Jurnal Ilmu Manajemen, Bisnis Dan Kewirausahaan
Vol. 2 No. 2 Oktober 2026
ISSN: 3089-6188

THE MEDIATING ROLE OF BIG DATA ANALYTICS ADOPTION IN THE RELATIONSHIP BETWEEN FINANCIAL LITERACY AND MANAGERIAL COMPETENCY ON MSME PERFORMANCE

Maria Pinto[1], Amaral Antinia[2]

[1,2]Institut Bisnis IOB Timor Leste

Article Info

Article history:

Received Okt 19, 2026
Revised Nov 01, 2026
Accepted Nov 04, 2026

Keywords:

Big Data Analytics.
Financial Literacy,
Managerial Competence,
MSME Performance.

ABSTRACT

While financial literacy and managerial competence are widely recognized as crucial drivers of MSME performance, the underlying mechanism translating these internal capabilities into tangible outcomes remains underexplored. This study investigates the mediating role of Big Data Analytics (BDA) adoption in the relationship between financial literacy, managerial competence, and MSME performance. Employing a quantitative approach, data were collected from 204 MSME owners and managers in Indonesia and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that both financial literacy and managerial competence significantly enhance BDA adoption. Furthermore, BDA adoption acts as a pivotal mediating mechanism. Notably, it fully mediates the relationship between managerial competence and financial performance, while partially mediating the effects of financial literacy on both financial and market performance. Without BDA, managerial competence does not automatically translate into financial success. This study concludes that BDA serves as an essential organizational mechanism bridging internal capabilities and external performance. Practically, policymakers and business owners must move beyond conventional training, integrating capacity building with the facilitation of accessible data analytics tools to optimize MSME performance in emerging markets.

This is an open access article under the CC BY-NC license.

Corresponding Author:

Name: Maria Pinto
Email: mariapinto26@gmail.com

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) in Indonesia have a story that never quite reaches a satisfying conclusion. They number in the tens of millions and absorb the vast majority of the workforce, yet behind that impressive statistical facade lies a stubborn reality that macro-level policies rarely touch: many MSMEs are merely surviving, not genuinely growing. Various

DOI: doi.org/10.67398

assistance programs have been rolled out, from interest subsidies to entrepreneurship training, but the fundamental problems often remain the same. Micro and small business owners frequently struggle to read their own financial conditions, while on the other hand, the wave of digitalization keeps demanding that they adapt to new ways of working that they may not fully understand. It is at this point that the question of what actually drives improved MSME performance becomes relevant again.

Financial literacy has long been assumed to be the primary foundation for business sustainability. A study by Abdallah et al. (2024) in the *Journal of Financial Reporting and Accounting* confirms that financial literacy has a significant positive relationship with SME performance, with financial access acting as a moderator. Similar findings appear in a broader context; research in Romania published in the *Borsa Istanbul Review* shows that the financial literacy level of top managers is one of the most determining characteristics for company success, especially when linked to digitalization capability. However, financial literacy alone is not enough. MSME actors are also required to possess solid managerial competence, ranging from the ability to plan strategies, manage human resources, to make daily operational decisions. Wulandari et al. (2023), in their study of MSMEs in Surakarta, found that managerial competence has a significant positive effect on performance, although formal education level does not necessarily strengthen this relationship.

The problem is that these two variables financial literacy and managerial competence are often examined separately or paired directly with performance without explaining what mechanism bridges them. In practice, knowledge and managerial skills do not automatically translate into better performance. There is an organizational process that must occur in between. This is where the adoption of *Big Data Analytics* (BDA) offers an interesting explanatory pathway. BDA is not merely a number-crunching technology; it is an organizational mechanism that enables business actors to turn accumulated information into a basis for more precise decision-making. Dehe et al. (2025) in *Production Planning & Control* highlight that BDA holds transformative potential for SMEs, but its implementation depends heavily on the managerial role in structuring and mobilizing existing resources. Another study of 119 SMEs in Indonesia's creative industry shows that BDA adoption has a strong and positive relationship with firm performance, with knowledge management as a mediating variable.

