.87			
	BDA13	0.884			
	BDA14	0.894			
Financial performance	FP1	0.919	0.862	0.920	0.949
	FP2	0.924			
	FP3	0.943			
Market performance	MP1	0.903	0.850	0.911	0.944
	MP2	0.947			
	MP3	0.915			

Table 4: Results of Fornell–Larcker criterion

Variable	FL	MC	BDA	FP	MP
FL	0.713				
MC	0.597	0.753			
BDA	0.473	0.495	0.891		
FP	0.463	0.361	0.530	0.929	
MP	0.379	0.345	0.542	0.898	0.922

Table 5: Results of Heterotrait–Monotrait ratio (HTMT)

Variable	FL	MC	BDA	FP	MP
FL					
MC	0.646				
BDA	0.486	0.518			
FP	0.494	0.39	0.555		
MP	0.403	0.372	0.571	0.981	

Table 6: Hypothesis testing

Hypothesis	Path	Coefficient	T-statistics (|O/STDEV|)	P-values	Decision
H_1	FL -> BDA	0.276	3.374	0.001	Supported
H_2	MC -> BDA	0.330	3.915	0.000	Supported
H_3	FL -> FP	0.275	2.962	0.003	Supported
H_4	FL -> MP	0.142	1.462	0.144	Not Supported
H_5	MC -> FP	−0.001	0.005	0.996	Not Supported
H_6	MC -> MP	0.033	0.334	0.739	Not Supported
H_7	BDA -> FP	0.400	4.900	0.000	Supported
H_8	BDA -> MP	0.458	5.238	0.000	Supported
H_9	FL -> BDA -> FP	0.110	2.611	0.009	Supported
H_{10}	FL -> BDA -> MP	0.127	2.615	0.009	Supported
H_{11}	MC -> BDA -> FP	0.132	3.212	0.001	Supported
H_{12}	MC -> BDA -> MP	0.151	3.177	0.001	Supported

FL: Financial literacy, MC: Managerial competence, BDA: Big data analytics, FP: Financial performance, MP: Market performance

significantly influence BDA; BDA significantly affects both FP and MP; FL is significant for FP but not for MP; while MC is not significant for either FP or MP. The mediation results further indicate that BDA significantly mediates the relationships between FL and performance, as well as MC and performance, supporting most of the proposed hypotheses except for the direct effect of FL on MP and the direct effects of MC on both FP and MP.

Based on the results of the coefficient of determination (R^2) in Table 7, the model explains 29.4% of the variance in big data analytics, 33.9% in financial performance, and 31.4% in market performance, indicating a moderate level of explanatory power. The adjusted R^2 values, which are close to the R^2 values, suggest that the model is stable. Furthermore, the predictive relevance (Q^2) values for all endogenous variables are >0, indicating that the model has adequate predictive capability (Hair et al., 2022). Overall, these results demonstrate that the model is not only able to explain the relationships between variables but also has satisfactory predictive relevance. The structural model with the bootstrapping results is presented in Figure 2.

Table 7: Coefficient determination and predictive relevance

Endogenous variable	R-squared	Adjusted R-square	Q^2
Big data analytics	0.294	0.287	0.231
Financial performance	0.339	0.329	0.279
Market performance	0.314	0.303	0.256

5. DISCUSSION

The findings of this study can be understood through the integration of the RBV and the TOE framework. Financial literacy represents a knowledge-based resource that enhances decision-making quality and supports the evaluation of costs, risks, and benefits associated with technology adoption (Barney, 1991; Eniola and Entebang, 2017; Liu et al., 2021; Ying et al., 2019). In owner-managed MSMEs, this cognitive readiness directly reflects organizational readiness, enabling more informed adoption decisions. Consistent with prior studies, higher financial literacy strengthens MSMEs' readiness to adopt digital technologies, although external pressures such as competition and market demands may also influence adoption decisions (Aldossari et al., 2023; Hussain et al., 2018; Kallmuenzer et al., 2025; Kurniasari et al., 2023; Liu et al., 2021; Tawil et al., 2024).

Managerial competence further contributes to organizational readiness by functioning as managerial readiness, enabling the coordination of resources, strategic planning, and the effective implementation of technology adoption (Chandler et al., 1992; Ying et al., 2019). In MSMEs with simple organizational structures, managerial competence is embedded in the owner, shaping how strategic decisions are translated into operational actions. While prior studies confirm its role in enhancing readiness for BDA adoption (Ferraris et al., 2019; Hussain et al., 2022; Jalali et al., 2024; Tawil et al., 2024), its direct impact on performance is not always evident, as it depends on supporting mechanisms such as financial resources and technological accessibility (Soomro et al., 2024; Yamauchi et al., 2024).