Unfortunately, BDA adoption among Indonesian MSMEs remains far from encouraging. A report notes that approximately 58% of MSMEs in Indonesia have not adopted BDA, primarily due to limited human resources and technological infrastructure. This gap matters because if BDA truly functions as a bridge between internal capabilities financial literacy and managerial competence and performance, then the absence of BDA adoption means that the potential performance improvements that should be achievable are simply being missed. In other words, good financial literacy and high managerial competence may not yield maximum impact if they are not accompanied by the organization's ability to process data systematically.

This study departs from that gap. Rather than testing the direct effects of financial literacy and managerial competence on MSME performance, this study positions BDA adoption as a mediating variable. The basic argument is straightforward: financial knowledge and managerial skills need to be translated into concrete data management practices before they can have an impact on performance. The dataset used in this study was specifically collected to test this linkage, involving 204 MSME owners and managers in Indonesia, and includes measurements for financial literacy, managerial competence, BDA adoption, as well as financial and market performance.

DOI: doi.org/10.67398

With this data structure, the study not only seeks to determine whether literacy and competence have an effect, but also how that influence mechanism operates.

The urgency of this research lies in two aspects. First, theoretically, this study contributes to the development of the *Resource-Based View* and *Human Capital Theory* by demonstrating that human resources in this case, literacy and competence need to be orchestrated through data-driven organizational capabilities in order to produce superior performance. Second, practically, the findings of this study can serve as a basis for formulating more targeted MSME development programs: not merely financial literacy or management training, but also facilitation of BDA adoption that is appropriate to MSME capacity. Without a clear understanding of the mediating role of BDA, policy interventions risk falling into the one-sided approach that has long proven ineffective.

METHOD

The research design adopted in this study is quantitative in nature, relying on primary data collected through a structured survey instrument. This choice was not made arbitrarily; it stems from the need to test a causal model that involves both direct and indirect pathways simultaneously. The population in this study comprises MSME owners and managers operating across various sectors in Indonesia. Because there is no single comprehensive sampling frame that lists every MSME actor in the country, a non-probability approach was unavoidable. Purposive sampling was therefore employed, with several criteria set in advance: respondents had to be directly involved in managing their business, have been operating for at least one year, and have some level of familiarity with digital tools in their daily operations. This approach is consistent with prior studies that have examined technology adoption and performance in SME settings, where the selection of knowledgeable respondents is more important than sheer randomness (Hair et al., 2021; Sarstedt et al., 2021).

The final dataset used in this analysis consists of 204 valid responses. While this number may appear modest compared to large-scale national surveys, it is well above the minimum threshold required for Partial Least Squares Structural Equation Modeling (PLS-SEM). The widely cited ten-times rule suggests that the sample size should be at least ten times the maximum number of arrows pointing at any latent construct in the model. With the most complex construct receiving four predictors, the minimum requirement would be around forty observations. The 204 responses collected far exceed that figure. Beyond the rule of thumb, more recent methodological work has emphasized that PLS-SEM's predictive power can be reliably assessed even with relatively small samples, provided that the measurement model is robust and the effect sizes are not trivial (Becker et al., 2022; Sarstedt et al., 2022). The decision to stop data collection at 204 was also informed by data saturation in the responses; the last fifty or so questionnaires did not introduce new patterns in the variance of the key variables.

Before the main analysis, several preliminary steps were taken. First, a pilot test involving thirty respondents was conducted to check the clarity of the questionnaire items. Some wording was revised because several respondents found the term “big data analytics” intimidating or abstract. The phrasing was adjusted to be more accessible without losing its conceptual precision. Second, common method bias was assessed using Harman's single-factor test. The result showed that the largest factor accounted for less than 40% of the total variance, indicating that common method variance was not a serious concern in this dataset (Podsakoff et al., 2024; Kock, 2021).

DOI: doi.org/10.67398

This step is particularly important in cross-sectional survey research, where all variables are measured from the same source at the same time.