In terms of performance, financial literacy demonstrates a differential effect. It directly enhances financial performance by improving financial management practices, decision quality, and resource allocation efficiency (Eniola and Entebang, 2017; Idris et al., 2023; Okello Candiya Bongomin et al., 2017; Tian et al., 2022; Ye and Kulathunga, 2019). However, its impact on market performance is not significant, indicating that knowledge-based resources require complementary mechanisms to generate competitive outcomes. Market performance depends on the integration of financial knowledge with other capabilities, such as innovation, market orientation, and adoption of digital technology (Bertello et al., 2021; Kallmuenzer et al., 2025; Liu et al., 2021).

Similarly, managerial competence does not directly translate into improved performance, reinforcing the argument that managerial readiness requires organizational mechanisms to produce measurable outcomes. Its contribution to performance is often indirect and contingent upon systems that enable the implementation of strategic decisions, including innovation practices and performance management systems (Battaglia et al., 2018b; Ngo, 2023; Sualeh Khattak et al., 2024). This finding highlights that managerial readiness alone is insufficient without the presence of enabling structures that connect strategy with execution.

Figure 1: Conceptual framework

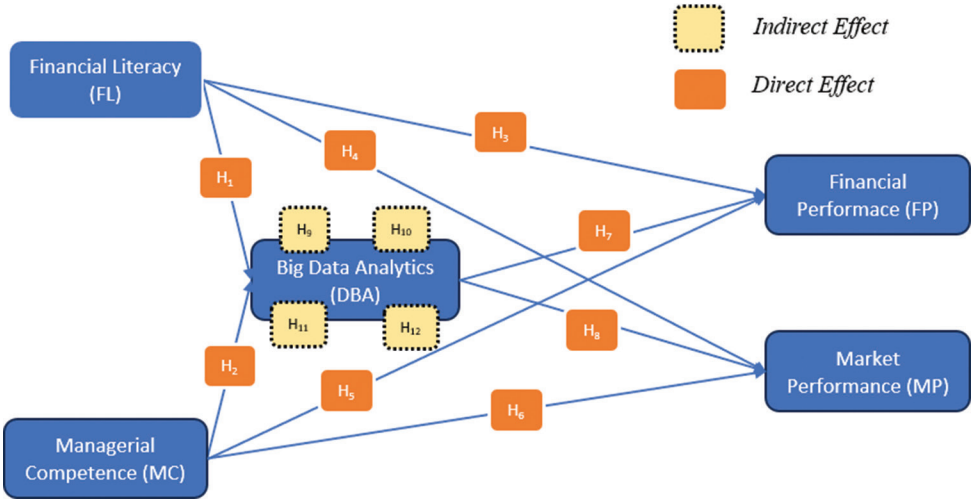
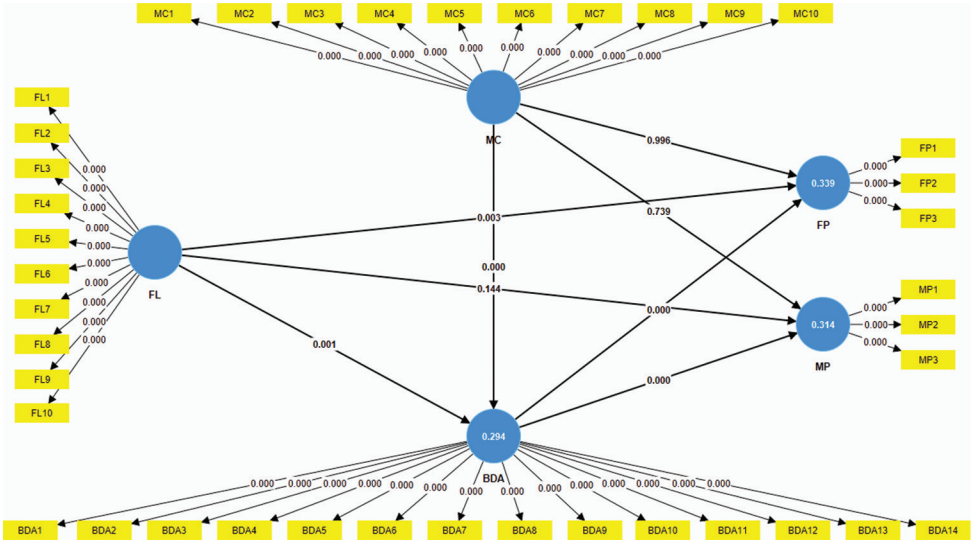


Figure 2: Structural model with SmartPLS bootstrapping



The role of BDA emerges as a critical organizational mechanism that enhances both financial and market performance. By integrating data-driven insights into business processes, BDA improves operational efficiency, resource allocation, and strategic decision-making (Ferraris et al., 2019; Gupta and George, 2016; Nasrollahi et al., 2021; Wamba et al., 2017). Within the TOE framework, BDA adoption reflects the effective integration of technology into organizational processes, particularly in owner-managed MSMEs, where the owner plays a central role in promoting data-driven practices (Maroufkhani et al., 2020). These findings are consistent with prior research demonstrating that BDA adoption strengthens competitiveness, innovation, and customer engagement (Bertello et al., 2021; Kumar et al., 2025).

Most importantly, the mediation results reveal that BDA functions as an organizational conversion mechanism that bridges individual readiness and performance outcomes. It partially mediates the relationship between financial literacy and financial performance, fully mediates the relationship between financial literacy and market performance, and fully mediates the relationship between managerial competence and MSME performance. These findings indicate that individual readiness, such as financial literacy and managerial competence, does not automatically lead to performance improvements but requires technological mechanisms to be effectively operationalized. From an RBV perspective, BDA enables the transformation of internal resources into economic value (Barney, 1991), while from a TOE perspective, its effectiveness depends on the organization's ability to integrate technology into business processes (Maroufkhani et al., 2020). In owner-managed MSMEs, where organizational dynamics are closely tied to the owner's cognition and behavior (Felin et al., 2012), BDA plays a crucial role in translating individual readiness into organizational performance.

6. CONCLUSION

This study examines how individual readiness—represented by financial literacy and managerial competence—drives big data analytics (BDA) adoption and its implications for MSME performance in Indonesia. Using a PLS-SEM approach, the findings reveal that both financial literacy and managerial

competence significantly influence BDA adoption, highlighting the importance of individual readiness in supporting data-driven decision-making. Furthermore, BDA adoption has a positive and significant impact on both financial and market performance, indicating that the integration of analytics into business processes enhances operational efficiency, decision quality, and competitiveness. However, the direct effects of individual readiness on performance are limited, as financial literacy only influences financial performance, while managerial competence shows no direct impact on performance outcomes.

The mediation results demonstrate that BDA serves as a critical mechanism linking individual readiness and performance. Specifically, BDA partially mediates the relationship between financial literacy and financial performance and fully mediates the relationships between financial literacy and market performance, as well as between managerial competence and MSME performance. These findings confirm that readiness alone is insufficient to generate performance improvements without the support of technology-based organizational systems. Integrating the perspectives of resource-based view and technology–organization–environment, this study concludes that MSMEs performance is achieved when individual readiness is effectively translated into data-driven practices through BDA adoption, positioning BDA as an organizational conversion mechanism that bridges individual readiness with measurable financial and market outcomes in owner-managed MSMEs.

6.1. Implications

This study highlights that improving MSME performance requires not only individual readiness but also the effective adoption and utilization of analytical technologies. For MSME owners and managers, enhancing financial literacy and managerial competence supports better decision-making, risk assessment, and technology implementation; however, these capabilities must be translated into the actual use of data-driven analytical systems to generate tangible performance improvements. At the organizational level, big data analytics should be viewed not merely as software but as an integrated decision-support system embedded within business processes to improve efficiency, cost management, customer understanding, and strategic planning. For policymakers and supporting institutions, MSME development should extend beyond literacy training to include support for technology adoption through training, implementation guidance, and digital incentives. Overall, digital transformation must be viewed as a strategic process that integrates individual readiness with organizational systems to enable consistent, data-driven decision-making and sustainable performance improvement.

6.2. Limitations and Future Research

This study has several limitations that should be considered when interpreting the findings. The sample is limited to owner-managed MSMEs in Indonesia, which may restrict the generalizability of the results to other contexts, while the uneven distribution of respondents across regions and sectors may affect representativeness. The cross-sectional design captures data at a single point in time, limiting the ability to observe changes in individual readiness, BDA adoption, and MSMEs performance, and constraining causal interpretations. The model also focuses primarily on financial literacy, managerial competence, and BDA adoption, potentially overlooking other relevant factors. Future research is encouraged to expand the model by incorporating additional variables and adopting longitudinal approaches to better capture the dynamics of digital transformation and its long-term impact on MSME performance.

7. DATA AVAILABILITY STATEMENT

The anonymized dataset supporting the findings of this study is publicly available in Zenodo at https://doi.org/10.5281/zenodo.22813497

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