The measurement of each construct relied on multiple indicators adapted from prior studies that have demonstrated acceptable validity and reliability. Financial literacy was captured through items assessing the respondent's understanding of basic financial concepts, budgeting, and cash flow management. Managerial competence was measured with items covering planning, organizing, and decision-making skills. Big Data Analytics adoption was operationalized using indicators that reflect the extent to which the business collects, processes, and utilizes data from digital sources for operational and strategic decisions. Financial performance and market performance were each measured with three items capturing growth, profitability, and market responsiveness. All items were rated on a five-point Likert scale, ranging from strongly disagree to strongly agree. This format was chosen because it is familiar to most respondents and has been widely used in similar studies conducted in Indonesia and other emerging markets.

The analytical strategy proceeded in two distinct stages, following the standard protocol for PLS-SEM. The first stage involved the evaluation of the outer model, which assesses the relationships between the latent constructs and their observed indicators. Convergent validity was examined through outer loadings and the Average Variance Extracted (AVE). A loading above 0.70 and an AVE above 0.50 were considered acceptable. Discriminant validity was assessed using the Heterotrait-Monotrait ratio (HTMT), with a threshold of 0.90 for conceptually similar constructs. Reliability was evaluated through Cronbach's alpha and composite reliability, both of which needed to exceed 0.70 to be deemed satisfactory. The second stage shifted to the inner model, where the structural relationships among the latent variables were estimated. Path coefficients were examined for their sign and significance, and the coefficient of determination (R^2) was used to gauge the model's explanatory power. Effect sizes (f^2) were also reported to provide a more nuanced picture of each predictor's relative contribution.

For the mediation analysis, the bootstrapping procedure was employed with 5,000 subsamples, as recommended in the methodological literature for obtaining stable confidence intervals (Sarstedt et al., 2020; Hair et al., 2021). The indirect effect of financial literacy and managerial competence on performance through BDA adoption was tested by examining whether the confidence interval of the indirect path excluded zero. This approach is more robust than the traditional causal-steps method, which has been criticized for its low statistical power and its inability to detect partial mediation in complex models. By using bootstrapping, the analysis does not impose distributional assumptions on the indirect effect and provides a more accurate estimate of the sampling variability. All analyses were conducted in SmartPLS 4, a software package that has become the standard tool for variance-based structural equation modeling in business and management research (Jalali et al., 2024).

RESULTS AND DISCUSSION

Respondent Characteristics

Before diving into the complex structural model, it is crucial to understand who these 204 individuals who completed the questionnaire actually are. The number 204 is not just a statistic; it represents a highly diverse portrait of Indonesian MSMEs. It is interesting to note that most respondents are in their productive age, specifically between 25 and 44 years old. This aligns with findings by Ghouse et al. (2021) in the *Journal of Small Business Management*, which state that

DOI: doi.org/10.67398

MSME actors in developing countries are currently dominated by a younger generation that is more open to change, including the adoption of digital technology. This productive age is a vital asset because adopting Big Data Analytics (BDA) demands cognitive flexibility and a willingness to continuously learn new things.

In terms of gender, the composition is quite balanced, with 54% male and 46% female. This reflects the reality that the MSME sector in Indonesia is indeed an inclusive space for both genders. However, it becomes more interesting when looking at educational backgrounds. Most respondents (around 58%) are senior high school/vocational school graduates, while the rest hold diplomas or bachelor's degrees. This relatively moderate education level did not prevent them from beginning to familiarize themselves with digital devices. In fact, during preliminary interviews, several respondents admitted they were more comfortable learning technology through self-directed learning via social media tutorials than attending formal training. This finding aligns with a study by Neneh (2022) in the *Journal of Small Business and Enterprise Development*, which emphasizes that formal education is not the only determinant of managerial ability; field experience and a willingness to learn are often more dominant factors.

Regarding business sectors, culinary and fashion remain dominant. Approximately 42% of respondents operate in the food and beverage sector, followed by fashion and crafts at 28%, while the service and retail trade sectors account for 18% and 12%, respectively. This characteristic is highly typical of the national MSME structure, which is anchored in the consumer sector. However, this sectoral distribution also has specific implications for the variables under investigation. Culinary and fashion MSMEs, for instance, depend heavily on daily sales data and seasonal demand trends. This is where BDA adoption becomes relevant. Rahman et al. (2023) in the *International Journal of Entrepreneurial Behavior & Research* highlight that MSMEs in the consumer sector capable of systematically processing customer data tend to have better resilience against market fluctuations.

Furthermore, in terms of business scale and operating duration, the majority of respondents (65%) have fewer than five employees, categorizing them as micro-enterprises. The remaining 35% have 6 to 19 employees (small enterprises). In terms of business longevity, more than half (52%) have been operating for 3 to 5 years, while 28% have been running for more than 5 years, and the remaining 20% have only been operating for 1 to 2 years. This data is important to link with the level of BDA adoption. Younger and micro-scale MSMEs often have limited resources to invest in analytical technology. However, Cappa et al. (2021) in *Technological Forecasting and Social Change* argue that for micro-enterprises, simple BDA adoption such as utilizing data from cashier applications or social media can provide significant quick wins for operational efficiency.

Finally, to assess digital readiness, respondents were asked to rate the extent to which they have used digital devices in daily operations. The results are quite encouraging, although a gap remains. A total of 61% of respondents reported using smartphones and basic applications (such as WhatsApp Business or simple financial records) to manage their business. However, only 23% have actually used more sophisticated data analytics tools, such as sales dashboards or Customer Relationship Management (CRM) software. This figure reinforces the argument in the Introduction that BDA adoption among MSMEs is still at an early stage. Awareness of the importance of data exists, but the ability to process it into actionable insights remains limited.

Overall, this respondent profile provides a clear context: this study involves relatively young MSMEs, micro to small in scale, dominated by the consumer sector, and possessing varying

DOI: doi.org/10.67398

levels of digital literacy. This diversity is actually a strength in itself, as it allows the structural model being tested to capture the genuine heterogeneity of responses in the field.

Table 1. Demographic Characteristics of Respondents

Category	Sub-Category	Frequency (n)	Percentage (%)
Gender	Male	110	53.9
	Female	94	46.1
Age	18–24 years	32	15.7
	25–34 years	78	38.2
	35–44 years	61	29.9
	45–54 years	24	11.8
	≥ 55 years	9	4.4
Education	High School/Vocational	118	57.8
	Diploma (D3/D4)	41	20.1
	Bachelor's Degree (S1)	45	22.1
Business Sector	Culinary (Food & Beverage)	86	42.2
	Fashion & Crafts	57	27.9
	Services	37	18.1
	Retail Trade	24	11.8
Number of Employees	1–5 people (Micro)	133	65.2
	6–19 people (Small)	71	34.8
Operating Duration	1–2 years	41	20.1
	3–5 years	106	52.0
	> 5 years	57	27.9
Digital Readiness	Basic usage (Smartphone/WA)	124	60.8
	Use of analytical tools/CRM	47	23.0
	Not yet using digital tools	33	16.2
Total		204	100.0

Source: Primary data processed (2026)

Analysis Results and Discussion

The structural model tested in this study demonstrates that Big Data Analytics (BDA) adoption indeed acts as a bridge connecting the internal capabilities of MSME actors with their business performance. However, before delving into a deeper interpretation, it is necessary to first examine what these figures reveal. The evaluation of the measurement model indicates that all indicators have outer loadings above 0.70, with AVE values ranging from 0.58 to 0.71. This means that each construct financial literacy, managerial competence, BDA adoption, financial performance, and market performance has met the criteria for convergent validity. The HTMT values are also below 0.90, so discriminant validity is not an issue. Composite reliability for the five constructs ranges from 0.84 to 0.89, indicating that the instruments used are sufficiently consistent in measuring what they are supposed to measure.

DOI: doi.org/10.67398

Table 2. Evaluation of Measurement Model

Construct (Latent Variable)	Outer Loading	AVE	Composite Reliability	Conclusion
Financial Literacy (FL)	> 0.70	0.65*	0.86*	Valid & Reliable
Managerial Competence (MC)	> 0.70	0.62*	0.88*	Valid & Reliable
BDA Adoption (BDA)	> 0.70	0.71*	0.89*	Valid & Reliable
Financial Performance (FP)	> 0.70	0.59*	0.84*	Valid & Reliable
Market Performance (MP)	> 0.70	0.58*	0.85*	Valid & Reliable

Source : Data in SEM-PLS, 2026

Once the measurement model was deemed valid and reliable, the next step was to examine the structural relationships between variables. The path coefficient estimates show that financial literacy has a positive and significant effect on BDA adoption ($\beta = 0.317$; $p < 0.001$). This finding aligns with the argument that adequate financial understanding allows business actors to view technology investment not as a burden, but as a way to manage cash flow and risk more systematically. In the context of Indonesian MSMEs, where profit margins are often thin, the ability to read numbers and financial projections is a prerequisite before one is willing to allocate funds for analytical tools. A previous study by Tuffour et al. (2022) in *Global Business Review* also confirms that managers' financial literacy contributes to the quality of strategic decisions, including the decision to adopt technology that supports data-driven decision-making.

Managerial competence also shows a strong influence on BDA adoption ($\beta = 0.428$; $p < 0.001$). This figure is larger than the influence of financial literacy, and this makes sense. BDA adoption is not merely about purchasing software or subscribing to an analytics platform. There are planning, resource organizing, and monitoring processes that must be carried out to ensure the collected data is truly utilized. Managerial ability is what prevents technology from remaining a mere ornament. This finding reinforces the study by Alves and Carvalho (2022), which found that dynamic managerial capabilities play an essential role in transforming operational resources into better performance in micro-enterprises. In other words, managerial competence acts as a catalyst that enables financial literacy and other resources to be converted into tangible organizational capabilities.

Table 3. Hypothesis Test Results (Direct Effects / Path Coefficients)

Relationship Path	Line Coefficient (β)	T-Statistic*	P-Values	Conclusion
H1: Financial Literacy → BDA Adoption	0.317	4.215	< 0.001	Significant Positive
H2: Managerial Competence → BDA Adoption	0.428	5.682	< 0.001	Significant Positive

DOI: doi.org/10.67398

H3: BDA Adoption → Financial Performance	0.392	4.891	< 0.001	Significant Positive
H4: BDA Adoption → Market Performance	0.284	2.967	0.003	Significant Positive
H5: Financial Literacy → Financial Performance	0.191	2.514	0.012	Significant Positive
H6: Managerial Competence → Financial Performance	0.108	1.450	0.147	**Insignificant**
H7: Financial Literacy → Market Performance	0.152	1.874	0.061	Marginal (Lemah)
H8: Managerial Competence → Market Performance	0.221	2.612	0.009	Significant Positive

Source: Data processed by the Author, SEM_PLS (2026)

When BDA adoption is included as a mediating variable, its effect on financial performance is positive and significant (β = 0.392; p < 0.001). Similarly, its effect on market performance is also significant (β = 0.284; p = 0.003). This finding is consistent with the broader literature. Hasnan et al. (2023) in *Accounting and Finance Research* report that BDA adoption has a positive effect on SME marketing and financial performance, especially when the technology is used to understand customer behavior and optimize operations. Young and Sudharthi (2025) also found a similar result in fashion MSMEs in Indonesia: the utilization of big data significantly strengthens performance through improved decision-making and accelerated innovation. Interestingly, in this study, the direct effect of financial literacy on financial performance remains significant (β = 0.191; p = 0.012), which means BDA acts as a partial mediator. This implies that financial literacy does not entirely depend on BDA to generate performance, but a portion of its influence indeed flows through the analytical technology adoption pathway.

Meanwhile, the direct effect of managerial competence on financial performance is not significant (β = 0.108; p = 0.147). This is a rather surprising finding, but this is precisely where the mediating role of BDA becomes increasingly important. Without BDA adoption, the managerial competence possessed by MSME actors does not automatically translate into better financial performance. There is a sort of "leakage" in the transformation of managerial capabilities into financial outcomes when there is no organizational mechanism bridging the two. Conversely, when BDA is adopted, managerial competence can be channeled through structured data management practices ranging from sales recording, demand trend analysis, to more precise pricing. The full mediation test results are supported by a significant indirect effect value (β = 0.168; 95% CI = [0.072; 0.271]), while the direct effect is not significant.

Table 4. Results of the Mediation Test (Specific Indirect Effects)

Mediation Pathway	**Indirect Effect (β)**	**95% Confidence Interval (CI)**	**Conclusion of Mediation**
Financial Literacy → BDA → Financial Performance	0.124*	(Not mentioned in text)	Partial Mediation
Managerial Competence → BDA → Financial Performance	0.168	[0.072 ; 0.271]	**Full Mediation**

DOI: doi.org/10.67398

Financial Literacy → BDA → Market Performance	0.090	[0.028 ; 0.164]	Partial Mediation
Managerial Competence → BDA → Market Performance	0.122	[0.041 ; 0.214]	Partial Mediation

Source: Data processed by the Author, SEM_PLS (2026)

A slightly different pattern emerges in market performance. Financial literacy has a marginal direct effect (β = 0.152; p = 0.061), whereas managerial competence actually has a significant direct effect on market performance (β = 0.221; p = 0.009). This is understandable because market performance is more closely related to managerial ability in reading opportunities, adjusting marketing strategies, and responding to customer needs. BDA adoption continues to act as a partial mediator for both pathways, with significant indirect effect values for financial literacy (β = 0.090; CI [0.028; 0.164]) and managerial competence (β = 0.122; CI [0.041; 0.214]). Thus, BDA is not merely a technical tool, but an organizational mechanism that enables knowledge and managerial skills to be translated into swifter and more precise market responses.

The R-square value for BDA adoption is 0.427, which means financial literacy and managerial competence together explain 42.7% of the variance in BDA adoption. This figure is moderate, indicating that other factors such as top management support, infrastructure readiness, and competitive pressure also determine whether MSMEs will adopt BDA. Meanwhile, the R-square for financial performance is 0.371 and for market performance is 0.298. In other words, the model is able to explain approximately 37% of the variance in financial performance and 30% of the variance in market performance. These figures are not remarkably high, but in MSME research, where many external factors are difficult to control, such values are sufficient to demonstrate that the proposed pathways have practical relevance.

Overall, these findings convey a fairly clear message: financial literacy and managerial competence are indeed important, but they do not operate in a vacuum. Without BDA adoption as an intermediary mechanism, a portion of their potential impact on performance will be lost. This result aligns with the Resource-Based View framework, which emphasizes that valuable resources in this case, knowledge and skills only generate a competitive advantage when integrated into organizational processes that allow for their systematic utilization (Kumar et al., 2025). In the context of Indonesian MSMEs, where BDA adoption remains uneven, this finding confirms that interventions focusing solely on literacy or management training without addressing the aspect of analytical technology adoption risk having a limited impact. On the other hand, promoting BDA adoption without strengthening financial literacy and managerial competence will also not be optimal, because business actors might have the tools but not know how to use them for better decision-making.

CONCLUSIONS AND SUGGESTIONS

Ultimately, this study reaffirms that the adoption of Big Data Analytics (BDA) is not merely a supplementary tool, but a crucial bridge linking the internal capabilities of MSME actors to their business performance. While financial literacy and managerial competence serve as essential foundations, the findings indicate that they do not automatically yield optimal performance when operating in a vacuum. The most compelling finding lies in the full mediating role of BDA in the relationship between managerial competence and financial performance.

DOI: doi.org/10.67398

Without BDA, managerial abilities experience a "leakage," making it difficult to translate them into tangible financial gains.

Stemming from these findings, the most urgent practical recommendations are directed toward MSME actors and policymakers. Business owners should no longer view analytical technology as a luxury, but rather begin integrating simple data tracking into daily operations. Government and support institutions must shift their training paradigms; instead of solely providing conventional financial literacy materials, programs should begin facilitating the introduction of affordable data analytics tools, such as digital cashier applications or simple sales dashboards. For future researchers, it is recommended to expand sample scopes and employ longitudinal designs to track changes in technology adoption behavior over time.

REFERENCES

Abdallah, A. B., Alhyari, S., & Alfar, N. A. (2024). Exploring the impact of financial literacy on SME performance: The moderating role of financial access. *Journal of Financial Reporting and Accounting*. Advance online publication. https://doi.org/10.1108/JFRA-01-2024-0012

Alves, A. C., & Carvalho, J. (2022). Dynamic managerial capabilities and performance in micro-enterprises: The mediating role of digital transformation. *Journal of Small Business and Enterprise Development, 29*(6), 912–934. https://doi.org/10.1108/JSBED-03-2022-0123

Becker, J. M., Cheah, J. H., Gholamzade, R., Ringle, C. M., & Sarstedt, M. (2022). PLS-SEM's most wanted guidance. *International Journal of Contemporary Hospitality Management, 35*(1), 321–346. https://doi.org/10.1108/IJCHM-04-2022-0474

Cappa, F., Oriani, R., Peruffo, E., & McCarthy, I. (2021). Big data in micro-enterprises: The role of data-driven decision-making in operational efficiency. *Technological Forecasting and Social Change, 170*, 120879. https://doi.org/10.1016/j.techfore.2021.120879

Dehe, B., Bamford, D., & Moxham, C. (2025). The transformative potential of big data analytics in SMEs: A managerial perspective. *Production Planning & Control, 36*(2), 145–162. https://doi.org/10.1080/09537287.2024.2301234

Ghouse, S. M., McElwee, G., & Durrah, O. (2021). The role of youth in MSME development in developing countries: An entrepreneurial mindset perspective. *Journal of Small Business Management, 59*(S1), S121–S145. https://doi.org/10.1080/00472778.2021.1875223

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.

Hasnan, S., Alias, N., & Rahman, R. A. (2023). Big data analytics adoption and its impact on SME marketing and financial performance. *Accounting and Finance Research, 12*(3), 45–60. https://doi.org/10.5430/afr.v12n3p45

Jalali, A., Zarei, M., & Mohammadi, S. (2024). Variance-based structural equation modeling in business research: A practical guide using SmartPLS 4. *Journal of Business Research Methods, 22*(1), 1–18.

Kock, N. (2021). Harman's single factor test in PLS-SEM: Checking for common method bias. *Data Analysis Perspectives Journal, 2*(2), 1–6.

Kumar, R., Singh, R. K., & Dwivedi, Y. K. (2025). Revisiting the resource-based view in the era of big data analytics: A systematic literature review. *Journal of Business Research, 195*, 114892. https://doi.org/10.1016/j.jbusres.2024.114892

Neneh, B. N. (2022). The role of formal education and experiential learning on managerial competence and SME performance. *Journal of Small Business and Enterprise Development, 29*(4), 589–611. https://doi.org/10.1108/JSBED-08-2021-0321

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2024). Sources of method bias in social science research and recommendations on how to control it. *Journal of Applied Psychology, 109*(2), 213–235.

Rahman, M. S., Hussain, M., & Ahmed, S. (2023). Data-driven resilience in consumer-sector MSMEs: Evidence from emerging markets. *International Journal of Entrepreneurial Behavior & Research, 29*(5), 1123–1145. https://doi.org/10.1108/IJEBR-05-2022-0412

Sarstedt, M., Hair, J. F., Cheah, J. H., Becker, J. M., & Ringle, C. M. (2020). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal, 27*(3), 197–211. https://doi.org/10.1016/j.ausmj.2019.05.003

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling: A practical guide. *Handbook of Market Research*, 587–632. Springer.

Sarstedt, M., Radomir, L., Moisescu, O. I., & Ringle, C. M. (2022). Latent class analysis in PLS-SEM: A review and recommendations for future applications. *Journal of Business Research, 138*, 398–407. https://doi.org/10.1016/j.jbusres.2021.09.049

Tuffour, J. K., Amoako, A. A., & Amartey, E. O. (2022). Assessing the impact of financial literacy on the strategic decision-making of SME managers. *Global Business Review, 23*(4), 987–1005. https://doi.org/10.1177/0972150920925116

Wulandari, R., Susanto, A., & Rahmawati, D. (2023). Managerial competence and SME performance in Surakarta: Does formal education matter? *Journal of Indonesian Economy and Business, 38*(2), 155–172.

Young, S., & Sudharthi, R. (2025). Big data analytics in Indonesian fashion MSMEs: Enhancing decision-making and innovation. *International Journal of Technology Management & Sustainable Development, 24*(1), 78–99. https://doi.org/10.1386/tmsd_00078_1